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**CHANGING CHILD HEALTH SURVEILLANCE IN SCOTLAND:
AN EXPLORATION OF THE IMPACT ON PREVENTIVE HEALTH CARE
OF PRE-SCHOOL CHILDREN**

Rachael Wood

Volume I

PhD
University of Edinburgh
2013

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Declaration

Thesis: CHANGING CHILD HEALTH SURVEILLANCE IN SCOTLAND:
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PRE-SCHOOL CHILDREN

Declaration: I confirm that I have composed this thesis and that the work presented is my own. Where others have made a contribution, for example provision of statistical advice, this is acknowledged in the text. The work presented has not been submitted for any other degree or professional qualification. Some of the work presented in the thesis has been published in peer reviewed journals: these are provided at the end of the thesis.

Signed

Date

Acknowledgements

Thanks are due to the following people and institutions.

My supervisors Harry Campbell, Allyson Pollock (to November 2008), Sarah Cunningham-Burley (from December 2008), and Jim Chalmers (from December 2008).

Colleagues that provided practical help, notably

- Colleagues working on child public health issues within the NHS in Scotland who helped me to understand the Scottish Child Health Programme in action and in context, in particular Zoë Dunhill and Charles Clark
- Colleagues from the Scottish Government who answered queries on policy issues, in particular Gillian Garvie and Mary Sloan
- The many colleagues from other countries who answered queries on aspects of their countries' Child Health Programme
- Colleagues in NHS National Services Scotland Information Services Division (ISD) who answered queries on the various national datasets used and prepared the required data extracts, in particular Judith Tait and Claire Nolan
- Colleagues from ISD and the University of Edinburgh who provided help with statistical analyses, in particular Diane Stockton and Helen Brown

Those that contributed data collected specifically for this thesis, notably

- The Health Visitors and Health Visitor managers of West Glasgow and Glenrothes and North East Fife Community Health Partnerships that contributed to the audit of CHSP-PS data quality
- The Community Health Partnership managers from across Scotland that provided data on their Health Visitor workforce
- The General Practices that provided information on recording of General Practitioner (GP) involvement in universal child health reviews

It should also be recognised that all the routine data analysed for this thesis are based on 'real' children being cared for by Health Visitors, GPs, and other NHS staff. The contribution of these children, their families, and the health professionals involved is therefore also acknowledged.

Finally, thanks are due to the Chief Scientist Office (CSO) for financial support. The work presented in this thesis was primarily undertaken whilst I was in receipt of a CSO Clinical Academic Fellowship (CAF/06/05) which ran from April 2007 to October 2011. The support of ISD's Medical Director, Hester Ward, who enabled me to complete this thesis whilst working as a Consultant in Public Health Medicine in ISD from January 2010, is also gratefully acknowledged.

Abstract

The health service provides a Child Health Programme (CHP) to all children to help them attain their health and development potential. Core elements include screening, immunisations, growth and development surveillance, health promotion advice, and parenting support. The surveillance/advice/support components (known as Child Health Surveillance CHS) are delivered through a series of universally offered child health reviews mainly provided by Health Visitors (HVs) supplemented by additional support as required. Scottish policy issued in 2005 led to considerable changes to the CHP. The number of CHS reviews was substantially reduced to enable more intensive support of children who required it. A three category indicator of need was introduced at the same time to facilitate the identification of children requiring enhanced support. This thesis aims to explore the shift to more targeted provision of CHS that occurred from 2005 onwards, and to examine the impact of this on the preventive health care provided to pre-school children.

The specific objectives are:

- To describe the development of professional guidance on the CHP and how this has been adopted into Scottish policy.
- To compare the CHP provided in Scotland to that offered in other high income countries.
- To examine the impact of the changes to CHS on the coverage of universally offered child health reviews.
- To explore, following the changes to CHS, which factors are associated with children being identified as in need of enhanced CHP support.
- To assess the impact of the changes to CHS on the totality of preventive care provided to pre-school children by HVs and General Practitioners (GPs).

The key methods used are literature review, policy analysis, and analysis of routine health data. Selected findings include the following:

- All the high income countries studied provide the same basic elements as the Scottish CHP but the detail of the different programmes varies considerably. Some of the variation may reflect the different needs of different populations, but much seems to reflect different approaches to evidence interpretation and policy making in different settings.
- Not all children offered 'universal' child health reviews actually receive them. Children from deprived areas are less likely to receive their reviews. Inequalities in review coverage have remained unchanged after the changes to CHS.
- Many factors, including those reflecting infant and maternal health and family social risk, are associated with being identified by HVs as needing enhanced CHP support. The threshold at which children are identified as needing enhanced support varies between areas across Scotland.
- GP provision of child health reviews has reduced after the changes to CHS as would be expected. Recorded GP provision of other preventive care consultations is uncommon and has not changed. Currently available routine data do not allow trends in the totality of HV provided care to be examined.

In summary, the Child Health Programme makes an important contribution to supporting young children and their families but it is a complex service and considerable uncertainty about aspects of its content and delivery remain.

Contents

Declaration	i
Acknowledgements	ii
Abstract	iii
Contents	iv
List of tables	vi
List of figures	ix
Abbreviations	xi
Chapter 1 Introduction	1
Chapter 2 Aims and objectives	4
Chapter 3 Early child development.....	6
3.1. The key steps in brain development.....	9
3.2. The role of experience in brain development.....	11
3.3. Factors that influence early child development	15
3.4. The extent of suboptimal child development.....	20
3.5. Early child development and outcomes over the life course.....	34
3.6. The policy implications of current understandings of early child development	38
3.7. Summary	43
Chapter 4 The Child Health Programme and Child Health Surveillance	45
4.1. The origins and delivery of Child Health Surveillance.....	47
4.2. Further professional guidance on the Child Health Programme: the Health for All Children reports.....	54
4.3. Incorporating professional guidance on the Child Health Programme into policy and practice in Scotland	73
4.4. The wider policy context for the Scottish Child Health Programme	96
4.5. Effectiveness of the Child Health Programme.....	107
4.6. Summary	125
Chapter 5 International approaches to Child Health Programme provision	127
5.1. Methods.....	129
5.2. Results	136
5.3. Discussion	178
Chapter 6 Coverage of Child Health Surveillance reviews	193
6.1. Methods.....	197
6.2. Results	207
6.3. Discussion	249
Chapter 7 Identification of children requiring enhanced Child Health Programme support.....	268
7.1. Methods.....	285

7.2. Results	293
7.3. Discussion	315
Chapter 8 Preventive child health care provided to pre-school children by General Practitioners.....	342
8.1. Methods.....	350
8.2. Results	354
8.3. Discussion	380
Chapter 9 Conclusions and recommendations	394
9.1. Summary of conclusions	395
9.2. Implications for policy and practice.....	399
9.3. Recommendations for future research	406
References	410
Appendices	457
Appendix 1 How early care giving and relationships influence early child development: attachment relationships and stress responses.....	458
Appendix 2 How the Child Health Programme is reflected in NHS, local authority, and central government performance monitoring processes.....	464
Appendix 3 Effectiveness of different elements of the CHP: examples relating to screening, immunisation, physical examination, and provision of health promotion advice	469
Appendix 4 Read codes used for analysis of trends in GP consultation rates for preventive care of pre-school children	484
Appendix 5 Research outputs and impact.....	508

List of tables

Table 1 Occurrence of selected factors influencing early child development	19
Table 2 Parental reporting of concerns about their children's development in the Growing Up in Scotland survey	21
Table 3 Occurrence of selected medical problems with developmental consequences	23
Table 4 Prevalence of disability in children suggested by the 1985/88 OPCS Surveys of Disability in Great Britain.....	27
Table 5 Occurrence of social/emotional developmental problems and mental health problems.....	28
Table 6 Selected foundation stage profile results for children in English primary schools, summer term 2010.....	31
Table 7 Universal Child Health Programme contacts up to school entry recommended in the Health for All Children reports.....	65
Table 8 Universal screening procedures (not relating to growth or senses) up to school entry recommended in the Health for All Children reports	67
Table 9 Universal screening and surveillance procedures (relating to growth or senses) up to school entry recommended in the Health for All Children reports ..	70
Table 10 Health promotion topics recommended for inclusion in the Child Health Programme in the Health for All Children reports.....	72
Table 11 Implementation of the CHSP-PS information system in NHS Boards across Scotland.....	77
Table 12 Child Health Programme recommended for children in Scotland up to school entry in the 2005 guidance.....	82
Table 13 Implementation of modified (2005 guidance compliant) CHSP-PS in NHS Boards across Scotland	87
Table 14 Selected Scottish policy and legislation relevant to the Child Health Programme	102
Table 15 Framework for collection of information on included countries' general health systems and recommended Child Health Programmes	130
Table 16 Websites reviewed for international comparison of countries' health systems and Child Health Programmes.....	132
Table 17 International comparison of Child Health Programmes: overview of consultation with experts from the countries studied.....	135
Table 18 General economic and health service indicators for included countries...	144
Table 19 Sources of information on the recommended Child Health Programme in included countries	160
Table 20 Organisation and delivery of Child Health Surveillance in included countries	162
Table 21 Child Health Surveillance contacts provided to pre-school children in included countries	164

Table 22 Childhood immunisations provided in included countries	167
Table 23 Childhood screening programmes provided in included countries.....	168
Table 24 Coverage of recommended childhood immunisations in included countries	175
Table 25 Child health indicators relevant to the CHP in included countries	177
Table 26 Cohorts of children included in the analysis of review coverage before and after changes to the CHS review schedule	199
Table 27 Number of children included in each cohort.....	208
Table 28 Number and percentage of children with a CHSP-PS record of receiving the specified CHS reviews, by cohort	211
Table 29 Difference in the percentage of children from the least and most deprived areas with a CHSP-PS record of receiving the specified CHS reviews, by cohort	212
Table 30 Number and percentage of children with a CHSP-PS record of receiving the specified CHS reviews, by cohort and deprivation quintile.....	216
Table 31 Number and percentage of children with a CHSP-PS record of receiving the specified CHS reviews within the recommended age limit, by cohort	222
Table 32 Number and percentage of children with a CHSP-PS record of receiving the specified CHS reviews, by NHS Board, cohort 1	225
Table 33 Number and percentage of children with a CHSP-PS record of receiving the specified CHS reviews, by NHS Board, cohort 2	227
Table 34 Number and percentage of children with a CHSP-PS record of receiving the specified CHS reviews, by NHS Board, cohort 3	229
Table 35 Number and percentage of children with a CHSP-PS record of receiving the specified CHS reviews, by NHS Board, cohort 4	231
Table 36 Difference in the percentage of children from the least and most deprived areas with a CHSP-PS record of receiving the specified CHS reviews, by cohort and NHS Board	237
Table 37 Comparison of the characteristics of children included in the CHSP-PS audit who genuinely missed their review and those whose notes indicated they had received their review	248
Table 38 Comparison of the results from the 2006 ISD analysis of coverage of child health reviews to those for cohort 1 from this analysis.....	257
Table 39 Framework of individual child or family factors known or likely to be associated with increased need for Child Health Programme support.....	295
Table 40 Variables included in the analysis of HPI allocation: definitions and data sources	296
Table 41 Distribution of predictor and outcome variables within sample included in the analysis of HPI allocation	298
Table 42 Association between each predictor variable and HPI allocation at 6-8 week review	302
Table 43 Association between all predictor variables and HPI allocation (intensive cf. core HPI) at 6-8 week review: results of standard and multilevel multiple regression models.....	306

Table 44 Association between all predictor variables and HPI allocation (non-core cf. core HPI) at 6-8 week review: results of standard and multilevel multiple regression models	309
Table 45 Ability of the multilevel model to distinguish children likely to be allocated an intensive rather than a core HPI	313
Table 46 Ability of the multilevel model to distinguish children likely to be allocated a non-core rather than a core HPI	314
Table 47 The proportion of universally offered child health reviews recorded on CHSP-PS as being delivered by a HV and/or a GP	348
Table 48 Categories of GP consultations included in the analysis	351
Table 49 Details of the 30 PTI practices included in the analysis: list size, NHS Board area, and date of implementation of the 2005 policy	355
Table 50 Age, deprivation and urban/rural profile of the 30 included practices' populations, all PTI practices, and all Scottish practices, 30 September 2009	356
Table 51 Results of practice survey enquiring about GP involvement in provision of child health reviews before and after implementation of the 2005 policy, and the Read codes assigned to the relevant consultations	359
Table 52 GP consultations with children aged 0-4 years for child health reviews, all 30 practices combined, by quarter before and after implementation of the 2005 policy, numbers and quarterly rates per 1,000 children aged 0-4 years	362
Table 53 GP consultations with children aged 0-4 years for child health reviews, all 30 practices combined: results of segmented linear regression	364
Table 54 GP consultations with children aged 0-4 years for other preventive care, all 30 practices combined, by quarter before and after implementation of the 2005 policy, numbers and quarterly rates per 1,000 children aged 0-4 years	367
Table 55 GP consultations with children aged 0-4 years for other preventive care, all 30 practices combined: results of segmented linear regression	370
Table 56 GP consultations with women aged 15-49 years for selected subcategories of other preventive care, all 30 practices combined, by quarter before and after implementation of the 2005 policy, numbers and quarterly rates per 1,000 women aged 15-49 years	371
Table 57 GP consultations with women aged 15-49 years for selected subcategories of other preventive care, all 30 practices combined: results of segmented linear regression	373
Table 58 All GP consultations with children aged 0-4 years by type of consultation, all 30 practices combined, by quarter before and after implementation of the 2005 policy, numbers and quarterly rates per 1,000 children aged 0-4 years	375
Table 59 All GP consultations with children aged 0-4 years, all 30 practices combined: results of segmented linear regression	377
Table 60 Routinely available information on the quality of PTI data submitted by included practices	379
Table 61 NHS Scotland HEAT targets agreed since 2005 relevant to the delivery of, or outcomes from, the Child Health Programme	465

List of figures

Figure 1 Total Environment Assessment Model of Early Child Development (TEAM-ECD) developed for the World Health Organisation's Commission on the Social Determinants of Health	17
Figure 2 My World Triangle model of factors influencing child development and well-being used by the Scottish Government's Getting It Right for Every Child programme	18
Figure 3 Getting It Right for Every Child national practice model	106
Figure 4 Theory of how child health reviews may contribute to the attainment of good and equitable early child development.....	124
Figure 5 Percentage of children with a CHSP-PS record of receiving the specified CHS reviews, by cohort	213
Figure 6 Percentage of children living in the least and most deprived areas with a CHSP-PS record of receiving the specified CHS reviews, by cohort.....	214
Figure 7 Percentage of children with a CHSP-PS record of receiving the specified CHS reviews, by deprivation quintile, cohort 1	217
Figure 8 Percentage of children with a CHSP-PS record of receiving the specified CHS reviews, by deprivation quintile, cohort 2	218
Figure 9 Percentage of children with a CHSP-PS record of receiving the specified CHS reviews, by deprivation quintile, cohort 3	219
Figure 10 Percentage of children with a CHSP-PS record of receiving the specified CHS reviews, by deprivation quintile, cohort 4	220
Figure 11 Percentage of children living in the least and most deprived areas recorded as receiving the specified CHS reviews after the recommended age limit, by cohort	223
Figure 12 Percentage of children with a CHSP-PS record of receiving the specified CHS reviews, by NHS Board, cohort 1	233
Figure 13 Percentage of children with a CHSP-PS record of receiving the specified CHS reviews, by NHS Board, cohort 2.....	234
Figure 14 Percentage of children with a CHSP-PS record of receiving the specified CHS reviews, by NHS Board, cohort 3.....	235
Figure 15 Percentage of children with a CHSP-PS record of receiving the specified CHS reviews, by NHS Board, cohort 4.....	236
Figure 16 Difference in the percentage of children from the least and most deprived areas with a CHSP-PS record of receiving the specified CHS reviews, by NHS Board, cohort 1	239
Figure 17 Difference in the percentage of children from the least and most deprived areas with a CHSP-PS record of receiving the specified CHS reviews, by NHS Board, cohort 2	240
Figure 18 Difference in the percentage of children from the least and most deprived areas with a CHSP-PS record of receiving the specified CHS reviews, by NHS Board, cohort 3	241

Figure 19 Difference in the percentage of children from the least and most deprived areas with a CHSP-PS record of receiving the specified CHS reviews, by NHS Board, cohort 4	242
Figure 20 Audit of CHSP-PS data quality: results for children with no CHSP-PS record of a 10 day review	245
Figure 21 Audit of CHSP-PS data quality: results for children with no CHSP-PS record of a 6-8 week review	246
Figure 22 Percentage of pre-school children allocated to each Health Plan Indicator category, 2006-2012, by NHS Board	271
Figure 23 Percentage of pre-school children allocated to each Health Plan Indicator category, August 2009, by NHS Board	277
Figure 24 Percentage of pre-school children allocated to each Health Plan Indicator category, August 2007, by SIMD 2006 deprivation quintile and NHS Board	279
Figure 25 Percentage of children born in 2007 allocated to each Health Plan Indicator category at their 10 day and 6-8 week reviews, by NHS Board	283
Figure 26 Children included in the analysis of HPI allocation	294
Figure 27 GP consultations with children aged 0-4 years for child health reviews, all 30 practices combined, by quarter before and after implementation of the 2005 policy, quarterly rates per 1,000 children aged 0-4 years	363
Figure 28 Additional (non child health review) GP consultations with children aged 0-4 years for other preventive care, all 30 practices combined, by quarter before and after implementation of the 2005 policy, quarterly rates per 1,000 children aged 0-4 years	369
Figure 29 GP consultations with women aged 15-49 years for selected subcategories of other preventive care, all 30 practices combined, by quarter before and after implementation of the 2005 policy, quarterly rates per 1,000 women aged 15-49 years	372
Figure 30 Relative contribution of child health reviews and additional consultations involving other preventive care to all GP consultations with children aged 0-4 years, all 30 practices combined, by quarter before and after implementation of the 2005 policy, rates per 1,000 children aged 0-4 years	376
Figure 31 Scottish Government national performance framework indicators relevant to children's well-being and the CHP	467
Figure 32 Deaths from SIDS in infants aged less than one year, Scotland, 1980-2010	480

Abbreviations

A&A	NHS Ayrshire & Arran
A&C	NHS Argyll & Clyde
AAP	American Academy of Pediatrics
ABCD	North Carolina Assuring Better Child Health and Development project
ACMG	American College of Medical Genetics and Genomics
ACTH	Adrenocorticotrophic hormone
ASQ	Ages and Stages Questionnaire
ASSIA	Applied Social Sciences Index and Abstracts database
BCG	Bacille Calmette-Guérin vaccine
BCS	British Cohort Study 1970
BF	Bright Futures
BMI	Body mass index
CAH	Congenital adrenal hyperplasia
CEL	NHS Scotland Chief Executive's letter
CF	Cystic fibrosis
CH	Congenital hypothyroidism
CHC	(Swedish) child healthcare centres
CHD	Congenital heart disease
CHI	Community Health Index
CHP	Child Health Programme
CHS	Child Health Surveillance
CHSP-PS	Child Health Surveillance Programme – Pre-school information system
CHSP-S	Child Health Surveillance Programme – School information system
CI	Confidence interval
CMO	Chief Medical Officer
CRH	Corticotrophin-releasing hormone
D&G	NHS Dumfries & Galloway
DAWBA	Development and Well-Being Assessment
DNA	Deoxyribonucleic acid
DPT	Diphtheria, Pertussis and tetanus vaccine
DSM	Diagnostic and Statistical Manual of Mental Disorders
DT	Diphtheria and tetanus vaccine
ECD	Early child development
EDI	Early Development Instrument
EEG.	Electroencephalogram
EPDS	Edinburgh postnatal depression scale
FH	(Read code) family history of
fMRI	Functional magnetic resonance imaging
FNS	(Starting Well) Family Needs Scale
FRS	Family Resources Survey
FSP	Foundation stage profile
FV	NHS Forth Valley

GDP	Gross domestic product
GG	NHS Greater Glasgow
GG&C	NHS Greater Glasgow & Clyde
GIRFEC	Getting It Right for Every Child
GP	General Practitioner
GPRD	General Practice Research Database
GUS	Growing Up in Scotland survey
HBHC	(Ontario) Healthy Babies Healthy Children programme
HEAT	NHS Scotland Health improvement, Efficiency, Access, and Treatment targets
HFAC	Health for All Children
Hib	Haemophilus influenzae type B
HPA	Hypothalamic-pituitary-adrenocortical axis
HPI	Health Plan Indicator
HTA	NHS Health Technology Assessment programme
HV	Health Visitor
ICD	International Classification of Diseases
ICIDH	International Classification of Impairments, Disabilities, and Handicaps
IQ	Intelligence quotient
ISD	NHS National Services Scotland Information Services Division
JCVI	Joint Committee on Vaccination and Immunisation
M&CH	(Australian) maternal and child health centres
MCADD	Medium chain acylCoA dehydrogenase deficiency
M-CHAT	Modified checklist for autism in toddlers
MCS	Millennium Cohort Study
MMR	Measles, mumps and rubella vaccine
NEC	(Read code) not elsewhere classified
NHMRC	(Australian) National Health and Medical Research Council
NHS	National Health Service
NICE	National Institute for Health and Clinical Excellence
NICU	Neonatal Intensive Care Unit
NOS	(Read code) not otherwise specified
NRS	National Records for Scotland (formerly General Register Office for Scotland)
NS	Not significant
NSC	National Screening Committee
NUG	(CHSP-PS) National User Group
OECD	Organisation for Economic Co-operation and Development
ONS	Office for National Statistics
OPCS	Office of Population Censuses and Surveys
OR	Odds ratio
OS	(Read code) otherwise specified
PAC	Privacy Advisory Committee
PEDS	Parents' Evaluation of Developmental Status
PET	Positron emission tomography
PKU	Phenylketonuria
PSTF	(US) Preventive Services Task Force

PTI	Practice Team Information
QIS	NHS Quality Improvement Scotland
QOF	Quality and Outcomes Framework
RBR	(Canadian) Rourke Baby Record
RCT	Randomised controlled trial
SAS	Statistical Analysis System
SCBU	Special Care Baby Unit
SCHIP	(US) State Children's Health Insurance Plan
SCIMP	Scottish Clinical Information Management in Practice
SD	Standard deviation
SDQ	Strengths and Difficulties Questionnaire
SIDS	Sudden Infant Death Syndrome
SIMD	Scottish Index of Multiple Deprivation
SIRS	Scottish Immunisation Recall System
SMR02	Scottish Morbidity Record 02
SNS	Sympathetic nervous system
SPSS	Statistical Package for the Social Sciences
SUDI	Sudden Unexpected Death in Infancy
SWISS	Scottish Workforce Information Standard System
TB	Tuberculosis
THIN	The Health Improvement Network
UK	United Kingdom
UNCRC	United Nations Convention on the Rights of the Child
UNICEF	United Nations Children's Fund
US	United States
WHO	World Health Organisation
WI	NHS Western Isles

Chapter 1 Introduction

This thesis starts from the premise that early childhood matters. It matters primarily because the relationships, environment, and services experienced early in life shape children's development which in turn influences health and wider social well-being across the life course. Current understandings of early child development have major implications for policy making and service delivery.

The Child Health Programme (CHP) is one of a range of services that has the protection and promotion of early child development as a key aim. The Child Health Programme is a complex package of interventions offered to all children from birth. Core elements of the Scottish CHP include screening tests, childhood immunisations, growth and development surveillance, health promotion advice, and parenting support. The surveillance/advice/support components (collectively known as Child Health Surveillance CHS) are delivered through a series of child health reviews offered to all children as they attain specified ages. The reviews are mainly provided by specialist nurses known as Health Visitors (HVs). They aim to identify children at increased risk of (or with) suboptimal development or other health or well-being issues at an early stage, and thus facilitate prompt access to effective services and ultimately improve children's outcomes.

The Child Health Programme has a long history and has changed and evolved over time. The Royal College of Paediatrics and Child Health has produced a series of reports providing professional guidance for the whole of the UK on the content and delivery of the Child Health Programme. The most recent report, Health for All Children 4 (HFAC4), was published in 2003. In 2005, in response to HFAC4, the Scottish Government issued the first official policy on the Scottish Child Health Programme. Implementation of the 2005 policy resulted in a substantial reduction in the number of child health reviews provided to pre-school children which was intended to free up Health Visitor resources so they could provide more intensive support to children with higher needs and hence secure more equitable child outcomes.

This thesis seeks to explore the 2005 policy and the impact it has had on the preventive care provided to pre-school children in Scotland. Quantitative analyses undertaken have primarily used routinely available health service data to explore their utility for this purpose. The thesis is structured as follows. The first substantive chapter (Chapter 3) outlines key issues in the current understanding of early child development and discusses their implications for policy and service delivery. Chapter 4 discusses the Child Health Programme in detail: its history, professional guidance on its content and delivery, and policy governing its provision in Scotland. Chapter 5 then goes on to compare the Scottish Child Health Programme to similar services provided in other high income countries.

Chapter 6 to Chapter 8 present a series of quantitative analyses. Chapter 6 explores the impact of the 2005 policy on the coverage of the universally offered child health reviews. Chapter 7 examines, in the period after the 2005 policy was implemented, which factors are associated with children being identified as requiring enhanced CHP support. Chapter 8 looks at trends in the overall provision of preventive care to pre-school children by Health Visitors and General Practitioners (GPs) before and after the 2005 policy was implemented. Chapter 9 then provides overall conclusions for the thesis as a whole, and considers their implications for future research and policy development.

It may be helpful for readers to be aware of the personal context in which the work presented in this thesis was undertaken. I commenced the work in April 2007 when I started a Chief Scientist Office Clinical Academic Fellowship based at the University of Edinburgh. From that time I also held an honorary National Health Service contract with NHS National Services Scotland's Information Services Division (ISD). ISD is the body responsible for collection, analysis, and dissemination of all routine data generated by the Scottish health service. In January 2010 I took up the post of Consultant in Public Health Medicine in ISD alongside an honorary position at the University, and I have completed the work presented here in that capacity. Within ISD, I have particular responsibility for overseeing the use of routine data relating to children's health.

One of the challenges inherent in researching issues closely linked to specific policies is that policy continues to evolve and to be interpreted and implemented in different ways. The work presented here is focused on the 2005 policy and its impacts but it is recognised that there have already been more recent amendments to Child Health Programme policy. Both whilst working as a Clinical Academic Fellow and as part of my current ISD role, I have had ongoing engagement with colleagues in the Scottish Government responsible for policy on child health in general and the Child Health Programme in particular. I have therefore been in the position of both researching the 2005 policy and contributing to shaping subsequent policy developments. More detail about my contribution to subsequent policy developments is provided in Chapter 4 and Appendix 5.

Chapter 2 Aims and objectives

The aim of this thesis is to explore the changes to the Child Health Programme, and in particular to the Child Health Surveillance offered to pre-school children, that occurred in Scotland from 2005 onwards, and to examine the impact of these on the preventive health care provided to pre-school children.

The objectives are:

- To describe the development of professional guidance on the CHP and how this has been adopted into Scottish policy.
- To compare the CHP provided in Scotland to that offered in other high income countries.
- To examine the impact of the changes to CHS on the coverage of universally offered child health reviews.
- To explore, following the changes to CHS, which factors are associated with children being identified as in need of enhanced CHP support.
- To assess the impact of the changes to CHS on the totality of preventive care provided to pre-school children by HVs and General Practitioners (GPs).

The specific research questions addressed are:

- How has professional guidance on the content and delivery of the CHP developed over time, and how has this been incorporated into Scottish policy and subsequently implemented?
- To what extent is guidance and policy on the CHP supported by available evidence on the effectiveness of CHP interventions?
- To what extent do the organisation (health professionals involved, location of provision) and content (detail of screening, immunisation, and CHS) of the Scottish CHP differ to that offered in selected other high income countries, and to what extent are the differences observed likely to reflect different levels of need between different countries/populations?

- To what extent do access to the CHP services offered (immunisation uptake, CHS review coverage) and relevant child health outcomes (breastfeeding rates, child well-being) differ between the countries studied?
- What proportion of children in Scotland receives each of the universally offered CHS reviews and how does review coverage vary by deprivation?
- What impact did the reduction in the number of universally offered CHS reviews seen from 2005 onwards have on the overall level of coverage of the remaining reviews and on the level of inequality in coverage by deprivation?
- Since 2005, what characteristics of children have been associated with the level of CHP support need that Health Visitors assign them to in early infancy?
- How do Health Visitor staffing levels vary across Scotland, and how do staffing levels influence the level of CHP support need children are assigned to?
- Is there residual variation between NHS Board areas in the allocation of children to different support need categories, even when children's characteristics and Health Visitor staffing levels are taken into account?
- How did the totality of care provided by Health Visitors to pre-school children change before and after the 2005 changes to the CHS schedule?
- How did preventive health care provided by General Practitioners to pre-school children (child health reviews and other forms of preventive care) change before and after 2005?

Chapter 3 Early child development

This chapter outlines key issues in the current understanding of early child development and discusses their implications for policy and service delivery.

High quality reviews from authoritative sources/institutions formed the core of the literature reviewed for the sections on brain development and policy responses (Sections 3.1, 3.2, and 3.6). Key sources included:

- The Institute of Medicine’s Committee on Integrating the Science of Early Childhood Development (Shonkoff, Phillips 2000),
- The US Families and Work Institute’s Rethinking the Brain work programme (Shore 2003),
- The World Health Organisation’s Commission on the Social Determinants of Health (Commission on Social Determinants of Health 2008),
- The Human Early Learning Partnership at the University of British Columbia, (Irwin, Siddiqi & Hertzman 2007),
- The Centre on the Developing Child at Harvard University (Centre on the Developing Child 2007),
- The Scottish Collaboration for Public Health Research and Policy (Geddes, Haw & Frank 2010), and
- The Institute of Health Equity at University College London (Marmot 2010).

Cited primary studies were accessed as required to allow assessment of the evidence base summarised in the reviews. In addition, focused de novo searches of the published literature were conducted to obtain further information on areas of particular interest, for example the relationship between stress and early child development (see Appendix 1). Medline was the main database used for de novo searches. Searches used a combination of relevant Medline Subject Headings (e.g. ‘stress, physiological’, ‘child development’) and free text terms (e.g. ‘cortisol’). On occasion, the work of relevant prominent researchers was also reviewed by searching for authors (e.g. ‘Gunnar, MR’, ‘McEwen, BS’). Searches were limited as

appropriate to English language papers, to relevant date ranges, and sometimes to review articles only, to ensure the volume of papers identified remained manageable.

Understanding of the factors that influence development and how early child development influences outcomes over the life course (Sections 3.3 and 3.5) has been particularly informed by population based surveys that start in early childhood and follow participants over time. Research output from these surveys was sought using focused Medline searches as described above and reviewing relevant survey websites which generally give comprehensive listings of research outputs including grey literature reports that would not be picked up via Medline. Particularly important sites included:

- The Growing Up in Scotland study (<http://www.growingupinscotland.org.uk/>),
- The Avon Longitudinal Study of Parents and Children (<http://www.bristol.ac.uk/alspac/>), and
- The Centre for Longitudinal Studies at the Institute of Education, University of London which oversees the 1958 National Child Development Study, the 1970 British Cohort Study, and the Millennium Cohort Study (<http://www.cls.ioe.ac.uk/Default.aspx>).

Finally, obtaining estimates of the extent of suboptimal development that were relevant to contemporary Scotland (Section 3.4) involved reviewing the results of the more recent longitudinal surveys noted above along with those of relevant cross sectional surveys (in particular the Office for Population Censuses and Surveys 1985/88 Surveys of Disability) and relevant routine health service and government statistical publications (e.g. those relating to pupils in school with additional learning support needs).

For the purposes of this thesis, early child development refers to the progressive acquisition of skills and abilities as a child grows up. Development is often considered as encompassing various domains such as motor (learning to walk), perceptual (learning to process visual images), communication and language (learning to talk), cognitive (learning to read and write, learning to plan and problem

solve), adaptive (learning self care skills such as feeding and toileting), and social and emotional (learning to establish positive relationships, learning to see things from others' point of view) (Hopkins et al. 2005).

Early child development essentially reflects the development of the brain. The following sections therefore outline the basic steps involved in brain development and how experience is incorporated into and shapes the brain as it develops. The chapter goes on to discuss the range of factors that influence early child development; the extent of suboptimal early child development in Scotland; and the relationship between early child development and health, educational, and wider social outcomes over the life course. Finally it considers the implication of all this for policy and service development, and provides an overall summary of the issues discussed.

3.1. The key steps in brain development

Over recent decades, a range of neuroscience research based on animal experimentation and the study of the structure and function of the developing human brain using embryology and autopsy studies and newer techniques that can be applied in vivo such as electroencephalogram (EEG) analysis, functional magnetic resonance imaging (fMRI), and positron emission tomography (PET) scanning, has provided enhanced understanding of brain development.

The key steps in brain development proceed along a predictable path (Shonkoff, Phillips 2000, Shore 2003). The neural plate forms along the back of the human embryo within just a few days of conception. Rapid proliferation results in the plate rolling up to form the neural tube which in turn develops into the brain, spinal cord, and peripheral nervous system. Nerve cells (neurons) are overproduced early in development then around half are lost through apoptosis. Term babies are born with around the adult complement of 10^{11} neurons. As neurons are produced, they migrate in waves to specific locations in the developing brain, e.g. the cerebral cortex (Rakic 1988). Again, by the time a term baby is born, this process of neuronal migration is largely complete.

Although human babies are born with essentially the right number of neurons in the right places, their brains are still extremely immature. The process of connecting up the brain cells and establishing efficient neurological pathways occurs to a large extent after birth. When neurons have reached their correct location within the brain, each one puts out one main output fibre (axon) (though this has many branched endings), and up to several thousand input fibres (dendrites). Axons can be relatively long and hence allow neurons to connect to other cells comparatively far away. Axonal growth, and to a greater extent dendritic sprouting, continue after birth into infancy and early childhood. Broadly speaking, connections between neurons are then made when an axon links to a dendrite to create a synapse (synaptogenesis). Synapses enable the transmission of information from one neuron to another when neurotransmitter chemicals such as serotonin or dopamine are released by the axon

into the synaptic space then picked up by the corresponding receptors on the dendrite. The process of synaptogenesis probably goes on throughout the life course, but it is particularly active in infancy and early childhood.

It appears however that synaptogenesis is a rather over exuberant and initially haphazard process that has to be further refined over time. An excess of connections are made then, by processes that are as yet rather poorly understood, those that are used are reinforced and stabilised whereas those that are not are 'pruned back' and lost (Changeux, Danchin 1976, Katz, Shatz 1996). Synaptogenesis far exceeds pruning in the first years of life so that by age three years children's brains have around twice as many connections as those of adults. The number of synapses remains at this high level from age three to the start of puberty. Thereafter, pruning exceeds synapse formation and the number of connections falls to the adult level of around 5^{14} synapses by the end of adolescence (Huttenlocher, Dabholkar 1997). It is important to note, however, that active sculpting continues at all times and neural connections become progressively more stable and organised into networks/pathways (although not immutable) over time.

Like synaptogenesis, the final critical step in brain development, myelination, also occurs predominantly after birth (indeed it continues into the second or third decade of life) (Shonkoff, Phillips 2000). Myelination refers to the process by which neurons are coated in a fatty sheath. This significantly increases the speed and efficiency with which neurons can transmit information and may fulfil other functions as yet unclear. The process of myelination is poorly understood but it is clear that areas of the brain that undertake more basic functions are myelinated first whereas areas that fulfil higher cognitive functions are myelinated last: myelination may be somehow dependent on input/experience in the same way as synaptic reinforcement and pruning. It is likely that neurochemicals/neurotransmitters are important in determining the detail of brain maturation but these 'software' processes are less well understood than the brain wiring/'hardware' processes described above.

3.2. The role of experience in brain development

That children's earliest experiences profoundly influence their development has long been understood intuitively but research conducted over recent decades has given more detailed insight into how this occurs.

Genetic endowment is critical in providing the basic blueprint for brain development: genes govern the basic sequence of neurological development and determine the fundamental architecture of the brain. Genetic abnormalities can clearly have a profound impact on brain development, for example seen clinically in Down's, Rett's and many other syndromes. Equally, it has been known for some time that specific environmental insults including congenital infections such as rubella (Gregg 1942), nutritional problems such as iron deficiency (Lozoff, Jimenez & Wolf 1991), and toxins such as alcohol (Children in Scotland 2011), cocaine (Singer, Minnes 2011) and medicines such as antiepileptics (Brewer, Waltman 2003) can significantly impair brain development. These insults may work through disrupting any of the normal processes of neuron formation, migration, and/or connection. We now understand, however, that in all children the dynamic interaction between genes and aspects of usual human experience shapes the detail of individuals' brains (Greenough, Black 1992). Babies born prematurely are at substantially elevated risk of developmental problems, probably due to a combination of increased risk of specific insults and more general disruption of the usual pattern of environmental input/experience at different stages of development (Mwaniki et al. 2012).

As the above description of the basic steps in brain development notes, both synaptic reinforcement and pruning and myelination are dependent on experience, that is they are influenced by information received by the brain and thus by the neural pathways that are most commonly activated. The importance of experience for brain development was first understood in relation to sensory systems. For example, experimental work with animals and clinical observations in children clearly show that the developmental of functional visual pathways within the brain is critically dependent on patterned light reaching the retina, and further that this has to happen

within a defined window of time (LeVay, Wiesel & Hubel 1980). If kittens with no inherent ocular or brain abnormalities have their eyes patched from birth for two to three months, their visual pathways will never develop and they will be permanently blind (Cragg 1975). Similarly, if only one eye is patched, the visual pathway in the corresponding side of the brain will show excessive synaptic pruning (and that eye will be permanently blind) whereas the contralateral side will show lower than usual synaptic pruning in an apparent effort to compensate. Likewise, babies born with congenital cataracts that prevent light getting through to their retinas can develop normal vision if the cataracts are removed soon after birth but will be permanently blind if removal is delayed (Lloyd et al. 2007).

In the case of the development of sensory systems, it is clear cut that particular types of input/experience are required at particular stages of development to enable the development of specific brain functions. Further, these experiences are ubiquitous under normal circumstances hence can be expected to happen. This type of environmental influence on brain development has thus been called ‘experience expectant’ (Couperous, Nelson 2006). It is now thought however that more subtle aspects of early experiences influence the development of a much wider range of human capacities such as the ability to form sustained positive relationships, intellectual capacity, and resilience to stress. The critical aspect of early experience in this regard is thought to be the quality of the parent-child relationship and the care giving provided (Richter 2004, Hofer 1994). This kind of environmental influence on brain development is much more variable and less predictable and has been termed ‘experience dependent’ (Couperous, Nelson 2006).

Again, the understanding of how early care and relationships influence early child development comes from a range of research sources (Centre on the Developing Child, 2012). Both experimental work with animals (Liu et al. 1997, Young et al. 1973, Suomi 1997) and observational work with children (Loman et al. 2009, Sroufe, Coffino & Carlson 2010) have been important. Two specific and interrelated strands of research have been particularly important: research exploring the development of attachment relationships and research investigating the development of healthy or

unhealthy stress responses. More detail on these two issues is provided in Appendix 1.

There is research and practical interest in how the timing of particular experiences influences brain development and how permanent or reversible the effect of particular experiences occurring at certain times may be. Human brain development follows a predictable sequence. Neurons migrate to their intended location within the brain in sequential waves. Similarly, bursts of synaptogenesis and subsequent pruning back of synapses to adult numbers occur across the different regions of the brain in a consistent pattern. This patterning is mirrored in the predictable, incremental development of skills attained by young children, for example babies learn to control their movements (for example sit up and crawl) before they can talk, and they learn to talk before they develop other functions such as ability to plan and tolerate frustration.

Broadly speaking, in human development, areas of the brain that perform the most complex functions take longest to develop. For example, synaptic density in the visual cortex peaks at around three months and has fallen back to adult levels by around five years whereas synaptic density in the prefrontal cortex (site of higher cognitive functions such as executive functioning) peaks at around 12 months and doesn't fall back to adult levels until mid adolescence. Various authors have cautioned against over-interpreting current knowledge in neuroscience to suggest that there is an absolute relationship between care received during particular periods of development and long term outcomes (Wastell, White 2012). Current thinking emphasises the ongoing plasticity of the brain, i.e. that the process of sculpting itself in response to experience continues across the life course. Overall, however, it is clear that plasticity is at its highest in utero and early infancy and in gradually decreases thereafter. The practical implication of this is that there can be remarkable recovery from insults to the brain and adverse experiences that happen very early in life, but the longer they persist, the more lasting the effects are likely to be. Nevertheless, there are no end points beyond which positive adaptation and

development cannot take place hence there is no age at which children, or indeed adults, should be written off as immutable.

It has been suggested that the immaturity of the human brain at birth, the overabundance of neural connections that are subsequently made, and the refinement of those over time in light of experience make sense in evolutionary terms. It provides humans with an unparalleled capacity for adaptation and learning. On the other hand, this method of brain development creates vulnerability. It means that early adverse experiences can damage the developing brain in ways that can be difficult to fully reverse. As Shonkoff and Phillips note '*Plasticity is a double edged sword that leads to both adaptation and vulnerability.*' (Shonkoff, Phillips 2000a, p914).

3.3. Factors that influence early child development

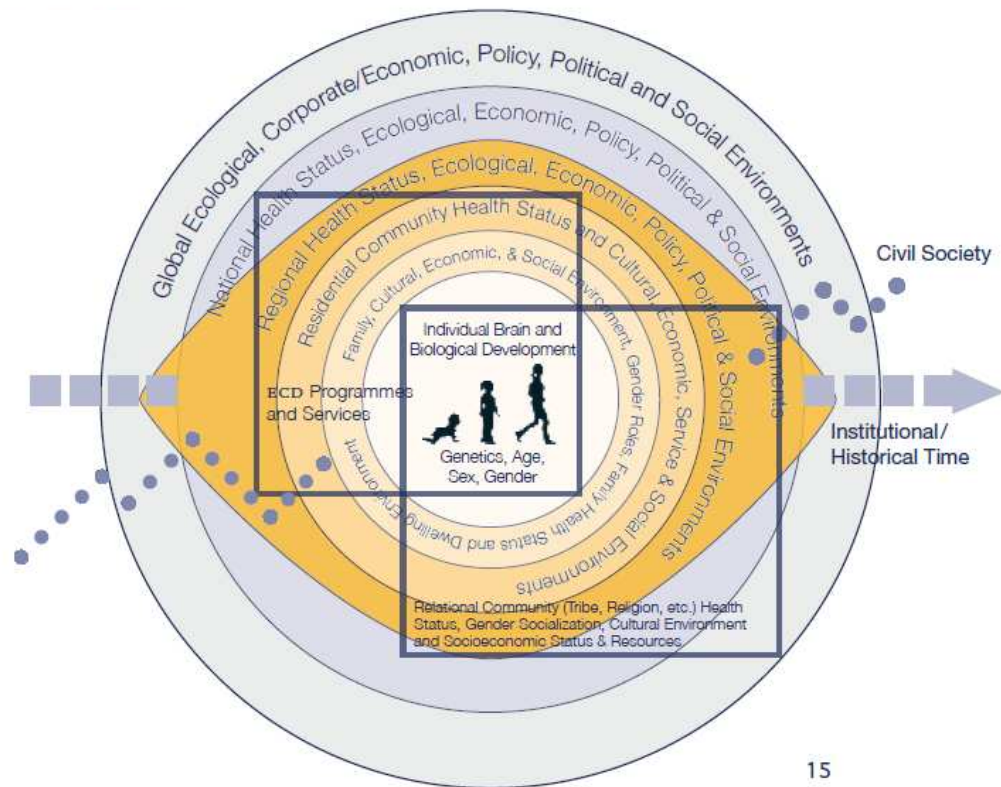
As the previous section makes clear, many factors influence early child development. Various authors have developed theories or models of these influences to help structure thinking about early child development; the factors that promote or impede healthy development; and the policies and services that are required to protect and promote it. One such theory that has been particularly influential is Bronfenbrenner's ecological systems theory. This theory is '*...a theory of environmental interconnections and their impact on the forces directly affecting psychological growth*' (Bronfenbrenner 1979, p8). It conceptualises the various factors that influence child development as concentric circles of complex interacting systems that change over time. He broadly categorised the circles as the:

- Microsystem – the most proximal circle containing people and settings with which children directly interact such as their family members and nursery
- Mesosystem – interactions between various components of the microsystem
- Exosystem – more distal settings and structural factors that children don't directly participate in but that nevertheless have an impact on their development, for example their parents' work environment, and
- Macrosystem – the overarching culture that the child is living in.

Many subsequent authors have adapted Bronfenbrenner's work and suggested updated models of the factors influencing child development. Current examples from the World Health Organisation's Committee on the Social Determinants of Health and the Scottish Government's Getting It Right for Every Child programme are shown in Figure 1 and Figure 2 respectively. These models reflect the currently accepted view that a wide array of factors operating at many different levels influence early child development (Walker et al. 2007, Walker et al. 2011); that adverse and protective factors change and interact over time; and that it is likely that many factors operate through a relatively small number of common final pathways, with reduction of parenting capacity, disruption of early care giving and attachment, and consequent stress likely to be one important pathway (see Appendix 1).

It is difficult to provide a comprehensive overview of the occurrence of factors influencing early child development in Scotland today due to the complexity involved but selected examples are provided in Table 1 using the Getting It Right for Every Child approach of considering factors intrinsic to the child, factors in their immediate environment, and more structural/distal factors, and concentrating on factors likely to interfere with early care giving. It is likely that many of the risk factors for suboptimal development considered in Table 1 will cluster together in families. Even so, it is clear that very considerable numbers of children in Scotland are born with or into conditions that make it harder for them to attain their full developmental potential.

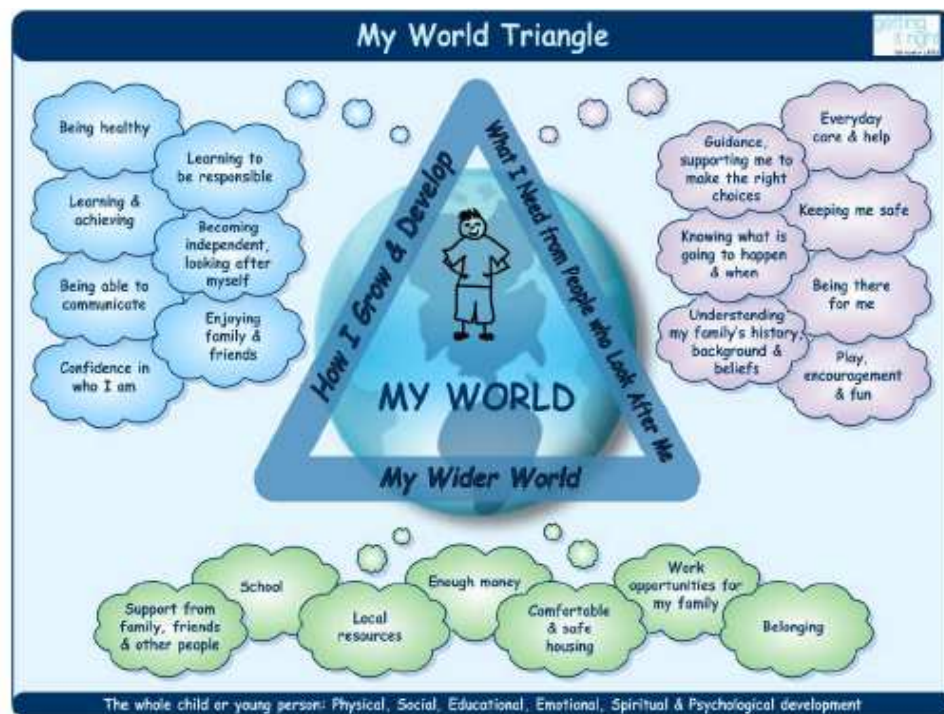
Figure 1 Total Environment Assessment Model of Early Child Development (TEAM-ECD) developed for the World Health Organisation's Commission on the Social Determinants of Health



15

(Siddiqi, Irwin & Hertzman, 2007, p15)

Figure 2 My World Triangle model of factors influencing child development and well-being used by the Scottish Government's Getting It Right for Every Child programme



(Aldgate, Rose 2009, p24)

Table 1 Occurrence of selected factors influencing early child development

Factor influencing early child development	Definition	Occurrence	Setting and date	Source
Prematurity	% of babies born at <37 weeks gestation	7%	Scotland, 2010	NHS Scotland maternity records (http://www.isdscotland.org/Health-Topics/Maternity-and-Births/Births/)
Breast feeding	% of babies who receive no breast feeding at all	26%	Scotland, 2010	Infant Feeding Survey (NHS Information Centre 2011)
Iron deficiency	% of children aged 12 months with anaemia (haemoglobin <110g/l – essentially all due to iron deficiency)	23%	England, 1993/94	Avon Longitudinal Study of Parent and Children (Hopkins et al. 2007)
Maternal mental health	% of mothers with children aged 10 months who have poor mental health (Short Form 12 mental health component score >1SD below mean)	14%	Scotland, 2005	Growing Up in Scotland survey (Marryat, Martin 2010)
Being read to	% of children aged 10 months whose parents read a story to them less frequently than once per week	13%	Scotland, 2005	Growing Up in Scotland survey (Marryat, Martin 2010)
Parental problem drug use	% of children aged <16 years with a parent who has problem drug misuse	5%	Scotland, around 2000	Hidden harm report – estimate from multiple data sources (Advisory Committee on the Misuse of Drugs 2003)
Child maltreatment	% of children aged 0-4 years on child protection register (neglect and emotional abuse as commonest reasons)	0.4%	Scotland, as at 31 March 2010	Local authority child protection records (Scottish Government 2010a)
Poverty	% of children aged 0-15 years living in relative poverty (household with <60% UK median income after housing costs)	25%	Scotland, 2009/10	Family Resources Survey (Scottish Government 2011c)

All websites accessed 27.1.2012

3.4. The extent of suboptimal child development

A number of different approaches have been used to assess the overall burden of suboptimal early child development. These have involved using data from epidemiological studies, large population based surveys, and routine administrative sources to examine the issue from a number of angles, for example:

- Identifying parents' concerns about their children's development
- Assessing the prevalence of key medical conditions associated with developmental problems
- Directly assessing the number of children delayed in one or more areas of development or functional ability relative to their peers
- Modelling based on known prevalence of key risk factors, and
- Assessing the number of children in receipt of relevant services.

A brief overview of some findings is summarised below.

3.4.1. *Parental concerns*

There is debate about the ability of parents to accurately identify developmental problems in their children (Voigt et al. 2007), but it is broadly accepted that substantial parental concerns are highly associated with the presence of identifiable developmental problems and that elicitation of parental concerns is an important step in assessing children's development (Ireton, Glascoe 1995). The Growing Up in Scotland (GUS) survey has asked parents whether they have 'some concerns' about their children's development on a number of occasions and summary results are shown in Table 2. They show that parental concerns are common, particularly towards the end of the pre-school period.

Table 2 Parental reporting of concerns about their children's development in the Growing Up in Scotland survey

Survey sweep/cohort/year	Age of child	% of respondents (usually mother) reporting 'some concerns' about child's development, learning, or behaviour	% of respondents (usually mother) reporting 'some concerns' about child's speech or language
Sweep 1 baby cohort 2005/06	10 months	8%	n/a
Sweep 2 baby cohort 2006/07	22 months	12%	15%
Sweep 1 child cohort 2005/06	34 months	19%	15%
Sweep 2 child cohort 2006/07	46 months	19%	17%

Sources: (Anderson et al. 2007, Bradshaw et al. 2008)

3.4.2. Prevalence of medical conditions associated with developmental problems

Table 3 gives an overview of the prevalence of selected medical problems with developmental consequences. It has been estimated that overall around 3-5% of children are born with a specific medical problem that is likely to adversely impact their development (such as Down's syndrome, cerebral palsy, hearing impairment) (HELP 2011a). A recent study assessed the prevalence of disabling conditions recorded (Read coded) in the GP notes of around 11,000 children aged 0-18 years registered with five practices in Bristol (Lingham et al. 2013). The average prevalence of all disabling conditions considered was found to be 4.9%.

Table 3 Occurrence of selected medical problems with developmental consequences

Developmental domain	Specific condition	Prevalence	Setting and date	Source
Motor development	Cerebral palsy	~2/1,000 live births	UK 1995	UK cerebral palsy register network (Surman et al. 2006)
	Duchenne muscular dystrophy	~3/10,000 live born boys	Globally applicable	Nelson Textbook of Pediatrics (Sarnat 2007)
Perceptual development	Severe visual impairment (20/200 or worse in better eye)	~0.6/1,000 10 year olds	Atlanta 1985/86	Metropolitan Atlanta Developmental Disabilities Study (Yeargin-Allsopp et al. 1992)
	Moderate hearing loss (25-35dB or worse in better ear)	~1/1,000 live births	High income countries	Forfar and Arneil's Textbook of Pediatrics (Kerr 2008)
Cognitive development	Severe learning disability (IQ<50)	~3-4/1,000 population	Scotland 2004	NHS Health Scotland health needs assessment (NHS Health Scotland 2004b) Estimate based on literature review
Social/emotional development	Autistic spectrum disorder	~1% school aged children	Scotland 2007	Scottish Intercollegiate Guideline on autism (SIGN 2007) Estimate based on literature review

3.4.3. Directly assessing the number of children delayed in one or more areas of development or functional ability relative to their peers

Directly assessing the number of children with developmental or functional delays is complicated and a detailed understanding of the measurement techniques used is important to enable interpretation of findings.

3.4.3.1. The use of standardised questionnaires to assess child development

Standardised questionnaires (usually completed by parents or other respondents such as teachers) are widely used in epidemiological studies and surveys that attempt to assess the overall prevalence of developmental problems in the general child population. A large number of developmental questionnaires are now available (Taylor 2005). They vary in a number of ways, for example the age range they can be applied to and whether they attempt to assess all developmental domains, specific domains only, or focus on detection of particular pathologies such as autism. Many, such as the Strengths and Difficulties Questionnaire (see Table 5) are used in clinical practice as well as research settings, whereas others, such as the questions for the Office of Population Censuses and Surveys (OPCS) Surveys of Disability in Great Britain (see Table 4) were developed for specific studies/surveys only.

When interpreting the results of studies that have used developmental questionnaires, it is important to consider the exact questions asked (and hence the aspects of development assessed); the psychometric properties of the questionnaire used; and the thresholds that were used to define developmental problems. Psychometric properties of interest include the questionnaire's reliability (inter-item, inter-rater, test-retest), its internal validity (construct, concurrent, predictive), and its external validity (generalisability to the population being tested) (McDowell 2006, Myers, Winters 2002). A number of authors have provided summaries of the properties of various developmental questionnaires to aid selection of appropriate instruments for particular purposes and facilitate the interpretation of published work (Drotar, Stancin & Dworkin 2008, Macy 2012, Spittle, Doyle & Boyd 2008).

Questionnaire ‘cut off’ thresholds used to define developmental problems will influence the proportion of the population that would be expected to score in the ‘abnormal’ range (Law et al. 1998). The thresholds used are inevitably somewhat arbitrary. From a clinical point of view, some children clearly have significant developmental problems arising from diagnosable underlying pathologies, but for others the situation is less clear: are they just at the lower end of the spectrum of normal development or are they so delayed as to warrant being labelled as ‘abnormal’?

When developmental questionnaires are developed, abnormality is defined relative to a population norm. For example, if 90% of children in a specified age range in the population on which the questionnaire is tested score above a certain level (or possess a certain skill), scores below that level (or absence of the skill) may be defined as ‘abnormal’, although by definition one in ten children would be expected to be in that category. When the questionnaire is then administered to children in a different area or population subgroup, the proportion scoring below the ‘abnormal’ threshold can be compared to the 10% that would be expected. This is analogous to thinking about childhood obesity when the proportion of children over a certain body mass index centile is compared to a population norm that pertained at a particular time (Cole et al. 2000).

3.4.3.2. UK based estimates of the prevalence of developmental problems in childhood

Estimates of the proportion of children in the UK with developmental problems resulting in significant functional difficulties/disability were provided by the Office of Population Censuses and Surveys (OPCS) disability surveys in 1985/88: findings are summarised in Table 4. Although this survey is now rather old, it remains the most comprehensive attempt to assess the prevalence of childhood developmental problems and associated disability conducted in the UK to date. Disability as measured in the OPCS survey was defined as any impairment that prevented children from doing what would be considered ‘normal’ for their age and hence the results

reflect the occurrence of functional problems that impact on children's daily lives. Whilst the substantial majority of disability detected in the OPCS survey will reflect an underlying developmental problem, the survey's overall definition of 'any disability' included disability arising from disfigurement, digestive problems, or disorders of consciousness (usually epilepsy), which would not usually be thought of as developmental problems. Bearing this caveat in mind, the survey suggested that around 3% of children had a developmental problem sufficiently severe to cause significant functional difficulties.

A high prevalence of disability due to behavioural problems is notable in the OPCS survey results and this accords with the current general recognition that problems with social and emotional development and associated behavioural and mental health problems are particularly prevalent among children in Western societies today. Table 5 gives an overview of the prevalence of these particular problems derived from major population based surveys. It should be noted that both the Growing Up in Scotland and Millennium Cohort Study estimates of social/emotional problems are based on administration of the Strengths and Difficulties Questionnaire (SDQ). In both cases, previously developed UK norms were used to define cut offs. These have been explicitly developed to identify the most poorly performing 10% of children on any of the subscales (Goodman 1997) hence the prevalence rates reported are not unexpected. Nevertheless, they allow comparison of the survey participants to the general UK population. Furthermore, scoring in the 'abnormal' range on the SDQ has been shown to be stable over time and to be well correlated with concurrent psychiatric diagnosis (Goodman et al. 2000, Goodman 2001, Ford et al. 2007).

Although there is ongoing debate about the diagnosis of specific psychiatric disorders in childhood, the results of the Office of National Statistics (ONS) survey on the mental health of children are alarming. In addition, they are congruent with a range of other work that suggests that child well-being is relatively low in the United Kingdom (Innocenti Research Centre 2007, Rees et al. 2012).

Table 4 Prevalence of disability in children suggested by the 1985/88 OPCS Surveys of Disability in Great Britain

Aspect of child development	Definition	Prevalence	Measurement instrument	Sample	Setting and date	Source
Disability	% of children aged 0-15 years with any disability	3.2%	Specially developed instrument based on WHO ICIDH ¹ with questions on functional abilities specific to age groups and scaled for severity ²	~1,200 disabled children 0-15 years living in 100,000 sampled private households ~1,000 disabled children 5-15 years living in 290 sampled communal establishments	Great Britain 1985 (private households) 1988 (communal establishments)	OPCS Surveys of Disability in Great Britain (Bone, Meltzer 1989)
	With motor disability	Locomotion 0.9% Reaching and stretching 0.2% Dexterity 0.3%				
	With perceptual disability	Seeing 0.2% Hearing 0.6%				
	With cognitive disability	Intellectual functioning 0.9%				
	With communication disability	Communication 1.1%				
	With social/emotional disability	Behaviour 2.1%				
	With adaptive disability	Personal care 0.7%				

¹ WHO ICIDH – World Health Organisation International Classification of Impairments, Disabilities, and Handicaps

² (Martin, Elliot 1992)

Table 5 Occurrence of social/emotional developmental problems and mental health problems

Aspect of child development	Definition	Prevalence	Measurement instrument	Sample	Setting and date	Source
Social/emotional development	% of children aged 4.5 to 6 years with SDQ ¹ score in the abnormal range	Emotional symptoms 5% Conduct problems 12% Hyperactivity 10% Peer problems 7% (Total difficulties 5%) Pro-social 2%	Parent completed SDQ administered in the year that the child started primary school (sweep 3 or 4)	~2,000 children from the GUS child cohort who participated in sweeps 1 to 4	Scotland 2008/09	Growing Up in Scotland survey (Bradshaw, Tipping 2010)
Social/emotional development	% of children aged 3 years with SDQ score in the abnormal range	Conduct problems 6% Hyperactivity problems 8% Both 3%	Parent completed SDQ administered in sweep 2	~13,700 children from the MCS who participated in sweeps 1 and 2	UK 2003/04	Millennium Cohort Study (Hutchinson et al. 2010)
Mental health problem	% of children aged 5-10 years with mental health problem	Any 8.2% Anxiety disorder 3.1% Depression 0.2% Conduct disorder 4.6% Hyperkinetic disorder 1.5% Autistic spectrum disorder 0.4%	Specially developed semi-structured interview (DAWBA ²) with transcripts reviewed by clinicians to assign diagnostic labels based on ICD 10 and DSM IV criteria	~6,000 children aged 5-10 years for whom either a parent or teacher interview was completed	Great Britain 1999	ONS Mental health of children and adolescents in Great Britain survey (Meltzer et al. 2000)

1 SDQ – Strengths and Difficulties Questionnaire

2 DAWBA – Development and Well-Being Assessment (Ford, Goodman & Meltzer 2003)

Current population based data on children's development around the time of school entry is available in England. In England, the national curriculum includes a 'foundation stage' which sets out the learning and development goals that most children should attain by the age of five years (Department for Children, Schools and Families 2008). At the end of the foundation stage (specifically in the final term of the school year in which children turn five), education staff are required by statute to complete a 'foundation stage profile' on all children. This gives an overview of children's development relative to the goals expected at that stage and is based on repeated observation of children's behaviour rather than a one off test. The profile is categorised into six domains broken down into 13 sub-domains as follows:

- Personal, social and emotional development (3 sub-domains),
- Communication, language and literacy (4 sub-domains),
- Problem solving, reasoning and numeracy (3 sub-domains),
- Knowledge and understanding of the world (1 sub-domain),
- Physical development (1 sub-domain), and
- Creative development (1 sub-domain).

Each sub-domain has a series of nine points which specify increasingly sophisticated skills in that area. Children who attain at least six points are described as 'working securely within the early learning goals' in that area. Children who attain at least six points for each of the sub-domains relating to 'personal, social and emotional' and 'communication, language and literacy' development, and attain at least 78 points overall, are usually classed as showing a 'good level of development' (Department for Education 2010a). Summary results relating to children in English primary schools in the summer term 2010 are shown in Table 6. The results suggest that using this measure, only just over half of children are assessed as showing a good level of development, and that boys, children from some ethnic minorities, and poor children are much less likely to be assessed as having a good level of development. Comparable results are not available for Scotland as there is currently no equivalent requirement for standardised assessment of children's progress at fixed points through their educational journey.

Relatively recently, researchers in Canada have developed an approach to assessing the overall level/strength of early child development in whole communities using the Early Development Instrument (EDI) (HELP 2011a). The EDI is completed by teachers on all children in their last year of pre-school (age 4-5 years). It asks 104 questions about each child designed to capture information on their development across several domains: physical well-being; social competence; emotional maturity; language and cognitive development; and communication and general knowledge. It is explicitly not used to identify or label individual children as having delays. Rather, the distribution of scores for the whole child population is examined, cut offs are set to identify the lowest performing 10% of children in each domain, then the proportion of children 'vulnerable' (i.e. below the cut off) on a specific domain or any of the domains is compared across population subgroups to help inform resource allocation and other planning decisions (Hertzman, Irwin 2007).

Similarities and differences can be noted between the EDI approach and the English foundation stage profile (FSP) approach. Both assess children at a similar stage with early education staff providing a composite assessment of their development that reflects their accumulated progress to that stage. The EDI scoring system is relative whereas the FSP approach is more absolute. The EDI is used to inform communities about how best to promote the development of pre-school children whereas the FSP approach is primarily used to support planning for individual children, assessing their educational progress over time, and hence considering the 'value added' by different schools. These differences reflect different philosophies and goals underlying development of the different approaches. A pilot project involving collecting EDI data on children entering primary school in East Lothian in 2011 has recently been conducted and final results are awaited (<https://www.scphrp.ac.uk/node/242>). If successful, EDI data collection may be extended more widely in Scotland in the future, potentially providing an important new source of population based data on the level and distribution of early child development.

Table 6 Selected foundation stage profile results for children in English primary schools, summer term 2010

Pupil characteristics	Percentage of children attaining a good level of development¹
All pupils	
All pupils	55.6
Gender	
Boys	46.8
Girls	64.9
Ethnicity	
White British	57.9
Gypsy/Roma	20.7
Indian	60.1
Pakistani	43.5
Black Caribbean	49.4
Chinese	54.0
First language	
First language English	57.7
First language other than English	46.6
Free school meals	
Receiving free school meals	39.5
Not receiving free school meals	59.2
Special educational needs	
Special educational needs identified	18.6
No special educational needs identified	60.0

Source: (Department for Education 2010a)

¹A good level of development is defined as attaining \geq six points for each of the seven sub-domains relating to personal, social and emotional and communication, language and literacy development and attaining \geq 78 points overall. See text for further details.

3.4.4. Modelling based on known prevalence of key risk factors.

Whilst robust information on the extent of suboptimal early child development is fairly hard to come by in high income settings, it is lacking altogether in many resource poor countries. The International Child Development Steering Group attempted to address this data lack in 2007 by publishing estimates of the prevalence of suboptimal early child development in developing countries (all except those in Western Europe, North America, and Australasia) (Grantham-McGregor et al. 2007). As direct data on early child development were lacking, they obtained information on two key risk factors highly likely to be associated with poor development, namely stunting (length/height for age $>2SD$ below mean) and absolute poverty ($<US\$1$ per day adjusted for purchasing parity): (estimated) data on these issues are available for most countries globally. They then assumed that any child with stunting, absolute poverty, or both would have poor development. The results suggested that at that time around 220 million (39%) children aged 0-4 years could be expected to have suboptimal early child development. The authors recognise that there will be a high degree of uncertainty in this estimate: it is likely to underestimate true prevalence as the risk factors chosen are intentionally very severe. Nevertheless, this estimate demonstrates the high burden of suboptimal early child development that pertains in low and middle income settings.

3.4.5. The number of children in receipt of relevant services

There is surprisingly little routine data available on children in Scotland in receipt of health services related to early child development. No data are published on the number of children referred to developmental paediatrics clinics or related services such as speech and language therapy.

From the education sector, the Scottish Government routinely publishes information on the number of children in mainstream and 'special' schools that have been identified as having additional learning support needs. At the start of the school year 2009/10, 6.5% of all school pupils came into this category

(<http://www.scotland.gov.uk/Topics/Statistics/Browse/School-Education/TrendSpecialEducation>). Identification of additional support needs is guided by the Education (Additional Support for Learning) (Scotland) Act 2004 (<http://enquire.org.uk/>). Additional needs can arise for a wide variety of reasons for example developmental problems, adverse social circumstances such as neglect, being in the care of the Local Authority, not having English as a first language, and so on. Concern has been raised about variable thresholds between areas in identifying additional needs but the figure above does suggest that considerable numbers of Scottish pupils are experiencing factors that make achieving at school more difficult. No figures are available on the number of pre-school children that have been identified as having additional learning support needs.

3.4.6. Summary

The above discussion shows that quantifying the extent of suboptimal early child development is a complex task that can be approached in a number of different ways. Development is a continuum and by definition there will always be some children at the tail end of the distribution. Nevertheless, substantial numbers of children in Scotland have developmental problems that cause significant difficulties in their day to day lives. Furthermore, it is clear that problems with early child development are highly socially patterned. Analyses of the major population based surveys of children's health and well-being, such as Growing Up in Scotland (GUS) and the Millennium Cohort Study (MCS), have shown very substantial differences in early child development between children with different circumstances (Bromley 2009, Blanden, Machin 2010, Dearden, Sibieta 2010). For example, GUS has shown that by the time children are 58 months old (i.e. around school entry age) children whose parents are educated to degree level have an expressive vocabulary level around 18 months ahead, and a problem solving ability level around 13 months ahead, of children whose parents have no qualifications (Bradshaw 2011).

3.5. Early child development and outcomes over the life course

As well as being an outcome of the interplay between genetic endowment and complex environmental influences experienced up to that point, early child development is also a powerful foundation for individuals' long term physical and mental health and wider social well-being and functioning (Shonkoff, Phillips 2000).

There is a body of literature looking at how early child development is associated with adult physical and mental health outcomes. An analysis of the British Cohort Study 1970 showed that general cognitive ability at age 5 (and/or 10 years) is associated with key chronic disease risk factors (smoking, overweight and high blood pressure) at age 30 (Batty et al. 2007). A separate analysis of the BCS showed that general cognitive ability at age 5 is associated with smoking and depression at age 30 (Feinstein, Bynner 2004). This study looked at how change in cognitive ability across childhood affected this association and found that children who showed poor ability at both age 5 and age 10 had the highest risk of adverse outcomes at age 30 whereas those that improved their relative position between ages 5 and 10 (a pattern that was strongly associated with high socio-economic status) had a somewhat lower (but still elevated) risk.

A further pooled analysis of the BCS and the National Child Development Study 1958 showed that both general cognitive ability and/or behavioural problems assessed at various points across childhood from age 5 upwards are associated with self assessed health, mental well-being, and limiting long standing illness at age 30/33 years (Mensah, Hobcraft 2008). Furthermore, these associations remained (although were attenuated) when childhood socio-economic status, family composition, birth weight and childhood health status were taken into account. In this and the previous studies, the measure of general cognitive ability was derived from the results of a range of age appropriate tests measuring verbal, numerical, drawing, and problem solving skills. A systematic review of cohort studies from various high income countries examining the relationship between general cognitive

ability measured in childhood or young adulthood and later all cause mortality found a consistent association between high ability and lower mortality which persists after adjustment for socio-economic status (Batty, Deary & Gottfredson 2007).

There is a further body of work looking at early child development and subsequent educational attainment, work, earning, and wider social well-being. Again these studies are often based on the major UK cohorts. Analysis involving a subgroup of BCS participants has shown that aspects of early development (high vocabulary and drawing ability and low behavioural/attention problems at five years) are all strongly correlated with academic achievement across individuals' educational careers (tests of maths and reading ability at age 10 and highest academic qualification achieved by age 30) and also with income at age 30 (Feinstein, Duckworth 2006). Socio-economic status strongly interacts with these associations however: over time, children with high ability and high socio-economic status do much better than those of comparable ability but of low socio-economic status. Similarly, children with low ability and low socio-economic status are much less likely than those with similarly poor ability but high socio-economic status to improve their performance over time (Feinstein 2003).

More recent analyses of data from the Millennium Cohort Study have confirmed that similar early trajectories are also seen for this cohort, although follow up is currently only available to mid childhood (Blanden, Machin 2010). Amongst MCS children, performance on a measure of expressive language ability (British Ability Scales naming vocabulary test) at age three is strongly correlated with subsequent performance at age five. Among the children with poor performance, those from a high socio-economic status background have shown considerably more 'catch up' by age five than those with low socio-economic status. Conversely, amongst children with good expressive language at age three, those from a high socio-economic status background have shown much less decline in their percentile score (a regression to the mean phenomenon seen in all groups) by age five than the more disadvantaged children. In addition, the MCS analyses have shown an interaction between expressive language ability and behaviour: children with poor language and poor

behaviour at age three show less improvement in their language ability by age five than those with poor language but no behavioural difficulties.

Feinstein and Bynner's study already mentioned above also showed that general cognitive ability at age five is associated at age 30 with low educational attainment, low wage, living in a workless household, criminality (among men), and teenage pregnancy (among women) (Feinstein, Bynner 2004). Other authors have emphasised the importance of early non-cognitive abilities such as motivation and perseverance in interacting with cognitive abilities to promote good educational and social outcomes (Heckman 2006).

Taken as a whole, this work shows that early child development, particularly cognitive/language and social/emotional/behavioural development, is strongly associated with later physical and mental health as well as educational attainment and wider social well-being. The relationships are complex as developmental trajectories in very young children can be quite unstable (e.g. many children with delay subsequently 'catch up' whereas some with initially normal developmental trajectories subsequently falter (Ukoumunne et al. 2012)) and even in older children with more established patterns of development some children 'buck the trend' and do better or worse than expected. Understanding determinants of this apparent resilience and vulnerability remains challenging, although it is clear that poor development in multiple domains compounded by low socio-economic status and poor physical health in childhood all increase the risk of poor outcomes.

So far, early child development has been discussed either as an outcome in its own right or as a foundation stone on which to build further development. More holistically, it can be seen as one of many critical steps along the life course pathway to health outcomes, academic achievement, and social well-being (Maggi et al. 2005, Hertzman, Wiens 1996). There are additional large amounts of literature linking early life experiences to physical, mental, educational and social outcomes across the life course. This ranges from work looking at the impact of fetal and infant nutrition and growth on risk of cardiovascular and other chronic diseases in adulthood

(Barker, Martyn 1992, Barouki et al. 2012), to that exploring the impact of multiple adverse childhood experiences such as neglect and parental substance misuse on a very wide range of physical and mental health outcomes (Felitti et al. 1998), to that documenting the pervasive influence of childhood poverty and socio-economic disadvantage on all aspects of adult health (Spencer 2008, Graham, Power 2004). In this work, early child development is usually not directly measured as a specific intermediate step along the pathway from risk factors to outcomes, but aspects of development are nevertheless likely to be an important ingredient in the mix.

3.6. The policy implications of current understandings of early child development

The current understanding of early childhood development presented above has considerable implications for social policy and the delivery of public services (Center on the Developing Child 2007, Shonkoff et al. 2012, Heckman 2012). Although knowledge remains incomplete, there is general consensus that the available evidence is sufficient to warrant action (Shore 2003). Many authors have emphasised that attaining a wide range of goals such as improving population health across the life course, reducing health inequalities, combating educational failure, securing enhanced economic productivity, and reducing social problems such as teenage pregnancy, drug misuse, crime and violence, all require serious attention to protecting and promoting early child development (Hertzman, Siddiqi & Irwin 2010). A concerted focus on early child development has been advocated for countries with higher (Marmot 2010, Allen 2011, Allen 2012, Field 2010, Marmot et al. 2012) and lower (Commission on Social Determinants of Health 2008, Engle et al. 2011, Engle et al. 2007, Pelto, Dickin & Engle 1999, World Health Organisation and UNICEF 2012) resource levels. The WHO Commission on the Social Determinants of Health report emphasised the central importance of early child development and noted that

‘Creating the conditions for all children to thrive requires coherent policy making across sectors. Investments in ECD [early child development] are one of the most powerful that countries can make – in terms of reducing the escalating chronic disease burden in adults, reducing costs for judicial and prison systems, and enabling more children to grow into healthy adults who can make a positive contribution to society, socially and economically. Investment in ECD can also be a powerful equaliser, with interventions having the largest effects on the most deprived children’ (Commission on Social Determinants of Health 2008, p51).

Protecting and promoting early child development is complex and involves attention to both broad structural and cultural factors and the organisation and delivery of services that directly seek to influence early child development ((Hertzman, Siddiqi & Irwin 2010, Commission on Social Determinants of Health 2008, Geddes, Haw &

Frank 2010). Relevant broad, more distal, factors include such disparate policy areas as:

- Tax and benefits designed to reduce child poverty and/or reduce income inequality
- Parental leave entitlements
- Environmental regulations, for example limiting exposure to lead, setting minimum housing standards
- Food related policy, for example on folic acid fortification, marketing of breast milk substitutes, availability of alcohol, and wider policies that influence the relative price and availability of nutritious food that are likely to have an impact on the nutritional health of women and their children, and
- Land use and planning regulations that influence children's access to safe play spaces.

Essentially these policy areas all directly or indirectly influence families' abilities to provide good nutrition, consistent and responsive care, and appropriate stimulation for infants and young children within reasonably safe environments. A wide range of services for adults and children can also influence early child development although this may not be their primary aim. Examples of adult services with potentially important 'knock on' impacts on child development include those for mental health (Chief Medical Officer 2007), substance misuse (Scottish Executive 2004), and domestic violence (Scottish Government 2011a). Children's services with similarly important impacts include those such as neonatal special care (Perlman 2001) and child protection (Scottish Government 2010d).

In addition to these more distal policies and services, a well functioning system of services with protection and promotion of early child development as (at least one of) their primary aims is required. There is no established categorisation of these services but essentially they include:

- Antenatal care
- The Child Health Programme
- Parenting support services, and
- Non-parental childcare and early education (Shore 2003).

Along with many other adverse health and social outcomes, suboptimal early child development is not restricted to a small number of children that are distinct from the rest of the child population, but rather there is a gradient of risk across the social spectrum ((Hertzman, Siddiqi & Irwin 2010). This has led many authors to conclude that provision of high intensity, targeted services alone will not be sufficient. Rather, a continuum of services, from lower to higher intensity is required with each child receiving input dependent on their needs. This service delivery model has been termed ‘proportionate universality’ (Marmot 2010, HELP 2011b). Antenatal care and the Child Health Programme are both universally offered (although the ‘dose’ provided varies according to individual need) and can thus be seen as the bedrock of early child development services for very young children (at least up to age three when universal nursery provision becomes available) and the ‘active filter’ through which children and their families are routed into more intensive services (Shonkoff, Garner 2012, NHS Greater Glasgow & Clyde and Glasgow City Council 2009).

Over recent years, antenatal care has moved away from a narrow focus on the physical health of the mother and baby and preparing for a medically safe delivery to a more holistic approach. Current approaches emphasise the developmental needs of unborn and young children and active consideration of parental social circumstances and family relationships (Scottish Government 2011d). The Child Health Programme is the complex package of health and development promotion interventions offered to all children and their families. Like antenatal care, the Child Health Programme has a long history but has shifted its focus over recent years in response to the evolving understanding of early child development. The Child Health Programme is discussed in detail in the next chapter.

Parenting support services are varied and include intensive home visiting services for pregnant and new parents (Olds, Kitzman 1993) as well as structured, often group based, parenting programmes for parents of toddlers and older children (Furlong et al. 2012). Childcare and early education services range from ‘parental substitute’ type childcare for infants to more formal nursery based early education for pre-

schoolers. The effectiveness of parenting support and early education services is not considered in detail here but it is worth noting that there is a range of evidence suggesting that early intensive home visiting, later early education, and two generational services that combine elements of both service types can have considerable success in improving both children's early development and their long term health, educational success, and wider social well-being, although success is dependent on service intensity and quality (Geddes, Haw & Frank 2010, Shonkoff, Phillips 2000b, Foley et al. 2000, Irwin, Siddiqi & Hertzman 2007, Bull et al. 2004, Gray, McCormick 2005). In general, these 'early intervention' services have been shown to be most effective for the most disadvantaged children, but it should be noted that even very successful services simply narrow rather than eradicate the gap between the most and least disadvantaged children (Hertzman, Wiens 1996). If a broad, long term view of costs and benefits is considered, early intervention services are generally accepted as being highly cost effective and indeed cost saving (although costs and savings generally accrue to different actors) (Shonkoff et al. 2012, Heckman, Masterov 2007, OECD 2009).

Although there is broad agreement about the range of policies and services that are important for early child development, there is inevitable uncertainty around the precise 'package' that is required in specific settings such as Scotland to improve developmental outcomes (and equity of outcomes) to an acceptable level (Geddes, Haw & Frank 2011). Scottish policy relating to the Child Health Programme in particular and child health and well-being more broadly is considered in detail in Chapter 4. Here it is just noted that a number of high level policy documents that place a strong emphasis on early child development, notably the Early Years Framework (Scottish Government 2008c), have been produced over recent years and considerable practical commitments have been made at UK or Scotland level, for example to increase parental leave entitlements (<http://www.readysteadybaby.org.uk/you-and-your-pregnancy/pregnant-life/maternity-leave-and-other-benefits-and-payments.aspx>) and expand access to high quality early education (<http://www.scotland.gov.uk/News/Releases/2011/12/21140320>). Child poverty

remains high, however, and patterns of spending continue to favour older children and adults rather than young children, and reactive rather than preventive services, and the challenges inherent in shifting this pattern remain (OECD 2009, Finance Committee 2011). Overall, therefore, it is reasonable to say that Scotland has started to reflect current understandings of early child development in its policy making and service delivery but there is still considerable scope for improving early child development and reaping the rewards that would bring.

3.7. Summary

This chapter has outlined the neurological basis of early child development. Genetic endowment underpins the predictable sequence of normal brain development from the formation of neurons to their migration to their intended location in the brain and subsequent waves of synapse formation and myelination. Genetic defects and environmental insults can disrupt this process but normal aspects of human experience are also critical to shaping the developing brain. Some aspects of experience, such as light reaching the retina, must happen during particular windows of time for the brain to develop specific functions, such as vision. Social experiences, in particular the quality of early care giving received by infants are also now recognised as critically important in supporting or hampering social/emotional and cognitive development. The exact mechanisms are not fully elucidated but the role of consistent, responsive care in allowing children to form secure attachment relationships and manage stress is likely to be important.

Many factors can influence the complex process of early child development. Ecological theories that emphasise the importance of children's intrinsic characteristics (e.g. genetics), their immediate environment (particularly the parenting they receive), and more distal/structural factors (e.g. economic and cultural factors) provide helpful frameworks for thinking about the influences on development. Quantifying the extent of suboptimal early child development is a complex task and it is not possible to state the 'true' number of young children in Scotland with developmental problems. Nevertheless, it is clear that considerable numbers of young children have developmental problems that make day to day functioning challenging – due to specific underlying medical problems, adverse social and physical environments, or both. Furthermore, suboptimal early child development is highly socially patterned: a strong social gradient in development is evident by the time children enter school, with children from the most advantaged backgrounds being on average very substantially ahead of the most deprived children in terms of cognitive, language, and social development. Inequalities in early child development tend to persist throughout children's school careers and poor early child

development is associated with a range of adverse health, educational, and social outcomes across the life course.

The current understanding of the factors that influence early child development, and its subsequent importance for long term outcomes, has considerable implications for policy making and service delivery. Creating the conditions that would enable all children to attain their development potential requires attention to broad economic and social policy as well as resourcing and delivering services that explicitly aim to support early child development, in particular antenatal care, the Child Health Programme, parenting support services, and childcare and early education services. Current thinking emphasises the need for a coherent system of such services, delivered according to the idea of ‘proportionate universalism’ with lower intensity services delivered to all children then those with higher risk/needs routed into appropriate, more intensive services. Although there is broad agreement on the basic ingredients of a well functioning system to support early child development, considerable uncertainty regarding the detail of such a system remains.

The next chapter considers one element of the system of services relevant to early child development, the Child Health Programme, in more detail.

Chapter 4 The Child Health Programme and Child Health Surveillance

This chapter focuses on the Child Health Programme. The Child Health Programme (CHP) is a complex package of interventions that is proactively offered to all children in Scotland. The overall aim of the programme is to support all children to attain their health and development potential. The universally provided elements of the current programme include:

- Screening procedures such as the Guthrie neonatal heel prick blood test; neonatal hearing screening; pre-school vision screening; and school entry height screening,
- Childhood immunisations against diphtheria, pertussis, tetanus, polio, Haemophilus influenzae type B, meningococcal group C, pneumococcus, measles, mumps and rubella; human papilloma virus for girls; and tuberculosis and hepatitis B for those at particular risk,
- Surveillance of children's development, growth, and health, and provision of health promotion advice and parenting support.

The surveillance, health promotion advice, and parenting support elements of the CHP have traditionally been known as Child Health Surveillance (CHS). This term is still used in Scotland and it will be used to indicate these particular elements of the CHP in this thesis. In practice, CHS involves a series of child health reviews offered to all children as they attain specified ages. In Scotland, the reviews are usually led by specialist nurses called Health Visitors (HVs) with General Practitioners (GPs) and other staff contributing to specific elements of some reviews. Reviews can be provided in families' homes, GP practices, or community based clinics. The reviews involve structured assessment of children's development, growth, and health alongside provision of age appropriate health promotion advice and parenting support. Children identified through the reviews as requiring additional professional input are then provided with additional Health Visitor care, helped to access relevant community services such as mother and baby groups, and/or referred to more

specialist services such as developmental paediatrics as required (Cowley et al. 2007).

The CHP covers children from birth to school leaving age but this thesis focuses on the programme (and in particular the Child Health Surveillance) that is provided to pre-school age children. The specific aims of CHS for this age group include promotion of strong early child development, healthy weight and growth, and good physical health coupled with early detection of factors that threaten children's health or development and facilitation of early access to effective interventions.

The chapter starts by considering the historical origins of Child Health Surveillance and how it has evolved to the current usual mode of delivery summarised above. It then provides an overview of the Health for All Children (HFAC) reports that have provided UK wide professional guidance on the content and delivery of the CHP since 1989. Next it discusses how the HFAC reports have been implemented in Scotland, in particular through the national child health information systems and the Scottish Government policy on the CHP that was published in 2005. It then outlines how the 2005 CHP policy fits within the wider Scottish social policy context. Finally, it provides an overview of the evidence on the effectiveness of the CHP, and provides an overall summary of the topics covered.

4.1. The origins and delivery of Child Health Surveillance

4.1.1. The origins of health visiting and Child Health Surveillance

The origins of Child Health Surveillance are bound up with the origins of health visiting as a function and a professional discipline. The first formal health visiting service is often cited as being the Manchester and Salford Ladies Sanitary Reform Association, established in 1862 (While 1987, Connolly 1980). This organisation used voluntary middle class women, and later paid working class women, to systematically visit poor families in the area and instruct them in ‘correct’ hygiene and parenting (particularly the feeding of infants and children) and provide general support and practical help. The service arose as an attempt to address the poor health that was common among the new urban poor created by the industrial revolution (Chadwick 1965). Embryonic health visiting services similar to that provided in Manchester continued to develop in a piecemeal fashion across the UK over the latter part of the 19th century, and increasingly they came under the direction of local Medical Officers of Health (required in all local authorities after the 1875 Public Health Act) rather than being independent charitable endeavours (While 1987, UK Parliament 1875).

Over time, delivery of health visiting also became increasingly ‘professional’. Originally, Health Visitors came from a range of backgrounds and no particular qualifications were required, but over the early 20th century, mandatory courses and qualifications were developed (Brooks, Rafferty 2010) and (as remains a requirement today (Cowley 2009)) it became increasingly common for Health Visitors to have prior midwifery or nursing training (While 1987, Kelsey 2000a, Kelsey 2000b).

At the start of the 20th century, a series of public health reports drew attention to the continuing poor state of children’s health (Booth 1902, Rowntree 1901). The practical implications of this poor health had been emphasised after the introduction of compulsory schooling from 1870 uncovered large numbers of children too

malnourished, disabled, or ill to be able to attend or benefit from school (Court 1976c), and they were brought to the fore again when at least half of the potential young adult recruits for the Boer War (1899-1902) were found to be unfit for military service due to poor physical health or disability (Barker 2003, Interdepartmental Committee on Physical Deterioration 1904). In response to this situation, legislation was brought forward to enable universal provision of preventive health services for pregnant women and pre-school children (UK Parliament 1907b, UK Parliament 1918b) and school medical services (UK Parliament 1907a, UK Parliament 1918a). In 1948 (UK Parliament 1946) and 1944 (UK Parliament 1944) respectively the legislation was strengthened such that local authorities came under a statutory duty to provide these services to their populations, and hence universal provision of Child Health Surveillance services became the norm.

4.1.2. Integrating preventive and therapeutic child health care within primary medical care

Although it was the Act that established the NHS that mandated provision of universal preventive health services for pre-school children including Child Health Surveillance, responsibility for delivery of this service continued to rest with local authorities rather than the new NHS. From 1948 local authority community child health services provided preventive services such as childhood immunisations, Child Health Surveillance, and more detailed assessment and support of children with developmental problems or disabilities. The services were provided by Health Visitors, supported by non-consultant grade doctors (clinical medical officers) or sessional GPs, and they served geographically defined 'patches' from community based clinics. They operated separately to GPs/primary care medicine and hospital based paediatrics that delivered general and specialist therapeutic care to children respectively.

After the establishment of the NHS, there was a trend for GPs to join together to form group practices, increasingly employing a range of other staff such as practice nurses to work within the primary care team. Gradually, some practices also

employed Health Visitors and started offering Child Health Surveillance to the practice's registered children but this was patchy and the main responsibility for provision of CHS remained with the community child health services (Court 1976d, Welshman 1997). This tripartite approach to the provision of child health services was repeatedly criticised as inappropriate and inefficient and a series of official reports recommended increased integration of preventive and therapeutic services. The Sheldon report of 1967 was the first to recommend integrating the delivery of Child Health Surveillance into general practice but its recommendations were not implemented (Sheldon 1967).

The NHS (Scotland) Act 1972 (UK Parliament 1972) and the NHS Reorganisation Act 1973 (UK Parliament 1973) brought local authority public health functions, including preventive child health services, under the remit of the NHS and presented an opportunity to rationalise the provision of health care for children and in particular to integrate the provision of preventive and therapeutic care. The Brotherston report of 1973 set out a vision for an integrated child health service in Scotland (Brotherston 1973) and the more comprehensive Court report of 1976 did the same on a UK basis (Court 1976a).

The Brotherston report recommended that the responsibility for primary preventive child health care, including Child Health Surveillance, should pass to GPs and Health Visitors working within general practices. Brotherston recommended that general paediatricians should work across hospital and community settings and that the existing local authority child health doctors should join these paediatric teams in providing specialist support to primary care, particularly in the assessment and care of children with developmental problems.

Court similarly, and more explicitly, recommended that the community child health services should be dismantled. He recommended that Health Visitors should be attached to GP practices and that provision of Child Health Surveillance and other aspects of preventive child health care should become a shared responsibility between HVs and GPs with particular training in child health, with HVs retaining a

particular responsibility for home visiting. Court also recommended that the primary preventive care of children should be supported by a new Community Paediatrics service led by consultant grade paediatricians with particular skill in developmental and social paediatrics and integrated with other hospital based consultant paediatric services.

The Court report emphasised the potential value of preventive services although it was robust in questioning the quality and effectiveness of some traditional services and called for the research base for CHS to be strengthened. It recommended that all children should have access to core services comprising screening; immunisation; development, growth, and health surveillance; health promotion advice; parenting support; and help to access additional support as required and it emphasised the need to balance detection of 'defects' with health promotion and primary prevention. It set out a recommended minimum schedule of CHS contacts to be delivered: shortly after birth; at 6 weeks; 7-8 months; 18 months; 2.5-3 years; and pre-school (Court 1976b). Although there are differences between the Court recommendations and current practice, overall it is striking how similar the Court recommendations are to current guidance (see Sections 4.2 and 4.3 below).

Despite the clear recommendations of these reports, the parallel provision of preventive child health care persisted for some time, with Child Health Surveillance provided both in community child health clinics and in increasing numbers of general practices. By the end of the 1980s, the system of community child health clinics was still in operation and best estimates suggested that only 35% to 55% of GP practices were involved in providing CHS to the children on their lists (Butler 1989b). Reasons for the slow transition included resistance from clinical medical officers and some Health Visitors (Butler 1989a, Anon1986, Health Visitors' Association 1985).

The new GP contract introduced in 1990 was designed, amongst other things, to incentivise GPs to increase their involvement in preventive child health care and accelerate the move towards an integrated child health service (Secretaries of State

for Health, Wales, Northern Ireland, and Scotland 1989, van Zwanenberg 1991). Prior to the implementation of the 1990 GP contract, GPs received ‘fee per item’ payments for childhood immunisations but no payments were available for the provision of CHS or wider preventive child health care. The 1990 contract offered practices the opportunity to register as ‘Child Health Surveillance’ providers with the relevant local health service authority. Registered practices could then receive payment for the provision of a series of child health reviews to pre-school children on their list whose families had consented to receive the service (Brown, Hampshire & Groom 1998). In addition, the 1990 contract replaced the fee per item payments for childhood immunisation with a two tier target payment system which rewarded practices for achieving high coverage. Whilst the 1990 contract still officially left provision of preventive child health care as an optional extra for GPs, it undoubtedly increased the proportion of practices providing CHS (although the impact on quality of provision was debated) such that by 2000 essentially all practices provided this service, most HVs had moved to working within practices, and the system of community child health clinics was effectively dismantled (Brown, Hampshire & Groom 1998, Butler 1997a, Butler 1997b).

The most recent GP contract, published in 2003, completely changed the remuneration system for GPs in the UK (Department of Health 2003). Under the 2003 contract, the provision of Child Health Surveillance and routine childhood immunisations were both identified as ‘additional services’. This meant that practices were expected to provide these services unless they had good reason to opt out, in which case they were required to forfeit 0.7% and 1.0% of their basic funding allocation respectively. In addition to the basic funding allocation, the 2003 contract offered practices considerable additional income for the provision of ‘quality’ care. A total of 1,050 points, each worth £75 to an average sized practice, was made available through the first Quality and Outcomes Framework (QOF) in 2004/05. The number of QOF points available for the provision of high quality preventive child health care was very small however: six points were available if ‘*Child development checks are offered at the intervals agreed in local guidelines and problems are followed up*’ and a further one point was available if ‘*Individual healthcare*

professionals have access to information on local procedures relating to child protection'. The QOF has been repeatedly revised since the contract was introduced. In 2011/12 a total of 1,000 QOF points, each worth around £130, were available. The available points relating to provision of preventive child health care have not been revised however and no relevant new points have been added. The 2003 contract retained additional incentive payments for achieving high immunisation coverage. Overall, the 2003 contract did not substantially change the amount of money available to practices to provide CHS and childhood immunisations (Philip Wilson, GP, personal communication) but it markedly changed the context. By focusing QOF payments primarily on management of chronic disease in adulthood, the contract has been accused of placing relatively little emphasis on child health in general, and preventive child health services in particular (Wood 2009, Marks et al. 2011), although it remains the case that to date essentially all practices continue to provide CHS and childhood immunisation services.

4.1.3. Back to the future

Although the dominant model of provision of CHS in Scotland to date remains provision within primary care by practice attached HVs supported by GPs, this is being challenged in some areas. Following a local review of Health Visitor services, NHS Greater Glasgow and Clyde recommended in 2007 that Health Visitors should no longer be attached to GP practices but work in teams alongside social workers serving geographical patches. These recommendations met with fierce opposition from GPs and some HVs and were never implemented (<http://www.phru.net/phn/healthvisitingreview/default.aspx> (Wilson 2007). NHS Highland is currently implementing a major service redesign that, from April 2012, has seen Health Visitors once again become local authority employees serving geographical patches. Responsibility for provision of the different elements of the CHP under the new arrangements is not entirely clear at present but it is likely that there will be an element of shared responsibility between the new HV service and general practices, with practices retaining responsibility for childhood immunisations (http://highlandlife.net/planning_for_integration).

Overall, it can be seen that there has been longstanding debate about the ‘correct’ model of CHS delivery, and in particular the degree to which it should be an integral part of general primary care or a stand alone service more closely aligned to other, local authority provided, family support services. In parallel to the debate about the model of CHS delivery, there has been wider debate about the effectiveness of different elements of the CHP and therefore the details of exactly what care should be offered through the programme. This debate was initially addressed in the Court and other reports (Court 1976a, Butler 1989a), and more recently has been addressed in the Health for All Children reports: these are considered in detail in the next section.

4.2. Further professional guidance on the Child Health Programme: the Health for All Children reports

By the end of the 1980s, although the provision of CHS within primary care had increased to some extent, as discussed in the previous section, the parallel system of community child health clinics still persisted and there were ongoing concerns about the wide variability in CHS offered in different areas and the effectiveness (or lack of it) of some activities being undertaken (Butler 1989a, Macfarlane, Pillay 1984). In 1986 a Joint Working Party on Child Health Surveillance was therefore convened *‘To review and comment upon current practice in Child Health Surveillance in the United Kingdom and to make recommendations for future practice’* (Hall 1989 pvii). The working party included representatives of the British Paediatric Association (forerunner of the Royal College of Paediatrics and Child Health), Royal College of General Practitioners, British Medical Association, Health Visitors’ Association, and the Royal College of Nursing. The report of the working party was published in 1989 as Health for All Children (HFAC1) (Hall 1989). Updated reports have been published in 1991 (HFAC2) (Hall 1991), 1996 (HFAC3) (Hall 1996), and 2003 (HFAC4) (Hall, Elliman 2003). A revised fourth edition was also published in 2006 (HFAC4r) (Hall, Elliman 2006).

The HFAC reports were informed by extensive literature reviews and interdisciplinary discussion and together chart the development of professional recommendations on the content as well as the delivery of the Child Health Programme (including CHS) in the UK. Each of the HFAC reports provides a discussion of the overall rationale for the Child Health Programme alongside recommendations on the health promotion, surveillance, and screening interventions that should be provided at specific ages. In the UK, the Department of Health’s Joint Committee on Vaccination and Immunisation is responsible for making recommendations on the childhood vaccination schedule hence none of the HFAC reports consider the detail of which immunisations should be provided through the

CHP, although they do take account of the recommended vaccination schedule when considering the optimal programme of child health reviews.

The detailed HFAC recommendations regarding the core CHP recommended for every child are presented in Table 7 to Table 10. Many of the specific recommendations have remained broadly similar in each of the HFAC reports, although there are exceptions that reflect the developing evidence base, for example the new recommendation supporting universal neonatal hearing screening in HFAC4. Around this relatively stable core, the wider emphases of the different reports have changed markedly.

HFAC1 provided the first attempt at synthesising the evidence for various elements of the CHP. Although it recognised the importance of primary disease prevention for children, it focused mainly on providing specific guidance on surveillance and screening procedures such as growth monitoring, developmental screening at fixed ages, and the distraction hearing test, in an attempt to bring some uniformity to the programme offered across the UK. It also called for better information systems to underpin delivery of the programme and a more active approach to performance monitoring. Shortly after the publication of HFAC1, the 1990 NHS and Community Care Act (HM Government 1990) introduced the purchaser-provider split into the NHS, and the 1990 New Contract for General Practice (Secretaries of State for Health, Wales, Northern Ireland, and Scotland 1989) offered GPs direct payment for the provision of CHS for the first time as noted previously. These developments further intensified the requirement to have a clearly specified Child Health Programme that purchasers would be willing to pay for. HFAC2 was therefore published as an early update: it reiterated most of the recommendations made in HFAC1, added editorial comment reflecting recently published evidence, and provided more detail on the delivery of the programme, for example by specifying which professional groups should deliver the various CHS reviews.

HFAC3 was very different. It had a much clearer focus on primary disease prevention, with formal surveillance and screening (i.e. secondary disease

prevention) recognised as only a part of the CHP that should complement rather than overshadow the primary prevention activity. HFAC3 also stressed viewing the CHP as part of an integrated web of services available to children. It emphasised the importance of clear referral pathways for definitive assessment and prompt effective treatment of children with suspected problems, rather than focusing on the provision of surveillance and screening in isolation. It also stressed the importance of effective interagency working, for example enabling nursery staff to raise concerns about a child's health or development. It discussed the need to engage particular groups such as homeless families and the importance of community focused activity such as development of play groups. HFAC3 was also the first report to explicitly recommend a 'core plus targeted' service delivery model (in other words that all children should receive an agreed core service through the CHP, with additional support provided to individual children/families according to their needs) although not much detail was provided on this.

HFAC4 continued to strongly emphasise the importance of a balance between primary and secondary disease prevention within the CHP. Although HFAC3 had recommended a core plus targeted model for the CHP, HFAC4 took this theme much further. It continued to emphasise that the core elements of the CHP should be universal, i.e. provided to all children, but it argued that provision of the CHP had traditionally been too uniform across families with widely differing levels of need, and that to achieve the goal of more equitable outcomes for children a more flexible and individualised approach to the provision of additional support for children/families based on a robust assessment of their needs would be required (see Section 4.2.1 below).

HFAC4 adopted a more population focused / public health approach than previous HFAC reports. It was the first report to discuss in detail the wider determinants of child health (including parenting); inequalities in health; and the substantial difficulties that are inherent in ensuring the CHP is accessed by certain groups such as homeless families, travellers, and looked after children. HFAC4 emphasised more strongly than previous reports the need for community based services to balance

traditional HV contacts with individual families in order to support the primary prevention aims of the CHP, in particular the aims relating to fostering of social capital and supportive social networks for parents. It noted the need for adult health services, for example those dealing with adults experiencing drug misuse, mental health problems, or domestic violence, to actively consider the needs of dependent children who may be affected. In addition, HFAC4 stressed the importance of the contribution of the CHP to statutory procedures relating to child protection, the care of looked after children, fostering and adoption, and services for children with additional (education) support needs. It noted the formation of the National Screening Committee (<http://www.screening.nhs.uk/uknsc>) in 1996 and the continued drive to stop inappropriate screening activity.

HFAC4 stated that ongoing monitoring and intermittent audits of the processes and outcomes of CHP care should be conducted as part of an overall quality improvement approach to service provision although it does not specify in detail how this should be achieved. It reiterated the need for effective information systems to facilitate service delivery. Unlike previous reports, HFAC4 formally considered the CHP for school-age as well as pre-school children, however only the pre-school age group is considered here. Prior to HFAC4, recommendations on preventive health care for school aged children had been provided in the 1995 Polnay report (Polnay 1995).

4.2.1. Targeting within the Child Health Programme

There has been a longstanding debate about the degree to which the CHP should be provided on a universal basis to all families or on a targeted basis to selected families with particular needs (Health Visitors Association 1994, Audit Commission 1994, Goodwin 1988, Elkan et al. 2000, Elkan et al. 2001). HFAC1 and 2 focused on specifying the universal core programme although they did acknowledge that some families would require additional support over and above the core programme. HFAC3 and HFAC4 addressed the targeting debate more directly and endorsed a 'core plus targeted' service model.

HFAC4 strongly endorsed retaining a universal core CHP provided to all families with young children. It claimed a universal approach allows development of relationships between HVs and all families that are vital to identifying families with additional needs, and provides a safety net for the minority of children at risk of neglect or abuse or those with unrecognised health or development problems. It argued that a universal service also allows provision of age appropriate health promotion interventions that are relevant to all families, such as testing for congenital hypothyroidism or providing advice on reducing the risk of Sudden Infant Death Syndrome. HFAC4 also claimed that universal service provision avoids the problem of stigma that can be associated with entirely targeted services (de Zwart 2005).

Despite strongly endorsing universal provision, HFAC4 clearly rejected provision of a rigidly uniform service. Rather it focused on reducing inequalities in child health outcomes, and explicitly stated that achieving this would require different inputs for different families. HFAC4 noted a number of linked strands of evidence that led the working party to favour this ‘core plus targeted’ approach (Blair, Isaacs 2003), namely:

- Evidence of the ‘inverse care law’ (Tudor Hart 1971) applying to the CHP in the UK, i.e. families with the most to benefit from CHP interventions being the least likely to access the programme,
- Evidence demonstrating the potential effectiveness of early intervention such as intensive home visiting, parenting programmes, and enhanced early education,
- Evidence that early intervention must be intensive to be effective and then is most beneficial for the most disadvantaged families, and
- Evidence showing interventions of sufficient intensity to benefit disadvantaged families could not be provided to the whole population given available resources.

No references were provided in the HFAC4 report (supporting documents were listed by chapter on an accompanying website) hence it is difficult to trace how specific pieces of evidence have been used to underpin specific HFAC4 recommendations. These strands of evidence are therefore more claimed than directly cited in the HFAC4 report.

HFAC4 discussed the need for targeting at both the area and individual level to support flexible provision of *additional* support within the CHP. Regarding area level targeting, there is evidence that HVs are not geographically distributed in accordance with the level of need experienced by different populations, and that HVs have widely differing caseloads that do not correlate with the requirements of the families that they serve (Crofts et al. 2000, Pollock et al. 2002, Steel, Reading & Allen 2001). HFAC4 therefore recommended that NHS authorities should take action to redistribute the available HV resource more in line with population need. It noted that area based targeting may be more acceptable to the population (but not necessarily to HVs), and that focusing on individual level targeting without addressing area level targeting is unlikely to succeed in reducing inequalities.

Regarding individual level targeting, HFAC4 provided guidance on assessing children's needs for additional support. It recommended a process of repeated needs assessment embedded within the universal CHP contacts leading to an agreement between the HV and the family about the nature and level of any additional support required. HFAC4 initially suggested that this assessment should be reached by the end of the primary immunisation course, i.e. when children are around 4 months of age. This recommendation was altered in the revised edition of HFAC4 to 'by a child's first birthday' to bring HFAC recommendations in line with those in England's National Service Framework for Children, Young People, and Maternity Services that was published after HAFC4 (Department of Health 2004). This changed recommendation was the main reason behind the publication of HFAC4r which was otherwise very similar to HFAC4.

HFAC4 envisaged this repeated assessment being relatively informal, rooted in positive and trusting relationships between HVs and families, and based on structured professional judgement for the majority of families. It rejected the use of formalised checklists or scoring systems to identify 'vulnerable' families, noting evidence that suggests this approach lacks predictive power, undermines professional expertise and intuition, and can be damaging to relationship building between HVs and families. HFAC4 did however endorse a comprehensive and structured multi-

agency approach to assessing family needs for children who have been identified as having complex requirements, such as that proposed in the Department of Health's Framework for the Assessment of Children in Need and their Families (Department of Health 2000).

Although HFAC4 was clear about its preferred approach to assessing children's needs, it was not always explicit about what types of need were being sought. The CHP is potentially concerned with all aspects of children's health and development and the full range of biological and environmental factors that help or hinder children achieving their potential. The CHP also has a distinct role in identifying children at risk of or experiencing neglect or abuse and contributing to child protection procedures. Implicitly, when generic needs assessment is being discussed, needs arising from adverse environmental factors, social 'vulnerability', and unhelpful parenting (that together risk constraining children's development and wider well-being) are the primary focus of concern.

Somewhat at odds with the population focused nature of the report, HFAC4 explicitly assumed that only a small minority of the population would require substantial additional input from the CHP (Hall 1996, p3). This raises questions about the assumed distribution of vulnerability within the population and the effectiveness of interventions for individuals at different levels of risk. Discussions about the relative merits of delivering interventions to small numbers of people at very high risk compared to larger sections of the population at more moderate risk are long running within public health practice (Rose 1981, Bayer, Hiscock & Morton-Allen 2007, Gilbert et al. 2012). Similarly the impact of different concepts of health inequalities (for example as a sharp divide between small numbers of highly disadvantaged people and the rest of society compared to as a continuous gradient across all sectors of society) on chosen policy responses have been the subject of debate (Marmot 2010, Graham 2004, Graham, Kelly 2004).

Finally, as well as discussing the need for targeting *additional* CHP support, HFAC4 also implicitly promoted targeting of the *core* universal programme of CHS review

by suggesting that some elements could be provided ‘flexibly’. In particular it suggested that the CHS contacts at 8 or 12 months, 2 years, and 3.5 years could comprise anything from a case note review if the child was already in regular contact with the primary care team, a letter, a phone call, or a face to face review provided on an individual family or group basis. This extension of the idea of targeting support from the additional elements of the CHP to some elements of the core programme is likely to be important to how HFAC4 recommendations have been implemented in Scotland (see Section 4.3.3 below).

4.2.2. Assessing child development within the Child Health Programme

As previously noted, promotion of strong early child development is one of the principal aims of the CHP. Although the HFAC reports note the high prevalence of suboptimal early child development, particularly problems with social and emotional development, each of the reports explicitly recommends against screening for developmental delay within the universal CHS reviews (Blair, Hall 2006). The reports do not define exactly what they mean by developmental screening but suggest this involves the repeated direct testing of children’s developmental skills at specified ages with the presumption that those who ‘fail’ are at increased risk of a developmental disorder and therefore require further assessment and, possibly, intervention. The HFAC reports have consistently argued that such screening is not adequately supported by evidence. They suggest that marked delay caused by serious underlying pathology is likely to come to light through different routes and, regarding more minor delay, that it is difficult to define a ‘case’, the performance of screening tests is doubtful, and effectiveness of interventions to improve developmental outcomes is uncertain.

HFAC1 and 2 barely mention the influence of parenting and environmental factors on early child development. Although they do not recommend developmental screening, they do recommend ‘surveillance’. Again, it is not quite clear what is meant by this but it seems to entail professionals having knowledge about ‘normal’

child development, considering whether a child's development appears appropriate to their age every time they see them, and having a low threshold for instigating formal developmental assessment and/or referral if any parental or professional concerns are raised. HFAC3 builds on the earlier reports by including a chapter on the promotion of child development in addition to one on detecting developmental problems. The new chapter discusses supporting parenting, treating maternal depression, and promoting parent-infant attachment and language rich environments for young children as potentially important but makes few specific recommendations. In the chapter on detecting developmental problems, HFAC3 provides more detail regarding what developmental surveillance should entail. It recommends a coordinated range of approaches including thorough neonatal and 6-8 week examinations; follow up of high risk infants (such as those born prematurely); education of both parents and professionals regarding 'normal' child development; prompt response to parental concerns; and well functioning referral and diagnostic pathways. HFAC4 makes similar recommendations to HFAC3 but is the first report to emphasise the importance of environmental factors on early child development and to note the potential utility of developmental questionnaires in supporting HVs to objectively assess children's development if concerns are raised (see section 3.4.3.1). HFAC4 is also more positive than earlier reports about the potential for parenting support and early intervention to improve children's developmental outcomes.

The recommendations relating to assessing child development have consistently been among the most controversial made in the various HFAC reports (Hall 1991, p92). It has been argued that the reports' primary interest in stopping unhelpful and variable repeated developmental testing of children have led to overly cautious recommendations that appear not to recognise the importance of active, structured consideration of children's development at each of the core CHS contacts resulting in *'the baby being thrown out with the bathwater'* (Bellman, Vijeratnam 2012) and an overly sharp distinction being drawn between a screening and a primary prevention approach

4.2.3. *Summary*

Taken together, the HFAC reports chart the development of professional guidance on the content and delivery of the UK CHP over the last two decades. Some themes, for example a focus on evidence based practice, the cessation of inappropriate screening activity, professional competence, and a desire for better information systems and more active performance monitoring, have been prominent in all the reports. Others, such as the need to engage parents in the programme and balance the provision of primary and secondary prevention have become increasingly prominent over time.

In general, the complexity of the reports has steadily increased. There has been a shift from simply describing the core universal programme to setting that within the key challenges facing child public health and discussing the broader CHP (including additional support for families with needs) and the wider system of care for children and families (including diagnostic and treatment services, and interagency issues such as additional educational support).

Over time, there has been an increasing focus on the CHP as a means to an end (i.e. the goal being securing positive and equitable child health outcomes) rather than as an end in itself (i.e. the goal being provision of a standardised, evidence based service). This increasing focus on outcomes has been accompanied by an increasing emphasis on flexible and individualised service provision. By HFAC4 this meant flexible provision of some of the core CHS reviews, robust assessment of individual children's needs within the core CHS contacts to facilitate targeting of additional support, and aligning HV resources with population need at the area level.

It is no easy task to provide guidance on a service as complex as the CHP and in general the HFAC reports have been welcomed as providing helpful and authoritative advice. Inevitably, some details have been controversial and subject to ongoing debate. The HFAC recommendations relating to assessment of early child development have been particularly and persistently contentious as noted above.

Some of the themes evident in the HFAC reports reflect wider themes within health care and social policy that have been evident over recent years such as the aspiration for evidence based care and policy; a focus on individual and population outcomes and their distribution; an increasing emphasis on actively managing services to ensure quality; a desire for better integration within policy development and service delivery; and design and delivery of services according to the principle of proportionate universalism (Marmot 2010, HELP 2011b, Sackett et al. 1996, Ham, Hunter & Robinson 1995, Hunter 2003, Tilbury 2004, Glasby 2005, Field 2011, Guterman 1999).

Table 7 Universal Child Health Programme contacts up to school entry recommended in the Health for All Children reports

	HFAC1	HFAC2	HFAC3	HFAC4
Generic CHS reviews				
Neonate	Neonate	Neonate	Neonate	Neonate
Within first 2 weeks	By 10 days	By 2 weeks	10-14 days	Home visiting as required over first 10 days
6-8 weeks	6 weeks	6-8 weeks	6-8 weeks	6-8 weeks
Later infancy	8 (7-9) months	6-9 months	6-9 months	8 or 12 months
Toddler 1	21 (18-24) months	18-24 months	18-24 months	24 months
Toddler 2	39 (36-42) months	36-48 months	39-42 months	42 months
School entry	48-66 months	54-66 months	54-66 months	School entry

	HFAC1	HFAC2	HFAC3	HFAC4
Additional contacts				
Guthrie bloodspot test	5-7 days	5-7 days	5-7 days	5-7 days
Immunisations	As per recommended schedule* No detail provided	As per recommended schedule 2,3,4 months At 36-48 month review	As per recommended schedule 2,3,4 months 13 months At 39-42 month review	As per recommended schedule 2,3,4 months 12-15 months 3-4 years May or may not be linked to generic reviews In 2006, 2 contacts at 12 and 13 months were implemented (Scottish Government 2006) but in 2011 these contacts were combined into a single contact offered at 12-13 months (Scottish Government 2010f)
Neonatal hearing screening	No	No	No	Yes (see Table 9)
Pre-school vision screening	No	No	No	Yes (see Table 9)

* The Joint Committee on Vaccination and Immunisation provides detailed recommendations on the UK childhood vaccination schedule

Table 8 Universal screening procedures (not relating to growth or senses) up to school entry recommended in the Health for All Children reports

	HFAC1	HFAC2	HFAC3	HFAC4
Physical examination				
General	At neonate, 6 weeks, and school entry review	At neonate and 6-8 weeks for all, and school entry for selected children only	At neonate and 6-8 weeks for all, and school entry for all or selected children only	At neonate and 6-8 weeks for all, and school entry for selected children only
Congenital heart disease	At neonate and 6 weeks reviews	At neonate, 6-8 weeks, and 36-48 months reviews	At neonate and 6-8 weeks reviews	At neonate and 6-8 weeks reviews
Congenital dislocation of the hip	At neonate, by 10 days, 6 weeks, 8 months, and 21 months reviews	At neonate, by 2 weeks, 6-8 weeks, 6-9 months, and 18-24 months reviews	At neonate, 6-8 weeks, 6-9 months, and 18-24 months reviews	At neonate and 6-8 weeks reviews Additional ultrasound scan for those at high risk or with suspected abnormality
Undescended testis	At neonate, 8 months, and 39 months reviews	At neonate, 6-9 months, and 36-48 months reviews	At neonate and 6-8 weeks reviews	At neonate and 6-8 weeks reviews

	HFAC1	HFAC2	HFAC3	HFAC4
Bloodspot screening				
Congenital hypothyroidism	Yes	Yes	Yes	Yes
Phenylketonuria	Yes	Yes	Yes	Yes
Cystic fibrosis	No	No	No	Yes (introduced in Scotland in 2002) (Scottish Government 2001b)
Sickle cell disease	Possibly	If local policy	Universal or selective depending on ethnic mix of pop served	Yes (selective antenatal screening for mother and universal neonatal bloodspot screening introduced in Scotland in 2008) (Scottish Government 2008b)
Thalassaemia	Possibly	If local policy	Universal or selective depending on ethnic mix of pop served	No (antenatal screening for mother introduced in Scotland in 2008 but no neonatal screening) (Scottish Government 2008b)
Galactosaemia	No	No	No	No (was actually done in Scotland until 2002) (Scottish Government 2001b)
Medium chain acylCoA dehydrogenase deficiency (MCADD)	No	No	No	No but notes evidence accumulating (was introduced in Scotland in 2008) (Scottish Government 2008b)
Maple syrup urine disease	No	No	No	No
Homocystinuria	No	No	No	No
Biotinidase deficiency	No	No	No	No

	HFAC1	HFAC2	HFAC3	HFAC4
Other screening considered in the HFAC reports				
Iron deficiency anaemia	Possibly	If local policy (check Hb at 18-24 month review)	If local policy (check Hb at 18-24 month review)	No
Hypertension	No	No	No	No
Asthma	No	No	No	No
Duchenne muscular dystrophy	No	No	No	No
Proteinuria/asymptomatic bacteriuria	No	No	No	No
Liver disease/extrahepatic biliary atresia	No	No	No	No
Familial hypercholesterolaemia	No	No	No	No
Lead toxicity	No	No	No	No
Neuroblastoma	No	No	No	No
Coeliac disease	No	No	No	No
Developmental screening	No	No	No	No

Table 9 Universal screening and surveillance procedures (relating to growth or senses) up to school entry recommended in the Health for All Children reports

	HFAC1	HFAC2	HFAC3	HFAC4
Growth				
Weight (surveillance)	At every contact	At every contact	At every contact in infancy, as indicated after that	At every contact in infancy, and at school entry review
Length/height (screening, cut off 0.4 and 99.6 centile)	At 39 months and school entry reviews	At 18-24 or 36-48 months review and school entry review	At neonate and 6-8 weeks reviews if indicated At 18-24 months, 39-42 months, and school entry reviews for all	At neonate and 6-8 weeks reviews if indicated At school entry review for all
BMI (population monitoring)	Not mentioned	Not mentioned	Not mentioned	Not as screening test but should be calculated from school entry review weight and height data for population health monitoring
Head circumference (screening, cut off 0.4 and 99.6 centile)	At neonate and 6 weeks reviews	At neonate and 6-8 weeks reviews	At neonate and 6-8 weeks reviews	At neonate and 6-8 weeks reviews

	HFAC1	HFAC2	HFAC3	HFAC4
Vision				
Eye examination	At neonate and 6 weeks reviews	At neonate and 6-8 weeks reviews	At neonate and 6-8 weeks reviews	At neonate and 6-8 weeks reviews
Pre-school vision screening	No	No	No	Yes (between 4th and 5th birthday by orthoptist) (implemented in Scotland from 2004) (Scottish Executive Health Department 2005b p29)
Visual acuity check at school entry	Yes	Yes	Yes	No (phase out once pre-school screening in place)
Hearing				
Neonatal hearing screening	No (but notes research ongoing)	No (but notes research ongoing)	Selective or universal on trial basis as per local situation	Universal (universal screening using automated otoacoustic emission procedure introduced in Scotland in 2001) (Scottish Government 2001a)
Distraction test at 8 months	Yes	Yes	Continue or stop as per local situation	No (phase out once neonatal screening in place)
Modified audiometry (sweep test) at school entry	Yes	Yes	Yes	Yes

Table 10 Health promotion topics recommended for inclusion in the Child Health Programme in the Health for All Children reports

	HFAC1	HFAC2	HFAC3	HFAC4
Promotion of immunisation uptake	Yes	Yes	Yes (including selective neonatal immunisation with BCG and Hepatitis B)	Yes (including selective neonatal immunisation with BCG and Hepatitis B)
Sudden Unexpected Death in Infancy (SUDI)	Yes	Yes	Yes	Yes
Infant and child feeding	Yes	Yes	Yes	Yes
Dental health	Yes	Yes	Yes	Yes
Unintentional injuries	Yes	Yes	Yes	Yes
Promotion of child development and behavioural management	Yes	Yes	Yes	Yes
Managing minor illness in childhood	Yes	Yes	Yes	No
Second hand smoke exposure	No	Yes	Yes	Yes
Sun safety	No	Yes	Yes	Yes
Vitamin K	No	No	Yes	Yes

4.3. Incorporating professional guidance on the Child Health Programme into policy and practice in Scotland

Prior to the publication of the HFAC reports, there was no health department policy that set out a recommended Child Health Programme. NHS regulations governing GPs' terms of service simply required them to deliver CHS according to a schedule agreed with their local health authority (Department of Health and Social Security 1990b). In 1992, an NHS Management Executive letter was issued that reproduced the core CHS programme recommended in HFAC2 as an appendix and asked health authorities to examine their local policies on CHS with a view to bringing them into line with the HFAC recommendations (NHS Management Executive 1992). The HFAC recommendations were thus given official policy recognition and support. The Management Executive letter applied equally in Scotland as in England at that time, as devolution of responsibility for health policy to the Scottish Executive (Scottish Government from 2007) did not occur until 1999 (<http://www.scotland.gov.uk/About/18060/11550>).

4.3.1. The Child Health Surveillance Programme – Pre-school information system

From 1991, increased uniformity of CHS provision for pre-school children in Scotland specifically was also supported by the implementation of a national information system (Child Health Surveillance Programme – Pre-school or CHSP-PS see <http://www.isdscotland.org/Health-Topics/Child-Health/Child-Health-Programme/Child-Health-Systems-Programme-Pre-school.asp>) which is still extant. CHSP-PS was designed to facilitate both the call-recall of pre-school children for their CHS reviews and the recording of review findings. A CHSP-PS National User Group (NUG) that includes relevant staff from across Scotland is responsible for ensuring that the system supports agreed practice.

When a child is due for a review, the system issues an invitation to the family and sends the relevant review-specific paper form (in triplicate) to the HV. Each review's form is designed to guide the HV (and/or GP) through actions relevant to that review (for example, the 6-8 week form prompts, *inter alia*, asking about infant feeding and the examination of babies' eyes). When a review has been done, the parent is given one copy of the completed form for inclusion in the child's Personal Child Health Record ('red book'); the HV retains one copy in the child's case notes, and one copy is returned to the NHS Board child health department where administrative staff key the findings into the electronic system. Downloads from the CHSP-PS system are passed to the NHS Scotland Information Services Division (ISD) on a quarterly basis for analytical purposes. Call-recall for pre-school children's immunisation contacts and the recording of information on completed vaccinations is managed through a separate national information system (Scottish Immunisation Recall System - SIRS) which was introduced in 1987 and has been used by all Boards in Scotland since 2002 (<http://www.isdscotland.org/Health-Topics/Child-Health/Child-Health-Programme/Scottish-Immunisation-Recall-System.asp>).

From 1991 to 2005, the universal CHS reviews supported by a CHSP-PS form were at:

- 10 days,
- 6-8 weeks,
- 8-9 months,
- 22-24 months,
- 39-42 months, and
- 48-54 months (pre-school).

The CHSP-PS review structure was very similar to that recommended in HFAC1 (the only report published by the time CHSP-PS was established) with the following exceptions. The universal neonatal review is usually provided by paediatric and/or midwifery staff in hospital hence CHSP-PS does not cover this review and it will not be considered further. CHSP-PS supported a pre-school review at 48-54 months in addition to a universal school entry review delivered to all children in their first year

of primary school. The school entry review (and all other reviews for school aged children) was supported by a separate information system, Child Health Surveillance Programme – School (CHSP-S – established 1995 and used by all Boards from 2010 <http://www.isdscotland.org/Health-Topics/Child-Health/Child-Health-Programme/Child-Health-Systems-Programme-School.asp>) which again is not considered further here. Children in Scotland enter primary school when aged between 4.5 and 5.5 years. Presumably in recognition of the ‘extra’ nature of the Scottish pre-school review, this was the only review after which return of a completed CHSP-PS form was optional rather than mandatory (although in practice return rates were high).

Examination of the 1991 to 2005 CHSP-PS forms (available on <http://www.isdscotland.org/Health-Topics/Child-Health/Child-Health-Programme/Child-Health-Systems-Programme-Pre-hall4.asp>) shows that the detail of what was expected in each of the reviews (both primary and secondary prevention activity) was also informed by HFAC1. For example, the 8-9 month review form prompts the HV and/or GP to enquire about the child’s dental health, examine their hips, check testicular descent, weigh them, and perform the distraction hearing test. The CHSP-PS system also supported some activities that were either not mentioned, or specifically recommended against, in HFAC1. For example, the CHSP-PS 8-9 month form was ahead of HFAC1 in prompting enquiry about exposure to second hand smoke in the home, and it also encouraged (against HFAC1 recommendations) measuring length and head circumference and a more extensive physical examination including an eye examination and checking for signs of congenital heart disease. In general, the CHSP-PS forms also encourage a much more systematic approach to developmental assessment than that recommended by HFAC1. All the forms ask the examiner to note whether they consider the child’s development in each of various domains to be normal, abnormal, or doubtful/uncertain. All the forms except the pre-school form also ask about the attainment of specific milestones that children should have achieved by the age of the review to support the overall assessment. It is likely that this approach reflected general unease regarding HFAC1’s strong

recommendations against developmental screening and one interpretation of what a more flexible developmental surveillance approach should entail.

CHSP-PS was a voluntary system: NHS Boards were free to implement it or use alternative local systems as they preferred. Table 11 below shows that it took until 2010 (i.e. almost 20 years) for CHSP-PS to be used in all areas of Scotland. Some variation in the provision of CHS persisted even between Boards using the system, with Boards calling children at different points within the 'window' period for the different reviews, and some Boards offering additional checks over and above the universal reviews supported by CHSP-PS. The CHSP-PS system also provides generic 'unscheduled' and 'recall' forms. Unscheduled forms can be used when parents self-present to HVs or reviews are done outwith the recommended age range. Recall forms can be used when HVs ask parents to attend for an additional review at a specified age, for example if there are possible concerns about a child's development that the HV wishes to reassess. Both unscheduled and recall forms are used variably by the different Boards: they are definitely not used to record all the contacts that occur between HVs and families (see Chapter 8). CHSP-PS clinical guidelines are available that provide guidance on the use of the system and the recording of information (see <http://www.isdscotland.org/Health-Topics/Child-Health/Child-Health-Programme/Child-Health-Systems-Programme-Pre-school.asp>).

Table 11 Implementation of the CHSP-PS information system in NHS Boards across Scotland

NHS Boards	Date of implementation of CHSP-PS
Argyll & Clyde	1991
Ayrshire & Arran	1993
Borders	1995
Dumfries & Galloway	2000
Fife	1994
Forth Valley	1997
Grampian	June 2010 *
Greater Glasgow	1995
Highland	May 2007 *
Lanarkshire	1992
Lothian	1994
Orkney	July 2010 *
Shetland	May 2008 *
Tayside	1995
Western Isles	May 2006 *

Note that NHS Argyll & Clyde ceased to exist on 31st March 2006. The area was split into two sub-areas that were subsumed into NHS Greater Glasgow & Clyde and NHS Highland respectively. The CHSP-PS system has continued to use the 'old' NHS Board configuration, however.

* Grampian, Highland, Orkney, Shetland, and Western Isles started using CHSP-PS after publication of the 2005 guidance (see section 4.3.3) hence have only ever used the 2005 guidance compliant forms (See **Table 13**).

4.3.2. *Scottish policy response to HFAC4*

Following the publication of HFAC4 in 2003, the Scottish Executive's Child Health Support Group (now Scottish Government's Children and Young People's Health Support Group – an expert Ministerial advisory committee – see <http://www.sehd.scot.nhs.uk/cyphsg/Index.htm>) was tasked with producing guidance on its implementation in Scotland. The reasons why the then Scottish Executive decided to produce the first formal Scottish policy on the CHP at that time are not recorded but anecdotally this reflected a view that provision of the CHP in Scotland had not evolved in line with HFAC guidance, in particular that provision was still too uniform, checklist driven, and focused on repeated 'checks' of children rather than flexible partnership with parents to promote optimal outcomes. The CHSP-PS system had not been significantly amended since its inception in 1991. Also, there was concern that the most disadvantaged children remained the least likely to attend the 'universal' CHS reviews hence the ability of the programme to address persistent inequalities in children's outcomes was at best limited (see Chapter 6). Finally, the devolution of health policy making to the newly established Scottish Executive in 1999 meant that there was an opportunity to develop a distinctively Scottish response to HFAC4. There is a range of evidence that confirms that 'getting onto the agenda' in terms of policy making is a complex process that is subject to many influences (Buse, Mays & Walt 2005a, Buse, Mays & Walt 2005b, Hall et al. 1975, Kingdon 1984, Kingdon 2003) and also that devolution has had a major, although not uncontested, impact on the development of health policy in Scotland (Jervis 2008, Greer 2009, Health Policy and Economic Research Unit 2007, Smith et al. 2009).

A subgroup of the Child Health Support Group was convened to oversee production of the guidance. Draft guidance was issued in late 2003 (Scottish Executive Health Department 2004) and subject to formal consultation. Final guidance, referred to hereafter as the 2005 guidance/policy, was published in April 2005 (Scottish Executive Health Department 2005b) alongside an analysis of the consultation responses (Scottish Executive Health Department 2005c). The 2005 guidance explicitly aimed to “*support consistent implementation across Scotland of the*

recommendations made by the Royal College of Paediatrics and Child Health in the fourth edition of Health for All Children” (Scottish Executive Health Department 2005b, p2).

The 2005 guidance summarises the key messages of HFAC4, sets HFAC4 in the context of other relevant Scottish policy, provides detailed guidance on implementing HFAC4 in Scotland, and lays out a timetable for action. The guidance is primarily concerned with ‘operationalising’ HFAC4: it explicitly does not critique HFAC4 or re-examine the evidence behind the recommendations it made. The themes within HFAC4 that the 2005 guidance is particularly concerned to implement in Scotland are a shift from secondary to primary prevention and a ‘core plus targeted’ delivery model. It also emphasises the importance of partnership with parents, good inter-professional and inter-agency working, clear care pathways and adequate capacity within follow on services for children requiring additional assessment/support, and the importance of community interventions as well as contacts with individual children/families. All these themes come directly from HFAC4.

Like HFAC4, the 2005 guidance supported increased targeting of CHP support at both the area and individual level. Regarding area based targeting, it called on NHS Boards to ‘*assess levels of need within particular communities and allocate resources, such as input from Health Visitors...to reflect any concentration of need in particular areas or communities.*’ (Scottish Executive Health Department 2005b, p49). Regarding individual level targeting, it called for refocusing of the core CHP, and in particular a reduction in the number of universal child health reviews and ‘routine’ developmental checks, accompanied by active allocation of all children to one of three models of support:

- Core (i.e. the core universal programme only, with parents able to seek additional appointments as needed),
- Additional (i.e. the core programme plus additional structured support from the HV), or
- Intensive (i.e. the core programme plus intensive multiagency support).

The guidance called for the cessation of the old 8-9 month and 39-42 month reviews. The old 48-54 month pre-school review was not mentioned and by implication was also stopped. The old 22-24 month review was also to cease and be replaced by a new, selective, two year review. The new selective review was to entail the families of children receiving the core service just being sent a mailer inviting them to make an appointment if desired, with only children receiving additional or intensive input being invited for a face to face review.

The guidance noted that most examination and assessment takes place over the first 6-8 weeks of a child's life. It suggested that by the end of the 6-8 week review, the HV should have agreed with the family the model of support to be subsequently offered. Little detail was provided on how needs assessment should be approached although both professional judgement and the use of 'tools' or 'checklists' were mentioned (Scottish Executive Health Department 2005b, pp35 and 45). Consideration of children's intrinsic characteristics, their immediate environment including parenting, and their wider world was recommended as a framework for structuring the assessment process for all children. This approach was later formalised within the Getting It Right for Every Child (GIRFEC) national practice model (see Section 4.4 and Figure 3). The guidance noted that an Interagency Assessment Framework was under development at the time of publication. It proposed this could be used to structure and record interagency assessments for children with complex needs but this has never been implemented in Scotland.

The detail of the CHP recommended for Scotland in the 2005 guidance is shown in Table 12. It can be seen that, unlike HFAC4, the Scottish guidance explicitly linked provision of generic CHS reviews to the provision of immunisations. The guidance recommended that the first set of primary immunisations should be delivered as part of the 6-8 week review rather than at a separate contact. It also recommended that immunisation contacts at 3, 4, and 13 months and 3-5 years should include holistic assessment of children's needs, provision of age appropriate health promotion/primary prevention, and surveillance of children's weight. No universal

face to face CHS reviews not linked to immunisation provision were recommended between the 6-8 week review and school entry.

The 2005 guidance reiterated the HFAC4 recommendation against developmental screening and noted that thorough universal assessment in early infancy; additional follow up of high risk children; consistent information for parents about normal developmental trajectories and prompt response to parental concerns; increased capacity within early education/childcare to identify and act on concerns about development; and robust care pathways for when problems are suspected was the appropriate model for developmental surveillance. It did not recommend any universal, proactive assessment of pre-school children's development after the 6-8 week review.

Table 12 shows that the specific screening procedures and health promotion topics recommended for inclusion in the Scottish CHP in the 2005 guidance were very similar to those recommended in HFAC4.

Table 12 Child Health Programme recommended for children in Scotland up to school entry in the 2005 guidance

Universal Child Health Programme contacts	Screening activity (not relating to growth or senses)		Screening and surveillance relating to growth or senses		Health promotion topics
Generic reviews / immunisation contacts	Physical examination		Growth		Promotion of immunisation uptake
Neonate	General physical examination	At neonate and 6-8 week reviews	Weight	At neonate, 10 day, 6-8 week, 3, 4, and 13 months, 3-5 years, and school entry reviews as surveillance	Baby care and Sudden Unexpected Death in Infancy (SUDI)
10 days	Congenital heart disease	At neonate and 6-8 week reviews	Length/height	At neonate and 6-8 week reviews if indicated At school entry review for all	Infant and child feeding
6-8 weeks (immunisation)	Congenital dislocation of the hip	At neonate and 6-8 week reviews	BMI	Calculated from school entry weight and height data for population health monitoring	Dental health
3 months (immunisation)...	Undescended testis	At neonate and 6-8 week reviews	Head circumference	At neonate and 6-8 week reviews	Unintentional injuries...

Universal Child Health Programme contacts	Screening activity (not relating to growth or senses)		Screening and surveillance relating to growth or senses		Health promotion topics
...4 months (immunisation)	Bloodspot screening		Vision		...Promotion of child development and behavioural management
13 months (immunisation)	Congenital hypothyroidism	Yes	Eye examination	At neonate and 6-8 week reviews	Attachment and parenting
2 years (selective)	Phenylketonuria	Yes	Pre-school vision screening	Yes in pre-school year by orthoptist	Second hand smoke exposure
3-5 years (immunisation)	Cystic fibrosis	Yes	Visual acuity check at school entry	No once pre-school screening in place	Vitamin K
School entry	Sickle cell disease	No but noted this was under review (added to Guthrie test in Scotland in 2008) (Scottish Government 2008b)	Hearing		
Additional contacts	Medium chain acylCoA dehydrogenase deficiency (MCADD)	(Not mentioned but was introduced in Scotland in 2008) (Scottish Government 2008b)	Neonatal hearing screening	Yes	
Guthrie bloodspot test	Other screening		Distraction test at 8 months	No once neonatal screening in place	
Neonatal hearing screening	Developmental screening	No	Modified audiometry (sweep test) at school entry	Yes if already in place	
Pre-school vision screening	Postnatal depression	No (although notes Edinburgh postnatal depression scale may be used at 6-8 week review as 'checklist')			

4.3.3. Implementation of the 2005 guidance

The action plan included in the 2005 guidance asked NHS Boards to implement the new Child Health Programme within three years, i.e. by 2008/09. A national group, the Hall 4 network group, was established by the Scottish Government to oversee implementation: the group met from 2005 until 2009. (The HFAC reports 1-4 were edited by David Hall hence are often termed the Hall reports).

After the draft guidance was published in 2003, the CHSP-PS NUG assumed responsibility for modifying the CHSP-PS system in line with the new policy to facilitate implementation. A Hall 4 subgroup of the NUG was established to lead this work. The subgroup produced an overview paper on how the system should be amended (Hall 4 subgroup 2005) and undertook the detailed work of updating the CHSP-PS forms (available on <http://www.isdscotland.org/Health-Topics/Child-Health/Child-Health-Programme/Child-Health-Systems-Programme-Pre-school.asp>). The system modifications were made available during 2005 although minor fine tuning continued into 2006.

Modified forms to support universal child health reviews at 10 days and 6-8 weeks were developed. A new form to support the selective review at 2 years (only for children requiring additional or intensive support), and new universal forms to record the findings of neonatal hearing and pre-school vision screening were also made available. Modified unscheduled and recall forms were developed. The 'old' forms that had supported universal CHS reviews at 8-9; 22-24; 39-42; and 48-54 months were withdrawn from use.

The main modification made to the CHS forms was the addition of the Health Plan Indicator (HPI). The HPI was designed to record the model of support to be provided through the CHP. Four categories – core, additional, intensive, and unknown – were made available to reflect the models of support outlined in the 2005 guidance. Updated CHSP-PS clinical guidelines echoed the 2005 guidance in stating that 'additional' should indicate need for structured input from the HV whereas

‘intensive’ should indicate need for structured multiagency input. No further guidance or definitions were provided although the clinical guidelines did clearly state that the HPI should reflect the needs of the child and not the capacity of services to meet the needs (e.g. if services were struggling to meet demand). The guidelines also made it clear that recording of an informative HPI (i.e. not unknown) was mandatory for newborn children by completion of their 6-8 week review forms.

The CHSP-PS system was modified to support delivery of the selective 2 year review as follows. The system periodically sends HVs lists of all children on their case load who are approaching their second birthday along with a note of the HPI recorded on the system for each child. The HV then updates the HPIs as required. The system then issues a mailer to all children with a core HPI asking them to contact their HV if required and facilitates the call-recall of children with an additional or intensive HPI for a face to face review.

As call-recall and data recording for all immunisation contacts was already managed through the SIRS system, no additional CHSP-PS forms for the 3, 4, or 13 month or 3-5 year contacts were made available. Although the 2005 guidance recommended that all children should have holistic assessment of their needs, be provided with age appropriate health promotion materials, and be weighed at these immunisation contacts, there was no perceived need to record any associated information centrally hence no modifications to the SIRS system were made (CHSP-PS NUG minutes and personal communication with Charles Clark, contemporaneous CHSP-PS NUG chair). The CHSP-PS NUG did note considerable concerns about the loss of some aspects of population based child health data associated with the implementation of the 2005 guidance, particularly data on infant feeding and child growth after 6-8 weeks (Hall 4 subgroup 2005). Plans were therefore made to modify the SIRS system to enable recording of infant feeding method at the 2, 3, and 4 month immunisation contacts to partially offset this but this was never implemented. The SIRS system has continued to record delivery of immunisations only.

An explicit decision was made not to expand the CHSP-PS system to capture comprehensive information on the extra support, over and above the universal contacts, provided to children with additional or intensive HPIs. Complexity and excessive data recording burden were cited as the main reasons (Hall 4 subgroup 2005).

NHS Boards across Scotland implemented the modified CHSP-PS functionality at different times as shown in Table 13 below. From the implementation dates shown, Boards called children for universal reviews according to the new schedule, assigned an HPI to all new babies by 6-8 weeks, and allocated all older children already on their case lists to an appropriate HPI.

Table 13 Implementation of modified (2005 guidance compliant) CHSP-PS in NHS Boards across Scotland

NHS Boards	Date of implementation of modified CHSP-PS
Argyll & Clyde	February 2006
Ayrshire & Arran	October 2006
Borders	October 2005
Dumfries & Galloway	April 2006
Fife	April 2006
Forth Valley	April 2006
Grampian	June 2010 *
Greater Glasgow	April 2006
Highland	May 2007 *
Lanarkshire	December 2006
Lothian	October 2005
Orkney	July 2010 *
Shetland	May 2008 *
Tayside	January 2007
Western Isles	May 2006 *

Note that NHS Argyll & Clyde ceased to exist on 31st March 2006. The area was split into two sub-areas that were subsumed into NHS Greater Glasgow & Clyde and NHS Highland respectively. The CHSP-PS system has continued to use the 'old' NHS Board configuration, however.

* For Grampian, Highland, Orkney, Shetland, and Western Isles, the date shown is the date the Board started using the CHSP-PS system (**see Table 11**). Some of these Boards, in particular Grampian and Orkney, started implementing a 2005 guidance compliant CHP before this date.

4.3.4. Local variation in implementation of the 2005 guidance and contested areas

Although the account above suggests uniform and uncontested implementation of the 2005 guidance across Scotland, the reality was more complex.

The Scottish Government issued a questionnaire on the implementation of the 2005 guidance in early 2008: 12 out of 14 NHS Boards responded. The results showed that Boards were taking an active approach to implementing the 2005 guidance but that a number of different, locally developed needs assessment tools were being used to support assessment of children's needs and there was a degree of variation in local guidance on allocating the HPI (Gillian Garvie, contemporaneous lead for child health policy, Scottish Government, personal communication). NHS Lothian was a notable outlier in this regard (Hogg et al. 2009, Hogg et al. 2012). It had mandated the use of a locally developed family needs assessment tool, the Lothian Child Concern Model. It required Lothian HVs to offer all families with new babies two additional face to face contacts between the 6-8 week review and the child reaching six months of age (recorded using CHSP-PS unscheduled forms) to administer the tool and complete the assessment process. The Board also required all newborn children to be initially allocated an additional (or intensive) HPI, with the allocation of a final HPI (i.e. including core where appropriate) deferred to the end of the fourth universally offered contact at around six months of age. No other Boards followed this approach.

Furthermore, although the 2005 guidance had been clear that all pre-school immunisation contacts should function as generic CHS review, it was clear from the results of the questionnaire that this was not being implemented. Only three of the Boards responding to the questionnaire indicated that they were routinely incorporating delivery of broader health promotion into the 2, 3 and 4 month immunisation contacts: the remaining nine Boards explicitly indicated that they were not doing this. The main reasons given included different staff groups involved in the different activities (mainly Practice Nurses giving immunisations whereas HVs

seen as responsible for health promotion) and clinical governance considerations encouraging focusing exclusively on safe delivery of vaccines within immunisation contacts (West Dunbartonshire Community Health Partnership 2007).

NHS Quality Improvement Scotland (QIS - now NHS Healthcare Improvement Scotland) commissioned a separate evaluation of the implementation of the 2005 guidance from the perspective of HVs. This work was undertaken in 2008 and reported in 2010 (Inwood 2010). The evaluation involved a survey of all HVs in Scotland with a caseload of pre-school children (694/1637 42% responded) and a consensus conference event at which the findings were debated. The evaluation confirmed the finding that a range of approaches to assessment were being used across Scotland and that HVs were dissatisfied with this position. In addition, the majority (59%) of respondents indicated they thought that the 6-8 week review was too early to allocate the HPI. Responses to the evaluation make it clear that this view reflected awareness that children allocated to a core HPI at this stage would in practice be offered no further meaningful assessment of their needs until school entry due to immunisation contacts remaining 'single issue'. This reality of no further holistic child health contacts after 6-8 weeks for children allocated a core HPI has been widely acknowledged, including by the Chief Medical Officer (Chief Medical Officer 2007, p9).

In response to ongoing debate amongst HVs and managers about the HPI, in autumn 2008 the Hall 4 network group convened an HPI working sub-group to review its use. The group recommended that an additional category should be added to the HPI: Support and assessment in early life. It recommended that all newborns by default should be allocated to this category, that HVs should visit children as often as they see fit over the first six months of life to assess children's needs and provide support, and that allocation of a definitive HPI (core, additional, or intensive) could be delayed until six months. The group further recommended that the Getting It Right for Every Child national practice model (developed after the 2005 guidance was published - see Section 4.4 and Figure 3) should be used as the basis of a common approach across Scotland to assessing children's needs. The working group

presented its findings to the Hall 4 network group in 2009 but no action was taken on them at that time.

4.3.5. Policy development subsequent to the 2005 guidance

Throughout 2008 and 2009, professional dissatisfaction with the loss of generic child health contacts for pre-school children after early infancy continued to be expressed at the Hall 4 network group. Other specific concerns were also raised, in particular difficulties implementing universal pre-school vision screening due to a shortage of orthoptists. The Review of Nursing in the Community was also discussed as a potential threat to the delivery of the CHP (see Section 4.4 below).

In response to these ongoing concerns, the Scottish Government issued a Chief Executive's letter (CEL) to the NHS in April 2010 (Scottish Government 2010e). The letter set out a commitment that the Scottish Government would, after a period of consultation, produce more detailed guidance on the allocation of the HPI and reintroduce a universal child health review for children aged 24-30 months. It also endorsed the use of the GIRFEC practice model to guide assessment, emphasised the importance of primary prevention/health promotion, asked every Board to clarify their plans regarding implementation of pre-school vision screening, and reassured the service that delivery of the CHP would be considered within the Modernising Nursing in the Community programme (the follow on to the Review of Nursing in the Community). The letter acknowledged that

'an unintended consequence of the 2005 Hall 4 guidance is that many HVs may no longer have regular contact with those children who are receiving the 'core' programme after the 6-8 week check. This is principally because routine universal surveillance checks at 8 months, 24 months and 39 months were discontinued. It is also partly as a result of changing practice in the provision of immunisations.'

The CEL was followed by the promised consultation exercise. Four structured round table discussion events involving 241 professionals involved in the management and delivery of the CHP were held across Scotland in June 2010. Following the consultation, a formal policy update was issued in January 2011 (Scottish

Government 2011b). The policy update outlined the many wider policy developments since the publication of the 2005 guidance, in particular GIRFEC (see Section 4.4). The update provided revised guidance on the allocation of the HPI. It emphasised that the HPI should reflect children's needs, and should not be influenced by service availability factors. It recommended a move from three to two categories (core and additional only) as this was felt to be more in line with the GIRFEC approach. It recommended that practitioners should be able to allocate the HPI at any point from the antenatal period to six months of age, and they should be free to provide assessment and support as required prior to allocation of the HPI. The GIRFEC national practice model was to be used across Scotland to support the assessment of children's needs and the HPI allocation.

The guidance reiterated the recommendation in CEL15 that a new universal child health review at 24-30 months should be introduced. A basic outline of what should be included in the review was provided (consideration of various developmental domains, vision, hearing, immunisation coverage, oral health, growth, physical activity, and play, and provision of consistent health promotion messages supported by national resources such as Ready Steady Toddler! <http://www.readysteadytoddler.org.uk/index.aspx>). Little direction was provided on how the review should be provided – Boards were instructed to agree the format and approach to the review locally – although the importance of achieving universal uptake and developing local pathways of care for children identified as requiring additional investigation or support was emphasised.

Although the policy update was generally welcomed by the service, the specific recommendation to move to a two category HPI was seen as being driven by a desire for policy congruence rather than reflecting the needs of the service and was consequently resisted. The CHSP-PS system has therefore not to date (December 2012) been modified to enable this change (or consequently the wider time frame for allocation of the HPI). Similarly, although the introduction of a new 24-30 month review was welcomed, the lack of detail within the update meant that Boards adopted a variety of approaches and made variable progress towards implementing the

review. Further, the CHSP-PS was not modified to support the new review hence no data was returned centrally on completed reviews. This was considered unsatisfactory and in October 2011 the Scottish Government convened a short life working group to produce detailed guidance on the content of the review and an agreed national minimum dataset that should be returned on completed reviews (Garvie, Sloan 2011). The group submitted draft guidance to the Scottish Government in June 2012 and the final guidance was published by the Scottish Government in December 2012 (Scottish Government 2012b). All Boards will be expected to be providing reviews in line with the guidance from April 2013, and the CHSP-PS system is currently (December 2012) being modified to accommodate this new review.

4.3.6. Personal involvement in the development of Scottish Child Health Programme policy

I started working in child public health from 2006 onwards, with it being my main focus from the start of my Clinical Academic Fellowship in April 2007. I was therefore not involved in the development of the 2005 guidance.

I joined the Hall 4 network group as an observer from 2007 until it folded in 2009. I presented an analysis of the wider Scottish policy context for the CHP to the group in January 2008 (Wood 2009) and presented a comparative analysis of the Child Health Programme in Scotland and that offered in other high income countries (based on the work presented in Chapter 5) in September 2008. I also submitted a research briefing commissioned by the chair of the group (Dr Zoë Dunhill, at that time working within the Child and Maternal Health department of the Scottish Government) that summarised the quantitative analyses presented in this thesis (Chapter 6 to Chapter 8) in January 2010. I was also a member of the group's HPI working group in 2008/09.

I co-authored a paper published in January 2009 (Wright et al. 2009) that used data from the Starting Well project to explore HVs' allocation of children to categories of

need during their first year of life. Full details of the Starting Well project and the 2009 paper are provided in Section 7.3.3.1. The results presented in this paper, and in particular their implications for the 2005 guidance recommendation that the HPI should be allocated to children by the end of their 6-8 week review, were widely discussed in Scotland. The 2010 Chief Executive's letter includes this paper as its only reference and cites it as the evidence supporting its recommendation to extend the age by which children should be allocated an HPI to six months.

I was on the working group that planned the consultation exercise that followed the 2010 Chief Executive's letter and facilitated at one of the four consultation events. Finally, at the Scottish Government's request, I also chaired the short life working group that produced the guidance on the new 24-30 month universal child health review.

4.3.7. Summary

This section has shown how the professional guidance contained within HFAC reports has influenced the delivery of the CHP in Scotland through the development of the CHSP-PS information system and various policy statements.

Implementation of the 2005 guidance resulted in considerable change to the Scottish CHP. Some areas of provision expanded, particularly formal screening activity with the introduction of universal neonatal hearing screening and pre-school vision screening. Provision of universal, holistic, HV led CHS reviews dramatically declined however, from six reviews spread across the pre-school period to just two reviews provided at 10 days and 6-8 weeks. This degree of decline was not recommended either by HFAC4 or the 2005 guidance and can be viewed as an unintended consequence of the 2005 guidance. Hindsight suggests that this unintended consequence stemmed from failure to appreciate two key issues: changing practice around delivery of immunisations (i.e. this no longer being within HVs' remit), and the extent to which the CHSP-PS system determined rather than

supported the delivery of CHS reviews (i.e. perceptions that if there was no CHSP-PS form to support a review, the review was not really required).

The 2005 guidance explicitly promoted a more active approach to targeting CHP support. It recommended that all children should be allocated to one of three ongoing models of support by the end of the 6-8 week review, and this was operationalised through the introduction of the Health Plan Indicator in the CHSP-PS system. From the start, HVs expressed concern about a lack of contact with 'core' babies after the 6-8 week review, and an associated concern that 6-8 weeks was too early to allocate the HPI. HFAC4 suggested that a reasonably clear idea of children's needs for ongoing support could be obtained by four months of age, with HFAC4r revising this time frame upwards to by twelve months.

Accumulating evidence on the implementation of the 2005 guidance – both from more formal assessments such as the QIS evaluation and from anecdote and opinion expressed through the Hall 4 network – has led to a series of policy revisions. Increased flexibility in HPI allocation and introduction of a new 24-30 month universal CHS review were first announced by the Scottish Government in April 2010 but neither of these goals has yet been fully implemented.

I have had the opportunity to be involved in the development of Scottish policy on the CHP from 2007 onwards. This has allowed first hand experience of theoretical issues well recognised within policy focused research such as: policy implementation gaps (i.e. discrepancy between policy makers' intentions and ultimate outcomes); the challenges and opportunities inherent in the constantly evolving nature of policy development; debate around legitimate targets for policy intervention (e.g. is provision of detailed advice on the content of the proposed 24-30 month review within the Scottish Government's remit, or should that be left to NHS Boards); and the involvement of and interaction between different groups such as academics, professionals, and civil servants in the policy making, implementing, and amending process (Buse, Mays & Walt 2005c, Lipsky 1980, Guldbrandsson, Back & Bremberg 2008, Hudson 2006, Exworthy, Berney & Powell 2002, Condon 2008). Direct

involvement in the policy process has also provided useful ‘inside information’ that is helpful when formulating practically relevant research questions and interpreting findings.

4.4. The wider policy context for the Scottish Child Health Programme

Policy on the Child Health Programme does not exist in isolation but rather within a complex web of policy and legislation relating to health, children's services, and broader social issues such as poverty. Understanding this context is useful when considering how professional guidance on the CHP has been translated into policy and how that has been subsequently implemented. Other policy areas, such as those influencing the community nursing workforce, can have a major impact on the implementation of CHP policy. Understanding the broad policy landscape is also essential if and when further developments to CHP policy are being planned, for example an understanding of the Getting It Right for Every Child programme (see below) was important when chairing the short life working group on the 24-30 month child health review.

The Scottish Parliament was established in 1999 (<http://www.scotland.gov.uk/About/Factfile/18060/11550>). It has full legislative powers over devolved issues, many of which are highly relevant to the CHP including health, education, and social work. Responsibility for other issues, including – importantly for child poverty – tax and benefits policy, is retained by the UK parliament. Table 14 provides an overview of key policies and legislation that were extant in Scotland in 2005 when the guidance on implementation of HFAC4 was published. The table also shows selected subsequent publications/developments. Particularly relevant areas are discussed briefly here.

Policy relating to the community nursing workforce, in particular HVs, is obviously of particular interest when considering the CHP. There have been long standing concerns about capacity within the community nursing workforce (for example a high proportion of the workforce being near retirement age and recruitment difficulties) which have been reflected in successive policy documents. *Nursing for Health* in 2001 (Scottish Executive 2001) reviewed the potential contribution of community nurses to public health and recommended bringing HVs and school

nurses together as ‘public health nurses’ but this has never been robustly implemented (Scottish Executive Health Department 2003). The Review of Nursing in the Community project published its report, *Visible, Accessible and Integrated Care*, in 2006 (Scottish Executive Health Department 2006) which went further, recommending that HVs, school nurses, and district nurses should be merged into new generic ‘community health nursing’ teams. The report was heavily focused on meeting the needs of adult patients with long term conditions and did not mention delivery of the CHP. Unsurprisingly, the report met with fierce opposition from the HV community and again its recommendations have never been implemented (O'Rourke 2007). The Review of Nursing in the Community project was re-launched as the Modernising Nursing in the Community programme in 2009 which is focusing more on supporting the workforce rather than imposing structural change. It is developing a range of training and practice support tools for front line staff and, by including children, young people and families as one of its three work streams, has implicitly committed to retaining HVs as a distinct professional group (<http://www.mnic.nes.scot.nhs.uk/>). The implications of the 2003 GP contract for the delivery of the CHP have been previously discussed in Section 4.1.2.

Overarching health services policy in Scotland has been outlined in *Delivering for Health* in 2005 (Scottish Executive Health Department 2005a), *Better Health, Better Care* in 2007 (Scottish Government 2007a), and most recently the *NHS Quality Strategy* in 2010 (Scottish Government 2010b). These policies share many features, for example a desire for health services to be delivered locally and quickly; focused on prevention as well as treatment; clinically safe, effective and outcomes focused; and well integrated. All these policies are concerned with ensuring the sustainability of health services in the face of an ageing population, a consequent increase in long term conditions, and technological advances and rising patient expectations that tend to drive health care costs up. Children’s health and health services receive variable attention within the three policies: *Better Health, Better Care* is notable for including a considerable focus on children.

Getting It Right for Every Child (GIRFEC) is a long term reform programme focused on all children's services (for example health, education, social work, and youth justice) that has practical implications for the delivery of the CHP

(<http://www.scotland.gov.uk/Topics/People/Young-People/gettingitright>). The

GIRFEC programme has established several principles that should underpin provision of children's services including that they should:

- Be focused on children's needs and improving their outcomes,
- Have a strong universal base with the opportunity for proportionate additional input for children and families that need it,
- Be striving for early intervention rather than crisis management, and
- Employ common approaches to assessment and information recording/sharing to strengthen joint working and streamline processes for families.

It has developed a framework of children's well-being indicators that all children's services should be focused on securing for every child. It has also developed tools to support the assessment of children's needs, in particular the national practice model (see Figure 3) which all practitioners working with children are expected to use, including HVs delivering the CHP. Under GIRFEC, all children have a 'named practitioner' that acts as a first point of contact if they, their families, or any professionals involved with them have concerns about a child's well-being. Health Visitors are as the named practitioner for pre-school children (Scottish Government 2011b). A number of pilot sites have worked through implementation of the GIRFEC principles, for example by redesigning child protection procedures so they are more focused on children's outcomes and easier for families to navigate (Scottish Government 2009).

The *Early Years Framework* (focused on supporting children from birth to age eight) (Scottish Government 2008c), *Equally Well* (focused on reduction in health inequalities) (Scottish Government 2008d), and *Achieving our Potential* (focused on poverty reduction) (Scottish Government 2008a) were all published in 2008 and are seen as the 'big three' social policies of the current administration. Together these policies attempt to outline a rounded response to intractable problems such as

socially-patterned intergenerational cycles of poverty, sub-optimal development, and poor health. They articulate a desire for Scotland to become a more equitable, healthier, and more productive society. The policies place considerable emphasis on the importance of the early years, and of the wider social determinants of health, in influencing outcomes over the life course. High level policy documents such as the *Early Years Framework* are sometimes criticised as being overly aspirational and rather short on practical detail. Policy that calls for major change without offering new resources (or at least redirecting existing resources) can seem particularly challenging to those tasked with implementation. The Early Years Taskforce and associated ‘change fund’ and service improvement ‘collaborative’ were established in 2011 and 2012 to help turn the vision set out in the *Early Years Framework* into tangible action as an implicit response to such criticisms (see <http://www.scotland.gov.uk/Topics/People/Young-People/Early-Years-and-Family/earlyyearstaskforce> and <http://www.scotland.gov.uk/Topics/People/Young-People/Early-Years-and-Family/early-years-collaborative>).

When the range of recent policies shown in Table 14 is taken together, a number of common themes can be identified, including:

- A focus on improving children’s early experiences as a means of reducing poor outcomes and inequalities across the life course,
- Recognition of the importance of the social determinants of health, for example the detrimental effect of poverty on children’s health and development,
- A focus on early intervention and prevention rather than crisis management wherever possible,
- An emphasis on improving outcomes through the provision of effective services,
- A progressive universalism approach to service delivery with a focus on proportionality, and
- A desire for integrated service provision focused on meeting the needs of users rather than the convenience of providers (O'Brien et al. 2006).

Other, more general, overviews of the development of legislation and policy affecting children within the UK (often exclusively England) have been provided (Foley et al. 2003, Law 2003, Tisdall, Hill 2010, Klett-Davies 2012, Parton 2012). These tend to address broader issues such as the views of children implicit within social policies (e.g. as inherently vulnerable and/or potentially threatening), the extent to which it is legitimate to use social policy to control aspects of family life (e.g. using welfare policy to promote maternal employment), and the use of evidence within policy making. Several commentators have discussed the potential participation of children themselves in the formulation of policy that affects them but in general this kind of participation remains the exception rather than the norm (Hill et al. 2004, Davis, Tisdall 2004). The potential tension between focusing on children's well-being as a means to improving adult health and/or productivity (as is common in current policies) rather than for its own sake as an inherently desirable goal has also been debated in the literature (Lister 2008). Foley et al have described early childhood as *'increasingly focused on as an important stage in the processing of an economically productive human workforce for the future'* (Foley et al. 2003, p114).

Ironically, whilst many areas of social policy now express a clear interest in the well-being of children (either for its own sake or for future benefit), generic health policy can present an exception to this (Wood 2009). The 2003 GP contract and the now superseded Review of Nursing in the Community, for example, paid scant attention to the needs of children or how primary care and community nursing could contribute to the wider goals of improving children's outcomes and reducing inequity in children's health. This appears to reflect a strong, sometimes overriding, concern within health policy with addressing the challenges inherent in population ageing (Hall 1999, Aynsley-Green et al. 2000). Repeated UK reports have also commented on the generally low status of care for children within the health service (Kennedy 2001, Healthcare Commission 2007, Kennedy 2010, Craft 2003, Craft 2007, Wolfe et al. 2011).

Understanding which aspects of policy are incorporated into performance monitoring processes, and particularly into national targets, gives further useful insight into the relative likelihood of successful implementation. Appendix 2 gives further details on how the Child Health Programme has been reflected in NHS, local authority, and central government performance monitoring processes since 2005.

Table 14 Selected Scottish policy and legislation relevant to the Child Health Programme

Policy area	Pre-2005	2005	2006	2007	2008	2009	2010	2011	2012
Child Health Programme	HFAC4: guidance on implementation in Scotland (draft), 2003	HFAC4: guidance on implementation in Scotland					CEL 15(2010)	A new look at Hall 4: the early years: good health for every child	Guidance on the 24-30 month child health review
Health Visitors / community nurses	Nursing for health, 2001 Scottish framework for nursing in schools, 2003		Review of nursing in the community: Visible, accessible and integrated care			Modernising nursing in the community programme			
General Practitioners	New GP contract, 2003								
Public health / health improvement	Diet action plan for Scotland, 1996 Towards a healthier Scotland, 1999 Starting Well demonstration project, 2001-05 Improving health in Scotland: the challenge, 2003 Hungry for success, 2003			Schools (health promotion and nutrition) (Scotland) Act	Equally well Healthy eating, active living	Towards a mentally flourishing Scotland		Improving maternal and infant nutrition: a framework for action	

Policy area	Pre-2005	2005	2006	2007	2008	2009	2010	2011	2012
Children's health services		The mental health of children and young people: a framework for promotion, prevention and care	Emergency care framework for children and young people in Scotland	Delivering a healthy future: an action framework for children and young people's health in Scotland		National delivery plan for children and young people's specialist services in Scotland Hospital services for young people in Scotland Scottish patient safety paediatric programme		Pathway of care for vulnerable families (0-3)	Developing a Community Child Health service for the 21 st century
General health services		Building a health service fit for the future Delivering for health		Better health, better care: action plan	Better together: Scotland's patient experience programme Scottish patient safety programme		Healthcare quality strategy for NHSScotland	Refreshed framework for maternity care in Scotland	

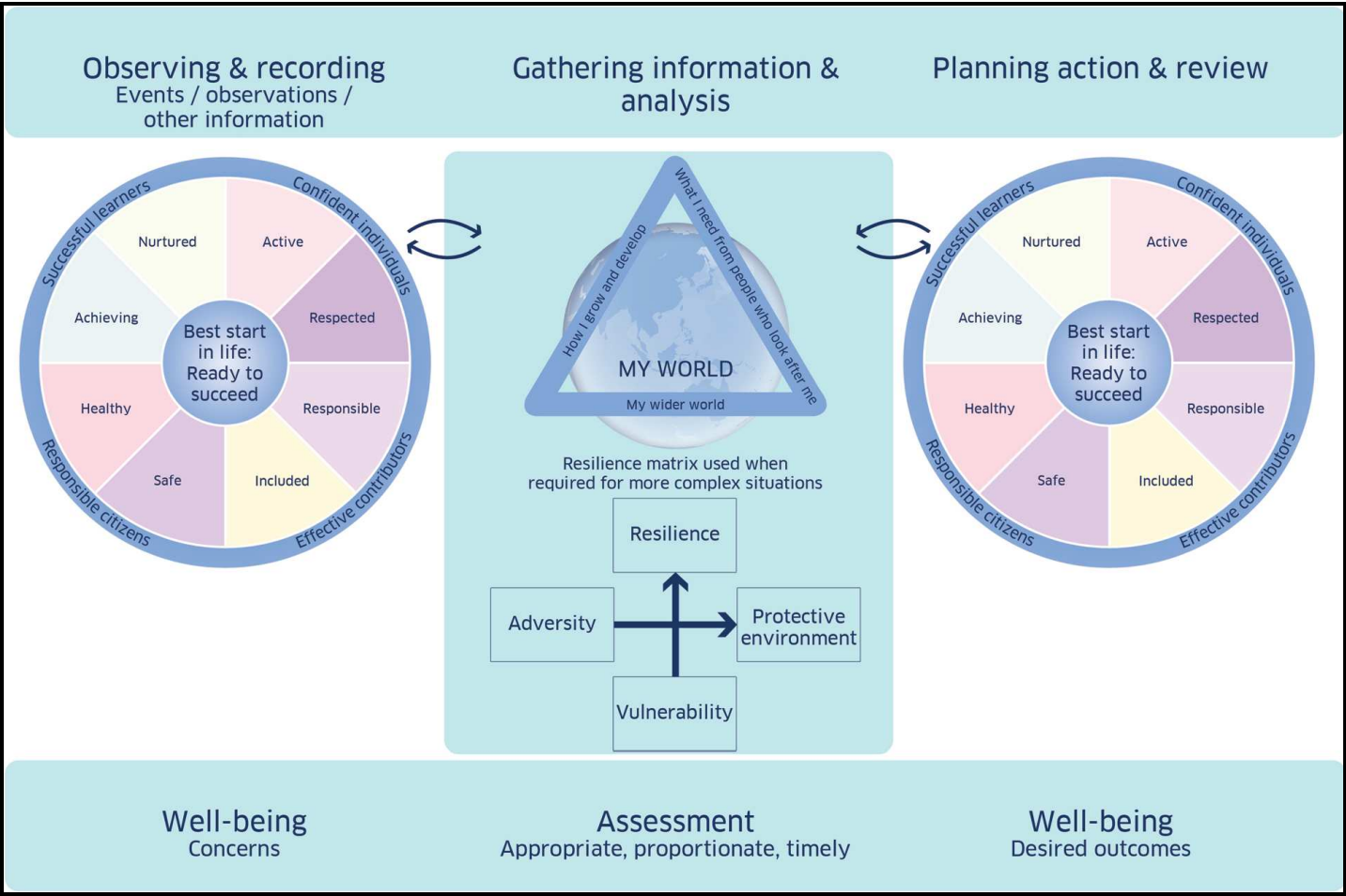
Policy area	Pre-2005	2005	2006	2007	2008	2009	2010	2011	2012
Early years					Early years framework	Nurse family partnership pilot launched		Early years taskforce and change fund	Early years collaborative
Education	Education (Scotland) Act, 2000 Education (additional support for learning) (Scotland) Act, 2004 Curriculum for excellence, 2004*		Curriculum for excellence: progress and proposals			Assessment for curriculum for excellence			Doran review of education for children with complex additional needs
Child protection	It's everyone's job to make sure I'm alright, 2002 Child protection reform programme, 2002-07			Looked after children and young people: we can and must do better		Looked after children (Scotland) regulations	National guidance for child protection in Scotland		National risk assessment toolkit for child protection National framework for child protection learning and development

Policy area	Pre-2005	2005	2006	2007	2008	2009	2010	2011	2012
General children's services	Children (Scotland) Act, 1995 Sure Start established, 1999 For Scotland's children, 2001 Requirement for integrated children's services planning, 2004		Getting It Right for Every Child implementation plan		A guide to Getting It Right for Every Child		A guide to implementing Getting It Right for Every Child		Common core of skills, knowledge, and values for the children's workforce New Children's Bill proposed (to cover children's services and rights)
Miscellaneous	Ratification of the UNCRC, 1991 UK government commitment to eradicate child poverty by 2020, 1999 Scotland's commissioner for children and young people established, 2002 Requirement for community planning, 2003**			Scottish-local government concordat	Achieving our potential			Scottish Parliament Finance Committee inquiry into preventative spending Child poverty strategy for Scotland	National parenting strategy

*The launch of Curriculum for excellence in 2004 involved publication of the curriculum review group report and a ministerial response

**Requirement for community planning was formalised through the Local government in Scotland Act 2003

Figure 3 Getting It Right for Every Child national practice model



Source: <http://www.scotland.gov.uk/Topics/People/Young-People/gettingitright/practical-tools>

4.5. Effectiveness of the Child Health Programme

This section considers the question: ‘How effectively does the Scottish Child Health Programme improve pre-school children’s outcomes?’ This question is inherently challenging due to the complex nature of what is delivered through the CHP (multiple inputs) and the various aspects of children’s health, development, and wellbeing that the programme potentially influences over variable timescales (multiple outcomes). Furthermore, the programme is not static: it changes and evolves over time as summarised in the previous sections. Its content, delivery, and context also vary between countries (see Chapter 5) making assessing the applicability of non-UK evidence difficult. In addition, elements of care delivered through the CHP are often only one necessary but insufficient link in a chain of events required to improve children’s outcomes. Expecting simple, quantitative answers is therefore unrealistic.

Brief overviews of the effectiveness of four specific interventions, each chosen to illustrate a particular type of intervention provided through the CHP, are presented in Appendix 3. The four interventions that are considered are:

- Universal neonatal hearing screening,
- Childhood vaccination against pneumococcal infection,
- Physical examination in early infancy to detect congenital heart disease, and
- Provision of advice on the prevention of Sudden Infant Death Syndrome.

In brief, the overviews show that:

- There is robust, randomised controlled trial (RCT) evidence showing that universal neonatal hearing screening can facilitate early diagnosis and treatment of congenital hearing loss. There are theoretical reasons to assume that earlier treatment will result in improved outcomes for deaf children, but definitive evidence showing that this is the case is currently lacking.
- There is robust evidence showing the efficacy and effectiveness of childhood pneumococcal vaccine in preventing invasive pneumococcal disease. The extent

to which serotype replacement effects may limit the effectiveness of vaccination over time remains uncertain however.

- Physical examinations offered to neonates (and to a lesser extent to infants aged around 6 weeks) can detect a considerable proportion of previously unsuspected congenital heart disease, particularly if careful attention is paid to clinical quality issues. Observational evidence suggests that early suspicion does not always translate into prompt diagnosis and treatment, emphasising the need for clear patient pathways. The role of pulse oximetry in supplementing physical examination continues to be debated.
- There is good observational evidence that national Back to Sleep campaigns have been very successful in reducing the occurrence of Sudden Infant Death Syndrome. It is, however, impossible to identify the specific contribution that advice provided by Health Visitors made to this success.

Taken together, the overviews demonstrate that different types of interventions provided through the CHP are supported by different amounts of evidence of varying design and quality (Cowley, Bidmead 2009). In general, newer elements of the programme that involve delivery of relatively discrete interventions (particularly specific screening procedures or immunisations) are supported by high quality effectiveness evidence, such as that derived from large scale randomised controlled trials. Nevertheless, even in these cases, important elements of evidence may be missing or inadequate.

It is generally much harder to summarise the evidence relating to the effectiveness of longer established, more diffuse, elements of the CHP, such as provision of child health reviews. In these instances, breaking the ‘intervention’ down into its component parts, such as physical examination at a certain age to facilitate the detection of specified congenital anomalies, or provision of health promotion advice on a particular topic, can help structure the identification and assessment of relevant evidence. Often, randomised controlled trial evidence relevant to these (sub)interventions is entirely lacking and different types of evidence, such as those based on observational and qualitative studies and expert opinion, must be

considered (Victora, Habicht & Bryce 2004). Such evidence may still be powerful, but often many areas of uncertainty remain.

4.5.1. Effectiveness of the CHP in improving early child development

Current understanding of early child development, and its importance for health and wellbeing over the life course, was outlined in Chapter 3. Given the current policy focus on early child development, the ability of the Child Health Programme to improve children's developmental outcomes is of particular interest. This section therefore considers this issue in some depth.

Universal elements of the CHP may potentially contribute to improving early child development through a variety of mechanisms. Screening procedures such as newborn bloodspot and hearing screening can facilitate the early detection of underlying medical conditions with serious developmental consequences that may be ameliorated through early treatment. Some vaccinations can also prevent developmental problems, for example by preventing infections that cause meningitis or encephalitis.

Child Health Surveillance reviews may also improve early child development by enabling prompt identification of children with previously unrecognised developmental problems and /or risk of suboptimal development due to social and environmental risk, and subsequently facilitating the provision of effective early intervention for these children. As noted in section 4.2.2, the extent to which CHS reviews actually do facilitate the early identification of children with previously unsuspected developmental problems has been particularly disputed. This specific issue is therefore considered in detail here.

4.5.1.1. The potential contribution of developmental surveillance to early detection of developmental problems

As noted previously in this chapter (particularly sections 4.2.2, 4.3.1, and 4.3.2), the HFAC reports and associated Scottish guidance have consistently recommended that developmental *surveillance* (but not developmental *screening*) is offered as part of the universal child health reviews. In practice, developmental surveillance entails, at every child health review, Health Visitors eliciting any concerns parents may have about their child's development, taking a developmental history, and observing children's milestones/skills as demonstrated through play or the completion of more structured tasks. The HFAC reports also note the potential contribution of the physical examinations offered during the neonatal and 6-8 week child health reviews to detecting developmental problems and/or associated medical problems. The use of developmental questionnaires for selected children about whom the parents or Health Visitor has a concern is also becoming a more common element of surveillance (Scottish Government 2012b, Department of Health 2009b). Routine use of specified 'tests'/questionnaires on all children at one or more specified child health reviews is outwith the scope of surveillance however: this would comprise developmental screening (see section 4.5.1.2).

There is some evidence on the ability of developmental surveillance to contribute to the early detection of developmental problems and/or improved developmental outcomes. Butler reviewed the available evidence relating surveillance to children's outcomes in 1989 (Butler 1989c). He cited four key studies from Sweden, the US, Scotland, and England. The Swedish study reported a comparison between two cohorts, each of around 1,000 children, born in 1965 (before the introduction of an additional universal child health review involving developmental surveillance at four years) and 1967 (after the review was introduced) (Sundelin, Melbin & Vuille 1982). Minimal difference was found between the cohorts when health, development, and educational assessments were undertaken by school nurses and teachers when the children were age ten years. The US based Rand health insurance experiment was a randomised controlled trial in which around 1,000 families were allocated to different health care plans which included, amongst other things, Child Health

Programme cover that was either free at the point of use or provided on a cost sharing basis (Valdez et al. 1985). Access to CHP services was found to be considerably (up to 30%) lower in the cost sharing group but no differences in health status in adolescence were detected between the groups.

The Scottish study involved a cohort of around 5,000 children born in Dundee in 1974/75 who were offered developmental surveillance through the CHP at 8, 20, and 29 weeks and 15, 24, and 36 months and followed up by teacher assessment of development and educational problems in early primary school when aged six or seven years (Drillien, Pickering & Drummond 1988). The results of developmental surveillance at age two and three years were found to be highly correlated with later developmental problems (suggesting that surveillance was relatively good at predicting problems) but no difference in the prevalence of problems was noted between children who received their surveillance and those that missed it (suggesting that surveillance was not good at influencing outcomes). Finally, a study from London was reported that compared the outcomes at two and four years of children living in an area with a comprehensive developmental surveillance programme with those living in a control area with a minimal service (Bax, Hart & Jenkins 1980). The results suggested that the prevalence of behavioural problems at age four was lower in the experimental area.

In these studies, all now rather old, it was often not clear how surveillance differed between the groups studied, for example in Sweden the four year review was likely to be the 'icing on the cake' of an already fairly comprehensive surveillance system, and in the US it was not clear exactly which aspects of preventive care were discouraged by the co-payment requirement. The interventions provided to 'surveillance positive' children, and the assessment of outcomes, were also often opaque. Taken together, therefore, these studies raise more questions than they answer about whether, or to what extent, developmental surveillance of toddlers and pre-school children leads to early identification of developmental problems and meaningful long term improvements in developmental outcomes.

The results of the implementation of a standardised CHP in Northumberland in 1986 suggested a more positive impact of CHS (Colver 1990). Prior to 1986 the region had minimal CHS that was variable between areas. From 1986 an agreed programme was introduced which was very similar to that subsequently recommended in HFAC1. It entailed developmental surveillance at each child health review, including specific assessment of language development at 18 months and three years, but no formal developmental screening. Attention was paid to the quality of the programme offered with standardised staff training and regular audit with feedback of results to frontline staff. Over the four years following implementation, the paper reports that the region saw a substantial decrease in the average age at which congenital deafness was identified and hearing aids fitted, and in the average age at which physiotherapy was started for diplegic and hemiplegic (but not quadriplegic) cerebral palsy. There was also a suggestion of an increase in the proportion of children with additional educational support needs identified by early primary school that had received relevant support services before age two. These changes were not seen in neighbouring areas that had no comprehensive CHS. Although these results suggest that provision of comprehensive CHS, and in particular attention to the quality of the service, can have a substantial impact on important outcomes, the study methods and results were rather poorly described and it is difficult to be sure to what extent the changes were real and could be directly attributed to the new CHS provision.

A range of other, relatively old, UK based papers reporting local audits of the detection of developmental problems through routine surveillance is available, for example (Hendrickse 1982, Dearlove, Kearney 1990, Barber 1982). One relatively large scale audit included around 2,000 children born in 1993/94 to mothers who remained registered with 28 GP practices in Nottingham until at least nine months after delivery. This study suggested that around 1.5% of both 6-8 week and 6-9 month child health reviews resulted in the identification of a 'concern' about the child's development (Hampshire et al. 1999). It is not clear how development was assessed within the reviews; how many of the concerns identified had been previously unsuspected; what the overlap was between concerns identified at each of

the two reviews; how many concerns were subsequently confirmed as a significant developmental problem; or how many developmental problems were missed at the surveillance reviews. These limitations (which are also present in many of the other studies cited above) clearly restrict the ability of the study to provide meaningful information on the ability of child health reviews to promptly detect developmental problems.

A more recent study from Sweden explored the ability of CHS in infancy to detect developmental problems (Magnusson, Persson & Sundelin 2001). Around 3,000 children born in one area of Sweden in 1996 were included. The children received very intensive surveillance comprising formal developmental surveillance and physical examinations at 2, 6, 9, and 12 months by a doctor or nurse and around a further 10 less formal contacts with the child health nurse over the year. Developmental problems diagnosed by 26-48 months were identified through administrative sources and case note review. Of 38 children with disabilities, 16 were identified through the neonatal examination, two were identified through follow up of neonatal intensive care graduates, 10 were identified through the post neonatal Child Health Programme (either at scheduled reviews or through additional ad hoc contact with service), and 10 were identified through other routes. Overall this study did suggest that this intensive model of CHS made a meaningful contribution to the identification of developmental problems but even in this system, a minority of children came to light via other routes.

On balance these studies indicate that, within a framework of multiple CHS reviews for every child, detection of new developmental concerns at any individual review offered after the immediate neonatal period is relatively uncommon (perhaps around 1-2% of children) (Bain 1989). The studies also serve as a reminder that not all detected concerns will go on to be confirmed as developmental problems and that some confirmed developmental problems will be identified through other routes than 'routine' CHS reviews. Sonnander has estimated that CHS reviews at age 3-4 years predict the presence of developmental problems evident in early primary school with sensitivity of 50-75% and specificity of 75-99% (Sonnander 2000). It is very

difficult though from these and similar studies to get a clear picture of how CHS overall contributes to the early detection of developmental problems, both by directly identifying concerns during reviews and generally raising awareness of developmental issues with parents and providing a route through which they can seek additional advice if they are concerned (Hart, Bax & Jenkins 1981, Dworkin 1989).

There are a small number of more recent UK studies looking at the performance of developmental surveillance within specific CHS reviews. A study of around 2,500 8-9 year old school children in a district of Kent in 2000 aimed to assess the contribution of the 2 and 3.5 year CHS reviews to the diagnosis of autism (Tebruegge, Nandini & Ritchie 2004). Cases of autism were identified by schools and information on the age and route of diagnosis was obtained from medical records. Of the 21 cases found, 19 and 17 had received their 2 and 3.5 year reviews respectively at which 12 and 16 had had developmental concerns (mainly speech and language) noted. Overall, 13 of the 21 cases had had the suspicion of autism raised for the first time (and been referred for formal assessment) as a result of these reviews (5 and 8 after the 2 and 3.5 year reviews respectively). The authors concluded that these reviews were making a significant contribution to the early detection of autism and facilitating early intervention that has been shown to improve outcomes. A separate audit of 124 referrals to a social communication clinic in London over an 18 month period in 2004/05 found that 32 (26%) arose directly from the 2 year CHS review. Overall, 66 of the referred children (53%) were subsequently diagnosed with autism, but it is not clear how many of these were among the 32 (Perera, Vijeratnam & Bolland 2007).

These more recent studies raise the question of what impact withdrawing the universal child health reviews offered after 6-8 weeks may have had in Scotland. A study from London, cited by Bellman (Bellman, Vijeratnam 2012), suggested that referrals of pre-school children to audiology and orthoptics clinics fell by 40% after implementation of HFAC4 recommendations led to targeted rather than universal CHS reviews (after the 6-8 week review) being offered in the clinic catchment areas. No additional information on the nature or outcome of the referrals before and after

the change was available. An audit of speech and language therapy referrals in Dumfries and Galloway before and after the implementation of the revised CHS programme there in 2006 has been anecdotally reported as showing that the average age at referral increased substantially, although no formal report of this is available (Debbie Smith, personal communication).

Since 2009, NHS Greater Glasgow & Clyde has been developing and piloting the re-introduction of a universal child health review for children aged 30 months. This work helped to inform the development of the national guidance on reintroduction of a universal 24-30 month review. The Glasgow pilot reviews have identified substantial numbers of children as having previously unsuspected developmental problems, for example 33 of 330 (10%) children that underwent reviews in one area of Glasgow in 2009 were found to have delayed speech and language development (Thompson, Wilson 2010).

4.5.1.2. The potential contribution of developmental screening to early detection of developmental problems

Formal developmental *screening* for all children has never been advocated by the HFAC reports or the National Screening Committee (Blair, Isaacs 2003, Blair, Hall 2006). The National Screening Committee periodically reviews this position: updated guidance on developmental screening in childhood was due in 2011/2012 but has not yet (Dec 2012) been published (<http://www.screening.nhs.uk/developmentbehaviour>).

A major systematic review of the evidence for various types of child health screening, including developmental screening, was reported by the Australian Centre for Community Child Health in 2002 (Centre for Community Child Health, Royal Children's Hospital Melbourne 2002). The review identified one randomised controlled trial of developmental screening. The trial involved around 5,000 pre-school children aged four to five years in Ontario, Canada. Children were randomly assigned to developmental screening using the Denver Developmental Screening Test plus follow up by the child's doctor and school nurse for those that screened

positive; screening without follow up; or no screening. No difference in outcomes (teacher and parent reported developmental status, direct developmental testing of children, and referrals to relevant services) was found between the three groups when the children were aged seven to eight years (Cadman et al. 1987).

The Australian review noted a number of limitations with the study, in particular the screening test used and the intervention provided to screen positive children. The Denver II is now known to have particularly poor sensitivity and specificity and is not recommended for use as a developmental screening test (Glascoe et al. 1992). Screen positive children in the ‘treatment’ arm of the trial essentially received ‘normal care’ provided to children with developmental delay in that community at that time. It is questionable whether this care was of the intensity or quality now known to be required to make a meaningful difference to children’s outcomes. Furthermore, although overall the trial was quite large, the number of children in the ‘screening plus treatment’ and ‘screening only’ arms that screened positive was quite low (n=28 and 24 respectively). This trial therefore provides limited information on the potential impact of developmental screening on children’s outcomes.

The Australia review cited a range of other information suggesting that early diagnosis of developmental problems is beneficial, and that effective interventions that improve outcomes are available for at least some groups of children, but overall, due to the lack of robust evidence on the impact of formal developmental screening on children’s outcomes, the review recommended that formal developmental screening programmes should *not* be introduced. The review echoed the HFAC reports in recommending proactive developmental surveillance however.

Two other major systematic reviews on the effectiveness of aspects of the CHP have been conducted by UK researchers, but neither of these looked in detail at developmental screening/surveillance (Elkan et al. 2001, Barlow et al. 2008). As well as considering general developmental screening (i.e. covering all domains of early child development), the Australian review also considered population based screening for delay in speech and language development specifically: the review also

recommended *against* screening for this problem. Other major UK (Law et al. 1998) and US (Nelson, Nygren & Walker 2006) reviews have also recommended against screening for speech and language delay.

The UK and Australian position on general developmental screening contrasts markedly with that in the US. As discussed in section 5.2.2.5, the American Academy of Pediatrics (AAP) first recommended universal developmental screening in 2001 and has provided more specific guidance since 2006 (American Academy of Pediatrics 2006). The 2006 guidance recommends that developmental *surveillance* should be undertaken at each of the 14 child health reviews offered between birth and age five years, and that this should be supplemented by general developmental *screening* (using a validated questionnaire) at the 9, 18, and 24 or 30 month visits plus autism specific screening (using the Modified Checklist for Autism in Toddlers questionnaire) at the 18 and 24 month visits.

The AAP notes that many developmental screening tests have sensitivity and specificity in the range of 70-80%. This is lower than would generally be required for screening programmes but the AAP considers this acceptable for developmental screening tests due to the inherent difficulties in defining ‘cases’, the repeated rather than one off nature of developmental screening, and fact that those who screen positive but then test negative are at increased risk of poor outcomes even if not formally considered a ‘case’ hence may benefit from, and are unlikely to be harmed by, early intervention services that may follow screening. This argument has been disputed by various authors (Sonnander 2000, Dworkin 1989).

Researchers from the US based Commonwealth Fund have written extensively in support of population based developmental screening. Sices has claimed there is good US based evidence showing that developmental surveillance alone under-detects developmental problems, including evidence of the mismatch between prevalence (around 10%) and participation in statutory early intervention services (2% of under 3s and 6% of 3-5 year olds); evidence of long time lags between development of parental concerns and definitive diagnosis and/or provision of early

intervention; and evidence that many developmental problems such as isolated speech and language delay are not identified before school entry despite this being technically possible (Sices 2007).

Sices also notes that the AAP recommendations in favour of screening are poorly implemented with only around half of US paediatricians reporting using any validated screening tools and most of them reporting using the tools selectively rather than universally (see also (Bethell et al. 2011)). The Commonwealth Fund implemented a quality improvement project aiming to improve the routine provision of developmental screening called the North Carolina Assuring Better Child Health and Development (ABCD) project (Earls, Shackelford Hay 2006, Pinto-Martin et al. 2005). This project found that implementing formal screening in addition to surveillance substantially increased detection, referral and early intervention rates, although impact on long term outcomes has not been assessed.

One recent observational US study has directly compared the performance of developmental surveillance and screening (Thomas et al. 2012). The study involved 94 children without previously known developmental problems who attended their 9, 18 or 24 month CHS reviews at one provider over a six month period. All children underwent usual surveillance involving elicitation of parental concerns, a standardised history eliciting attainment of age appropriate skills/milestones, physical examination and unstructured clinical observation. All families also completed the Ages and Stages Questionnaire (ASQ). The ASQ was completed after surveillance and scored separately by blinded assessors. Developmental delay identified through surveillance was defined as a concern being recorded in the notes or a relevant referral made, and delay identified through screening was defined as borderline or fail score on the ASQ. Ten children were identified as having delay on surveillance, all of whom were also identified by screening. Of the remaining 84 children who had no concerns identified on surveillance, 33 were identified as having delay by the ASQ. Surveillance initially resulted in nine referrals with three children also being recalled for early repeat assessment: screening resulted in a further six referrals and a further 40 children recalled for early assessment. No information on

outcomes is provided. This study strongly suggests that formal screening results in higher numbers of children being identified as possibly having developmental problems and consequently higher requirements for follow on assessment, but the impact on ultimate detection rates, provision of interventions, or outcomes cannot be inferred.

A US based randomised controlled trial directly comparing developmental surveillance and screening has also been reported recently (Guevara et al. 2013). The trial involved around 2,000 children registered with four paediatric practices (i.e. groups of office based paediatricians and support staff providing preventive and general primary care to children) in Philadelphia. Children were eligible to participate if they were less than 30 months old, had been born at term, and had no known congenital or developmental problems. All children were offered the programme of well child reviews recommended by Bright Futures (see Table 21). Children were randomised to receive either developmental surveillance only at their reviews, or developmental surveillance at all reviews plus the developmental screening recommended by Bright Futures at selected reviews. Developmental surveillance involved formal review (through discussion with parents) of age appropriate developmental milestones using previously developed standard questions. Developmental screening comprised parent completion of the Ages and Stages Questionnaire II (ASQ) at the 9, 18, and 30 month reviews plus the Modified Checklist for Autism in Toddlers questionnaire (M-CHAT) at the 18 and 24 month reviews. Children receiving screening were further randomised to receive support from staff to complete the developmental questionnaires or no support. Children were followed up for 18 months and the proportions with suspected and confirmed developmental delays identified.

No differences were found between children receiving screening with no support to complete questionnaires compared to those who received support. A considerably greater proportion of children receiving screening was identified as having a suspected developmental delay over the 18 months of follow up however (348/1,397, 25% cf. 90/695, 13%). Suspected developmental delay was defined as significant

delay with respect to developmental milestones or performance on the ASQ or M-CHAT below accepted thresholds. Similarly, a higher proportion of children receiving screening was referred to early intervention services (261/1,397, 19% cf. 71/695, 10%) and underwent formal developmental assessment within the EI service (128/1,397, 9% cf. 42/695, 6%).

The authors investigated whether the higher suspicion and referral rates associated with screening reflected higher ascertainment of children with developmental problems or over-referral of 'normal' children. A higher proportion of children in the screening arms of the trial were confirmed as having a developmental problem (defined as accepted as eligible for EI services) after suspicion (86/348, 25% cf. 21/90, 23%), referral to (86/261, 33% cf. 21/71, 30%) or assessment within (86/128, 67% cf. 21/42, 50%) EI services, suggesting that screening was increasing the proportion of true cases identified rather than leading to over-identification.

Finally, time to suspicion and referral was examined. Children in the screening arms of the trial were identified and referred more quickly than those in the surveillance arm, suggesting that screening promoted earlier diagnosis and intervention.

This trial sought to explore the impact of developmental screening in a usual clinical setting hence some contamination between trial arms is likely, for example office staff may have helped parents in the 'screening with no support' arm complete questionnaires if required, and clinicians could administer developmental questionnaires to children in the 'surveillance only' arm if they felt it was clinically appropriate. The trial was also inevitably unblinded: both parents and staff knew which arm children were in. Provision of EI services following confirmation of eligibility and children's outcomes were not assessed as part of the trial. The potentially high impact of implementing universal developmental screening on follow on EI services was acknowledged. The children included in the trial were from poor, urban neighbourhoods and a large proportion were African American hence the generalisability of findings requires confirmation. Despite these limitations, this is the first study to provide relatively convincing evidence that

developmental screening is superior to developmental surveillance alone in terms of facilitating prompt identification of developmental problems, at least for some children in some settings. Evidence that this translates into improved developmental outcomes for children remains lacking.

4.5.2. Summary

In summary, although there is quite a lot of evidence relating to the ability of child health reviews to contribute to the early detection of developmental problems, it is difficult to synthesise into clear cut recommendations for policy and practice. Much of the available evidence relating to developmental surveillance is now quite old, of variable quality, and of limited applicability to the current Scottish model of CHS provision. On balance, the evidence suggests that developmental surveillance provided as part of repeated child health reviews can make a meaningful contribution to the early detection of developmental problems, although it is by no means the only route through which developmental problems are first suspected/recognised. It is not possible to state with certainty what the optimal configuration of CHS reviews would look like in terms of making the most effective and efficient contribution to early detection of developmental problems. Logic would suggest there will be a trade off between effectiveness and efficiency: the more frequently reviews are provided, the more likely it is that developmental problems will be first identified through this route but also, at least after a threshold, the more resource will be expended per case identified.

The very limited evidence that is available suggests that the withdrawal of universal developmental surveillance after the age of 6-8 weeks that occurred in Scotland from 2005 may have had a detrimental effect on the prompt identification of at least some types of developmental problems. The re-introduction of a 24-30 month child health review from April 2013 onwards will provide a valuable opportunity to assess the impact of developmental surveillance at this age on the identification of developmental problems and on children's outcomes. There is essentially no

evidence on how the provision of developmental surveillance, or its reduction in Scotland since 2005, impacts on children's long term outcomes.

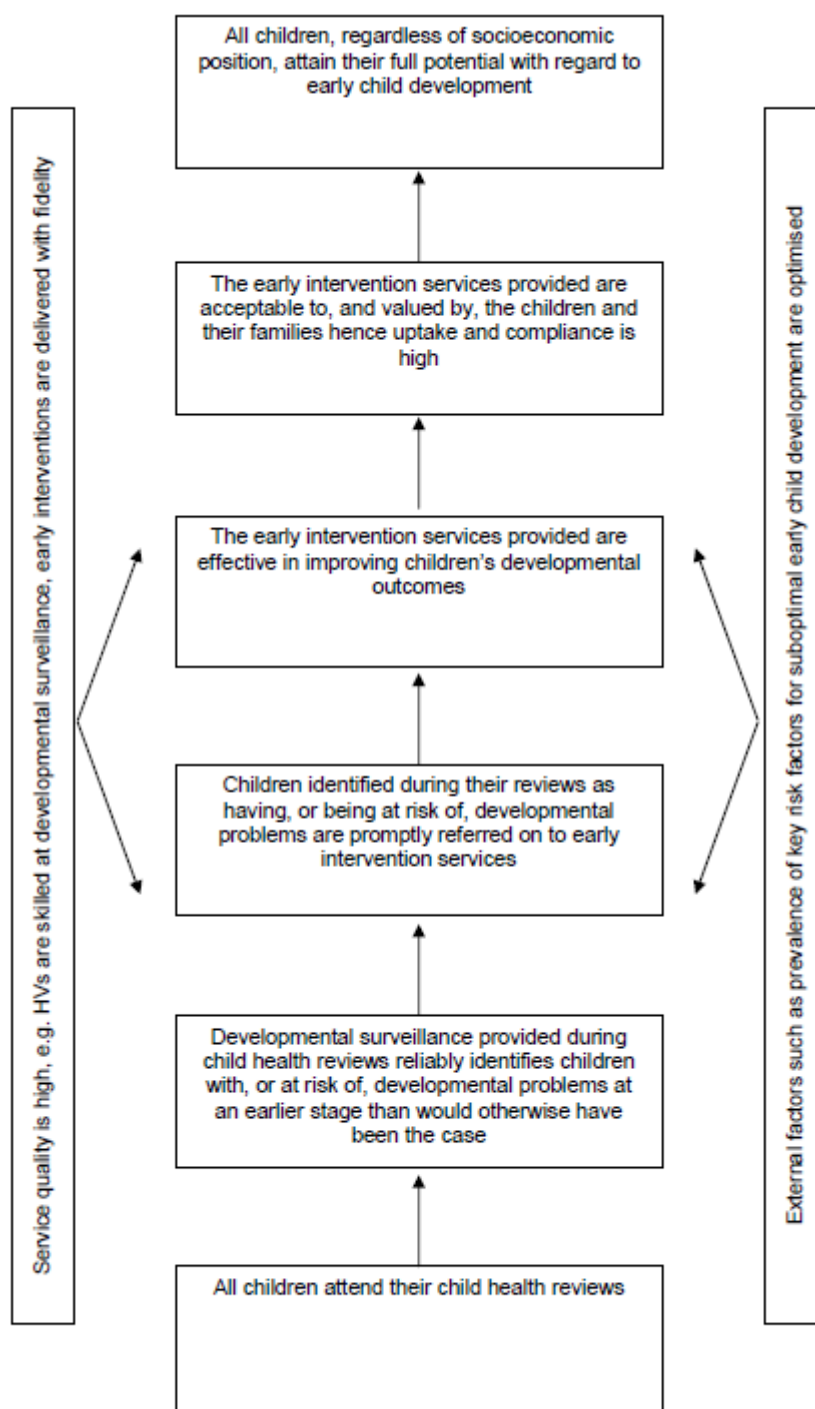
There is some evidence that, even when comprehensive developmental surveillance is offered, many children with developmental problems are still diagnosed relatively late. This has led US authorities to recommend formal developmental screening for all children. There is evidence that a screening approach identifies a much larger proportion of children as potentially having developmental problems than a surveillance approach, but again there is as yet no evidence that this leads to improved developmental outcomes. To date, formal screening has been resisted in the UK.

This section has focused primarily on the ability of child health reviews to contribute to the early detection of developmental problems. Even if early detection could be reliably achieved, other elements would need to be in place before this could translate into improved developmental outcomes. Methodologies developed to support the evaluation of complex interventions can be useful when thinking about what other elements of a whole system may be required, and therefore what other evidence should be considered, before determining whether or to what extent CHS reviews contribute to securing good developmental outcomes for all children. Different methodological approaches are available, but a clear exposition of the theory/logic that underpins the particular interventions or policies that are being evaluated is common to all (Connell et al. 1995, Fulbright-Anderson, Kubisch & Connell 1998, McLaughlin, Jordan 1999, Campbell et al. 2000, Craig et al. 2008, Anderson 2008, Pawson, Tilley 1997, Pawson et al. 2004, Mayne 2012, Wimbush, Montague & Mulherin 2012). A highly simplified 'theory' of how child health reviews could help to secure good and equitable early child development outcomes is shown in Figure 4.

Even this very simplified schema suggests important other areas that need to be considered, such as the coverage of child health reviews and the availability of effective interventions that improve children's developmental outcomes, particularly

when provided promptly after early detection. Coverage of child health reviews is considered in Chapter 6. Reviewing the effectiveness of early interventions for developmental problems is outwith the scope of this thesis. A brief summary of intervention types that have been shown to be effective, particularly for children with or at risk of developmental delay due to adverse social and environmental factors, was provided in section 3.6. Evidence on the effectiveness of early interventions for children with developmental problems due to specific underlying medical problems is more variable, but again there is good evidence that at least some types of early intervention can substantially improve outcomes for at least some groups of children (Shonkoff, Hauser-Cram 1987, Guralnick 2005, Law, Garrett & Nye 2003, Howlin, Magiati & Charman 2009, Smith, Groen & Wynn 2004, Dawson et al. 2010, Spittle et al. 2012).

Figure 4 Theory of how child health reviews may contribute to the attainment of good and equitable early child development



4.6. Summary

This chapter has focused in detail on the Child Health Programme and Child Health Surveillance. The historical origins and current model of provision of the programme have been considered. The Health for All Children reports that have provided UK wide professional guidance on the content of the CHP since 1989 have been reviewed. The HFAC recommendations regarding core elements of the CHP that should be provided to all children have changed relatively little over time, but recommendations on the broader context and delivery of the programme have changed considerably. The most recent report, HFAC4 published in 2003, emphasised the importance of parenting and wider social and environmental influences on children's outcomes and recognised the difficulties inherent in ensuring the programme reaches those most in need. HFAC4 recommended an explicitly individualised approach to the provision of additional and some core CHS support ('progressive universalism') to ensure that the CHP is as effective as possible in securing improved, and more equitable, outcomes for children.

Guidance contained in the HFAC reports has been incorporated into practice in Scotland through two main mechanisms: the development of a national information system and the publication of national policy documents. From 1991, the CHSP-PS information system has promoted the provision of a specified programme of CHS reviews to pre-school children. In 2005, the first formal Scottish policy on the content and delivery of the CHP was published in response to HFAC4: further policy updates have been published subsequently.

The 2005 policy attempted to 'operationalise' the HFAC4 aim of more flexible and individualised provision of CHS support by reducing the number of universal child health reviews and requiring all children to be allocated to a 'core, additional, or intensive' model of ongoing support by the end of their 6-8 week review. The 2005 policy assumed that subsequent immunisation contacts would function as holistic child health reviews but this has not been the case, hence in effect no universal reviews after the 6-8 week contact were provided after implementation of the policy.

In recognition of this, recent policy updates have recommended the reintroduction of a universal review for children aged 24-30 months.

The last section of this chapter has briefly reviewed the evidence on the effectiveness of the CHP. The CHP as a whole comprises a range of different types of interventions and these tend to be supported by different volumes, types, and quality of evidence. Some specific interventions, such as screening procedures and immunisations, are supported by high quality effectiveness evidence. The evidence supporting longer established and more diffuse elements of the CHP, such as child health reviews, is more variable and harder to summarise.

Current understandings of early child development emphasise its fundamental importance to long term health, wellbeing, and wider social outcomes. The HFAC recommendations on assessing child development within the context of CHS reviews have been particularly controversial. Evidence on the ability of CHS reviews to support the early detection of children with, or at risk of, developmental problems has therefore been considered in some detail. The limited evidence that is available suggests that developmental surveillance provided as part of a programme of CHS reviews can make a meaningful contribution to the early detection of developmental problems, but as yet there is essentially no evidence that developmental surveillance influences children's long term outcomes.

Given that the evidence supporting the CHP is variable, developing policy on the precise content of the programme inevitably relies to some extent on values and judgement. It is therefore of interest to explore how the available evidence is filtered through into policy in different settings. The next chapter does this by comparing the Child Health Programme recommended in Scotland to that recommended in a number of other high income countries.

Chapter 5 International approaches to Child Health Programme provision

This chapter seeks to place the Scottish Child Health Programme in an international context. Understanding how Scotland's programme compares to that provided in other high income countries provides a helpful platform from which to consider future potential Scottish policy developments. The Scottish CHP is compared to that offered in England; Australia; Canada; the United States (US); and Sweden. These countries were selected to provide a range of English speaking nations with different health systems and a European comparison often recognised as providing an exemplary child health service (Crombie et al. 2003). National policies outlining the core Child Health Programme that is recommended in each country form the basis of the comparisons. The comparisons focus mainly on structure and process aspects of the CHPs (Donabedian 1966). Outcome data are also presented where possible but the available information is limited.

The specific questions addressed in this chapter include:

- How is the Child Health Programme for pre-school children delivered in each of the countries studied (health professionals involved, location of provision, integration with other health and children's services)?
- What specific elements of care are offered within the core/universal service (screening procedures, immunisations, Child Health Surveillance reviews, developmental assessment, growth monitoring, health promotion advice)?
- How does access to CHP services (e.g. CHS review coverage, immunisation coverage) and child health outcomes that reflect, at least in part, care delivered through the CHP (breastfeeding rates, child well-being) vary between the countries studied?

At the population level, the success of the CHP depends both on the effectiveness of the care offered and on its uptake across the population, including by children at increased risk of poor health or compromised development. Service accessibility and

uptake is influenced by wider aspects of a country's health system in particular its financing and delivery mechanisms (Black, Gruen 2005a, Black, Gruen 2005b). These wider aspects of the included countries' health systems are therefore also considered to provide information on the context within which the countries' CHPs are delivered.

5.1. Methods

For the purposes of this analysis, the core Child Health Programme was defined as the comprehensive programme of preventive health care (including screening, immunisation, and broader health promotion elements) that is proactively delivered to all pre-school aged children by clinically qualified personnel (nurses or doctors). The terminology used for these programmes varies between countries, and includes names such as child health promotion, child health maintenance, preventive paediatric care, maternal and child health services, and well-child care. For consistency, the term Child Health Programme has been used throughout in this chapter.

A framework covering the specific items of information sought on each country's CHP and wider health system was developed in Excel 2003 and populated as relevant information was found (see Table 15).

Table 15 Framework for collection of information on included countries' general health systems and recommended Child Health Programmes

Overall health system	
General description	
Primary funding source	
Delivery mechanisms	
Reimbursement of providers	
National to local management structures and devolution/local variation	
Eligibility criteria for health care/coverage of the population	
Quantitative economic and health service indicators as shown in Table 18	
Child health programme for pre-school children	
Key guidance/policy documents/sources	
Extent of regional/local variation	
Recommended screening procedures	
	Newborn physical examination
	Newborn bloodspot screening – conditions included
	Hearing screening
	Vision screening
	Other screening procedures
Recommended childhood immunisations	
	Immunisation schedule
	Immunisations provided as part of CHS reviews?
Recommended Child Health Surveillance	
	Main provider
	Main location of provision
	Population served (e.g. children on practice list, residents in catchment area)
	Home visiting undertaken by main CHS provider?
	Integration with other relevant services (antenatal care, primary care, specialist paediatric care, non-health services such as parenting support, early education)
	Eligibility criteria for accessing CHS/cost sharing requirements
	CHS review schedule (0-5 years inclusive)
	Physical examination within CHS reviews
	Growth monitoring within CHS reviews
	Developmental assessment within CHS reviews
	Health promotion topics covered within CHS reviews
Access to CHP services	
	Quantitative indicators on childhood immunisation coverage as shown in Table 24
Child health outcomes	
	Quantitative indicators on child health outcomes as shown in Table 25

The information required to populate the framework on was obtained using a combination of literature review, searching of specific websites, and consultation with experts in the countries studied. The literature and website reviews were originally conducted in 2008 and a working paper presenting the main findings was produced in August 2008. This was used as the basis for correspondence with experts in the countries studied. It was also presented to the Scottish Government's Hall 4 network group in September 2008 and was widely circulated within Scotland for comment (see below). The analysis was comprehensively updated in May 2012 for presentation in this thesis.

The literature review was structured as follows:

- Databases searched Medline and ASSIA
- Search terms used terms for CHP (such as well child care; child health promotion; child health services; preventive health care; or preventive health services combined with terms for pre-school children when required) combined with terms for the countries of interest (Scotland; England; Great Britain; United Kingdom; Australia; Canada; United States; or Sweden)
- Date range included 1990-present (initially July 2008 then May 2012)
- Limits English language only

Websites searched included those providing country specific information on the country's CHP and wider health system (e.g. government health departments, national public health bodies, national medical and paediatric colleges/associations) and those providing international comparative information on health systems and child health indicators (e.g. the World Health Organisation, World Bank, and Unicef). A complete list of the websites searched is provided in Table 16.

Table 16 Websites reviewed for international comparison of countries' health systems and Child Health Programmes

Country specific sites	
Scotland	
Scottish Government Health and Social Care Directorate	http://www.scotland.gov.uk/Topics/Health
England	
Department of Health	http://www.dh.gov.uk/en/index.htm
Royal College of Paediatrics and Child Health	http://www.rcpch.ac.uk/
Australia	
Australian Department of Health and Ageing	http://www.health.gov.au/
Australian Institute of Health and Welfare	http://www.aihw.gov.au/home/
Royal Australasian College of Physicians	http://www.racp.edu.au/
Royal Australian College of General Practitioners	http://www.racgp.org.au/
Victoria Department of Education and Early Child Development: Maternal and Child Health Service	http://www.education.vic.gov.au/ecsmanagement/matchildhealth/default.htm (for professionals)
	http://www.education.vic.gov.au/earlychildhood/mch/default.htm (for parents)
Royal Children's Hospital, Melbourne Centre for Community Child Health	http://www.rch.org.au/ccch/index.cfm
Canada	
Health Canada	http://www.hc-sc.gc.ca/index-eng.php
Public Health Agency of Canada	http://phac-aspc.gc.ca/
Canadian Institute for Health Information	http://www.cihi.ca/
Canadian Task Force on Preventive Health Care	http://www.canadiantaskforce.ca/
Canadian Institute for Clinical Evaluative Sciences	http://www.ices.on.ca/
College of Family Physicians of Canada	http://www.cfpc.ca/Home/
Ontario Ministry of Health and Long Term Care	http://www.health.gov.on.ca/en/
Ontario Healthy Babies Healthy Children programme	http://www.children.gov.on.ca/htdocs/English/topics/earlychildhood/health/index.aspx
Rourke Baby Record	http://www.rourkebabyrecord.ca/
Greig Health Record	http://www.cps.ca/English/statements/CP/PreventiveCare.htm
Nipissing District Developmental Screen	http://www.ndds.ca/canada

United States	
US Maternal and Child Health Bureau	http://mchb.hrsa.gov/
Medicaid	http://www.medicaid.gov/
American Academy of Pediatrics	http://www.aap.org/
Bright Futures	http://brightfutures.aap.org/
National Newborn Screening and Genetics Resource Center	http://genes-r-us.uthscsa.edu/index.htm
Commonwealth Fund	http://www.commonwealthfund.org/
Association of Maternal and Child Health Programs	http://www.amchp.org/ABOUTAMCHP/Pages/default.aspx
Insure Kids Now	http://www.insurekidsnow.gov/
Sweden	
Government Offices of Sweden	http://www.sweden.gov.se/
Swedish National Board of Health and Welfare	http://www.socialstyrelsen.se/en/
Swedish National Institute of Public Health	http://www.fhi.se/en/
Swedish Association of Local Authorities and Regions	http://english.skl.se/
Swedish Institute for Communicable Disease Control	http://www.smittskyddsinstitutet.se/in-english/
Child Health Care in Stockholm County	http://www.bhvsll.se/
Global sites	
WHO global health observatory	http://www.who.int/gho/en/
WHO Europe Health Evidence Network	http://www.euro.who.int/hen
World Bank	http://data.worldbank.org/
OECD	http://www.oecd.org/home/
Unicef Childinfo	http://www.childinfo.org/
Unicef Innocenti Research Centre	http://www.unicef-irc.org/
Unicef State of the World's Children 2012	http://www.unicef.org/sowc2012/

All websites accessed May 2012

It is recognised that national policies may not accurately reflect the care provided to children – indeed this is the case in Scotland – hence local experts from each of the countries studied have commented on the findings to enhance their validity. In-country experts on preventive child health care were identified through academic publications and relevant organisations such as medical colleges. The August 2008 working paper presenting the initial findings of the international comparison was emailed to at least two experts from each country at that time for comment. The experts were all asked to comment on the accuracy of the findings for their country. They were also asked specific questions as required depending on areas of uncertainty remaining after the literature and website reviews, for example had any relevant policy documents been omitted, how did the stated policy relate to actual provision of services, how did specialist CHP services relate to other services such as general primary care. Respondents were also asked to nominate other individuals from their country if they felt unable to respond.

One reminder was sent then, if no adequate response was obtained for any specific country, the process was repeated with further potential respondents until at least one detailed response had been obtained from each country. This was achieved by end November 2008. Experts in Sweden were re-contacted in May 2012 as it was not clear from website searches conducted at that time whether any changes to the Swedish CHP had been implemented since 2008.

In 2008, the working paper was also circulated to a range of colleagues in Scotland responsible for CHP policy development and/or service delivery. They were asked to comment on the accuracy of the Scottish data presented and to provide wider comments on the utility of the analysis. An overview of the consultation process is provided in Table 17.

Table 17 International comparison of Child Health Programmes: overview of consultation with experts from the countries studied

Country	Number of individuals contacted (number providing detailed response)	Role	Institution
Scotland	9 (3)	Community paediatrician	NHS Lothian
		Community paediatrician	NHS Greater Glasgow & Clyde
		Academic speech and language therapist	Queen Margaret University, Edinburgh
England	3 (2)	Academic paediatrician	University of Sheffield
		Academic paediatrician	Imperial College, London
Australia	2 (1)	Academic paediatrician	Centre for Community Child Health, Royal Children's Hospital, Melbourne
Canada	4 (1)	Paediatrician	Canadian Paediatric Society, Community Paediatrics committee
United States	6 (2)	Academic paediatrician	Commonwealth Fund, New York
		Paediatrician	Oakland Children's Hospital, California
Sweden	2 (1) + additional 3 (2) in 2012	Associate Professor	Karolinska Institute, Stockholm
		Associate Professor	National Board of Health and Welfare, Stockholm
		Newborn screening specialist	National Board of Health and Welfare, Stockholm

5.2. Results

All the countries studied are high income, industrialised nations (Table 18). Considerable variation exists in income inequality and child relative poverty rates between the countries. In general, Sweden has relatively equitable income distribution and low child poverty rates, with around 7% of its children living in households with an equivalised income of <50% of the contemporaneous national median. By contrast, the US has markedly inequitable income distribution and high child poverty rates at around 23%. The UK, Australia, and Canada have intermediate rates. Child poverty rates for Scotland and England specifically are not available in this internationally comparable format but in general the rates for the two countries are similar. A UK based report noted that in 2008/09-2010/11 combined 19% of children in both England and, separately, Scotland were living in households with <60% of the contemporaneous median UK household income before housing costs (Adams et al. 2012, p135).

5.2.1. *Overall national health systems*

Aspects of the health systems of the countries studied, for example total costs, the balance between public and private sector involvement, and the detail of funding and delivery mechanisms, vary considerably (Table 18). These differences can impact on important elements of overall health system functioning such as integration between different elements of the system, comprehensiveness of the services provided, population eligibility/coverage, equity, and efficiency (Black & Gruen 2005b, Department of Health Systems Financing 2005, Department of Health Systems Financing 2007, Frenk & Donabedian 1987). In addition, they provide very different contexts for the Child Health Programme to operate within.

5.2.1.1. Scotland and England

The UK wide National Health Service operates in both Scotland and England although the detail of how the service is delivered is increasingly different in the two

nations (Jervis 2008, Health Policy and Economic Research Unit 2007, Smith, Hellowell 2012, Greer 2005). The NHS is funded through general taxation and provides comprehensive services to all residents. Primary care is provided by General Practitioners (GPs), who are independent but contracted to the NHS, working in community based practices alongside Practice Nurses and other staff, often including Health Visitors. Individuals are expected to register with one GP practice. GPs' remuneration is complex: it reflects both capitation payments based on the number of registered patients and quality of care incentive payments. Secondary care is provided by NHS employed salaried specialists working in (mainly) public hospitals.

The Scottish Government has been responsible for national health policy in Scotland since 1999 (Scottish Government 2007b). Integrated planning, management, and delivery of all services for local Scottish populations is carried out by 14 NHS Boards that together cover the whole country (Robinson, Dixon 1999).

The UK Government is responsible for national health policy in England. In contrast to the continuing focus on integrated planning and service delivery by public providers in Scotland, in England there has been a long standing policy commitment to separating the commissioning and provision of services, and increasing the range, and hence choice, of providers e.g. to include private providers contracted to the NHS (Naylor, Goodwin 2010, Dixon et al. 2010). Until recently, ten Strategic Health Authorities have been responsible for overseeing the NHS at regional level. At local level, around 150 Primary Care Trusts have been responsible for commissioning services to meet the needs of the population and managing the provision of primary care services, with a mixture of Acute, Mental Health, and Foundation Trusts providing of secondary care services (Boyle 2011).

The health service in England is currently undergoing major structural reorganisation. The changes are laid out in the 2010 white paper *Equity and Excellence: Liberating the NHS* (Department of Health 2010) and the 2012 Health and Social Care Act (UK Parliament 2012, Department of Health 2012a). Under the

changes, responsibility for commissioning services for local populations will pass to newly constituted Clinical Commissioning Groups. Strategic Health Authorities and Primary Care Trusts will be abolished. Core public health functions will become the responsibility of local government rather than the NHS. The changes have been highly controversial and the target of severe professional criticism (Pollock, Price 2011, Ham 2012, Ingleby et al. 2012). The implications of the changes for the delivery of the Child Health Programme, and child health services more generally, are currently uncertain (Wolfe et al. 2011, Lewis, Lenehan 2012).

Individuals across the UK are free to purchase private health insurance and thus access private rather than NHS care although in practice this is more common in England than Scotland.

5.2.1.2. Australia

Australia has a complex health system comprising a universal social insurance scheme funded through general taxation (Medicare), widespread use of top up private health insurance, and a network of public health services (Australian Institute of Health and Welfare 2010, Healy, Sharman & Lokuge 2006, Financing and Analysis Branch 2000). Medicare provides all residents with access to core health care at no or minimal cost. It predominantly or fully reimburses patients for primary care provided by GPs and specialist care provided in public hospitals. It also partly reimburses patients for specialist care provided in private hospitals. GPs are generally self employed and reimbursed through Medicare on a fee per item basis. Around half the population has top up private health insurance to cover 'gap' costs (i.e. the discrepancy between what Medicare reimburses and what is charged) and/or services not covered by Medicare, and this is encouraged through tax breaks.

National government is responsible for overall health policy, administering the Medicare scheme, allocating funds to state governments, and some national public health services such as remote and rural health initiatives. State governments have a high degree of autonomy in determining the detail of health service provision in their area and are responsible for directly providing public hospitals and most public

health services. All states/territories provide some form of maternal and child health (M&CH) community service that provides the Australian equivalent of the Child Health Programme.

5.2.1.3. Canada

Like Australia, Canada's health system comprises a national social insurance scheme (also called Medicare), an active top up private health insurance market, and a network of public health services (Marchildon 2005, Health Canada 2005, Health Canada 2011, Naylor 1999, Romanow 2002). Medicare is funded through general taxation. The Canada Health Act sets out the scheme's core principles and standards then the 13 provinces and territories develop specific health insurance plans that set out the detail of what services are covered locally. All of the provincial plans are required to provide universal access for all residents to 'medically necessary' services including primary care and hospital based preventive, diagnostic, and treatment services. Other aspects of care such as prescription charges and community based dental care are not automatically covered although provinces may choose to include these in their plans. Individuals are free to purchase 'top up' private insurance to cover aspects of care not available through Medicare, and a large proportion of Canadians hold such insurance.

Primary care services are usually provided by self employed GPs working in community based individual or group practices on a fee for service basis.

Alternative models e.g. community health centres employing a range of health professionals including directly salaried primary care doctors and having a particular focus on preventive care are also common in some areas, particularly more remote areas (Albrecht 1998, Richard et al. 2005). In urban areas with academic centres, it is also quite common for general paediatricians to provide children's primary care from community based offices (Guttmann et al. 2006). Individuals are free to attend primary care services of their choice although most consistently use a 'usual provider'. Hospitals are usually independent not-for-profit organisations administered by community boards of trustees

As well as administering local health insurance plans, provincial governments are also responsible for providing locally determined public health programmes such as community based early child development programmes.

5.2.1.4. The United States

The US health system is fundamentally different to that operating in all the other countries studied in that there is no single national health system providing universal access to necessary care. Individuals are expected to purchase private health insurance, which is often provided as part of employment remuneration packages. The exact care available to individuals then depends on what is covered by their particular health insurance plan.

Private insurance is expensive, particularly for those at highest risk, and historically a large proportion of the population has been un- or under-insured (Mann, Rowland & Garfield 2003, Anon 2003). Sequential reforms have led to the provision of public insurance plans for particular population subgroups that find it difficult to access private insurance. These plans are funded through general taxation and administered by federal or state governments. Medicaid (covering poor children and adults) and Medicare (covering older adults and disabled people) were established in 1965. The State Children's Health Insurance Plan (SCHIP) for 'near-poor' children was introduced in 1997 as many children who were not eligible for Medicaid remained uninsured (Iglehart 2007, Committee on Child Health Financing 2007, Krisberg 2009).

Despite these safeguards, in 2000, an estimated 13% of all US children were still uninsured (Holahan, Dubay & Kenney 2003). In 2007 an estimated 28% of the US working age population had been uninsured at some point over the preceding year, with an additional 14% deemed to be under-insured, i.e. at risk of unaffordable out of pocket costs (Schoen et al. 2008). The most recent attempt to address the problem of inadequate and inequitable access to care, the Patient Protection and Affordable Care Act was passed into US law in 2010. The Act comprises various components such as substantially expanding Medicaid eligibility, extending authorisation for the SCHIP

through to 2019, imposing a requirement for individuals ineligible for public schemes to purchase private insurance balanced by mechanisms to ensure premiums are more affordable and penalties for non-purchase, and prohibiting providers from denying coverage to high risk/high cost individuals (including children with pre-existing medical conditions) (Connors, Gostin 2010). The Act has been highly controversial in the US although its political future appears somewhat more secure following the 2012 US presidential election (New York Times, Jaffe 2012).

There is a complex mix of different types of health care providers in the US, including self employed, charitable, not-for-profit, and for-profit organisations. Physicians are usually reimbursed on a fee for item basis for providing elements of care covered by individuals' insurance plans. Although access to care at the population level is highly fragmented in the US, care for individuals with adequate insurance coverage can be very well integrated. Some insurance schemes provide access to managed care providers that provided an integrated network of primary and secondary, preventive and therapeutic care (Fairfield et al. 1997b, Fairfield et al. 1997a).

5.2.1.5. Sweden

National government and its various agencies set overall health policy in Sweden but responsibility for delivery mainly rests with regional government (around 20 county councils) (Anell, Glenngard & Merkur 2012, Glenngard et al. 2005). County councils have a duty to ensure all residents have access to necessary health care on the basis of need. Funding for the health system mainly comes from general taxation. User co-charges do exist for all aspects of care including primary and secondary care consultations and medicines but children are exempt and caps are in place to ensure that charges are not excessive for any individual.

General primary care is mainly provided through health centres staffed by GPs and primary care nurses. Most health centres are publicly provided but some private providers operating under contract to the state also exist. Individuals are expected to register with a particular health centre. Primary care providers are usually

reimbursed through a mixture of capitation, fee for service and performance based payments. In addition to general (all age) primary care health centres, a network of specialist maternity and (separately) child healthcare centres is also provided. The maternity centres are staffed mainly by midwives and provide services such as antenatal care. Child healthcare centres (CHCs) play a lead role in providing the Swedish equivalent of the Child Health Programme as discussed in section 5.2.2.6 below.

Most hospitals are directly provided by county councils. As in Scotland, doctors working in secondary care in Sweden are usually directly salaried. Private health insurance and associated private health care provision is very uncommon in Sweden.

5.2.1.6. Summary

Scotland, England, Australia, Canada, and Sweden all operate core national health systems that are funded through general taxation and provide reasonably comprehensive care to their whole populations. The systems differ in certain aspects such as:

- The exact range of services covered
- The extent to which user co-charges apply at the point of use (although co-charges for Child Health Programme type services do not apply in any of the countries studied)
- Whether services are generally provided directly by the state or by private organisations operating under contract to the state
- How different staff groups are remunerated
- The degree of decentralisation (e.g. to state or local level) of service planning and delivery within countries
- The extent and exact role of co-existing private health insurance markets.

The US health system is fundamentally different to that provided in any of the other countries studied in that its core system is based on private purchase of health insurance, with the state only assuming responsibility for provision of safety net services for particular population sub groups. Despite the availability of the various

safety net schemes, considerable numbers of children and adults in the US remain without health insurance and consequently without predictable access to affordable care.

How provision of Child Health Programme services is embedded within these wider systems is discussed in the following section.

Table 18 General economic and health service indicators for included countries

Indicator	Units	Date	UK	Australia	Canada	US	Sweden
General economic indicators							
Total population	000's	2010	61,990	22,533	34,109	309,051	9,378
Gross domestic product per capita	US\$	2010	36,343	50,748	46,212	47,153	48,897
Children <18 years in relative poverty*	%	2009	12	11	13	23	7
Health service indicators							
Per capita total expenditure on health	US\$	2010	3,503	4,775	5,222	8,362	4,710
Total expenditure on health as % of GDP	%	2010	9.6	8.7	11.3	17.9	9.6
% of total expenditure on health that comes from government sources	%	2010	83.9	68.0	70.5	53.1	81.1
% of total expenditure on health that comes from private sources	%	2010	16.1	32.0	29.5	46.9	18.9
% of private expenditure on health that comes from prepaid insurance plans	%	2010	6.5	25.2	43.3	67.8	1.2
% of private expenditure on health that comes from out of pocket expenditure	%	2010	62.0	64.1	49.7	23.1	90.1

* relative poverty defined as equivalised household income <50% of the national median in the same year
Data from WHO global health observatory, World Bank, and Unicef report on child poverty (Adamson 2012)

5.2.2. *Child Health Programme provision*

The key sources of information on the CHP provided in each included country are shown in Table 19. Each of the countries studied offers Child Health Programme-type services to all pre-school children. Each country offers the core elements of the Scottish CHP, namely screening procedures, immunisations, and Child Health Surveillance incorporating surveillance of children's health, growth and development and provision of health promotion and parenting advice. The detail of the services provided varies considerably between countries as outlined in Table 20 to Table 23 and discussed below.

5.2.2.1. Scotland

The Scottish CHP has been described in detail in Chapter 4. To summarise, in Scotland CHS provision is lead by specialist nurses (Health Visitors). HVs are usually based in GP practices and serve all children registered with the practice, although alternative models such as groups of HVs working in community clinics and serving all children living in the local area exist in places. HVs see children in the practice/clinic or in their home: home visiting is a long established cornerstone of Health Visiting practice. In general, HVs work closely with GPs. Whilst HVs have lead responsibility for delivery of CHS reviews, GPs often contribute to at least some of the reviews, for example by conducting physical examinations.

The number of CHS reviews offered to pre-school children in Scotland is relatively low. Current policy recommends seven reviews between birth and school entry. In practice, as discussed in Chapter 4, four of these 'reviews' are solely focussed on provision of immunisations, and are usually provided by Practice Nurses rather than HVs. In addition, the review provided at around 2 years of age is still provided selectively rather than universally in many areas, although universal provision should be in place across the country from April 2013. Therefore, although seven reviews are recommended, only two (increasing to three from 2013) universal holistic child health reviews are actually provided.

Scotland, and indeed all the countries studied, offers all babies a full physical examination shortly after birth. This is usually provided by midwives or paediatricians on postnatal wards hence is different from later CHS reviews and has not been included in Table 21.

In general, Scottish policy on the CHS reviews places relatively little emphasis on ‘medical’ procedures such as physical examination and growth measurement. Rather, the policy seeks to curtail repetitious provision of such assessment in the absence of evidence of benefit. Provision of health promotion advice and family support is a major focus of the CHS reviews. The health promotion topics that are universally addressed with all families are noted in Chapter 4, Table 12.

As noted above, immunisations are usually provided separately to CHS reviews and given by Practice Nurses (treatment room nurses working alongside GPs in general practices). The childhood immunisations currently provided in Scotland are shown in Table 22.

All babies are offered newborn bloodspot screening for the five genetic/metabolic conditions listed in Table 23 in the first week of life. Bloodspot screening is provided by postnatal services, with samples usually taken by midwives. Universal neonatal hearing screening is also provided through postnatal services, usually before babies are discharged home from hospital after delivery. No further hearing screening is then provided until children enter school. Orthoptist led vision screening for acuity, strabismus, and amblyopia is provided in children’s pre-school year. This is usually provided in nurseries and hence is dissociated from provision of CHS reviews. No other screening procedures are provided to pre-school children in Scotland.

5.2.2.2. England

Other parts of the UK have shown different policy responses to HFAC4. In England, post HFAC4 policy on the Child Health Programme was first set out in the National Service Framework for Children, Young People, and Maternity Services

(Department of Health 2004). This was superseded by a specific policy on the CHP (renamed the Healthy Child Programme) published in 2009 (Department of Health 2009b, Department of Health 2009a, Department of Health 2009c, Blair 2010).

There are many similarities between Scottish CHP policy and the English Healthy Child Programme guidance but equally some key differences. As noted in section 5.2.1.1, the English CHP operates in a different health policy environment focused on commissioning and NHS reform. In England, as in Scotland, Health Visitors have lead responsibility for delivery of CHS. There is a particular policy focus on Health Visiting as an independent profession in England currently, and a commitment to significantly increasing HV numbers (Department of Health 2007, Department of Health 2011c, Department of Health 2012b). Some HVs in England still work from GP practices but many now work from Sure Start children's centres. Children's centres are Local Authority run and provide a range of family support services including HV led CHP services alongside parenting support and early learning and childcare services led by early years, education, and social work staff (Department for Education 2010b).

Unsurprisingly, given the common basis of the two countries' policies in the Health for All Children guidance, the overall number of CHS reviews for pre-school children recommended in England (seven) is the same as that recommended in Scotland. As in Scotland, the reviews recommended at 3 and 4 months and 3 years are predominantly focused on immunisation and hence may function as 'single issue' contacts rather than genuine holistic CHS reviews. Unlike in Scotland, however, the reviews recommended at 12 months and 2 years have consistently been promoted as universal, holistic CHS reviews. England therefore currently offers four universal, holistic child health reviews over the pre-school period compared to the two (increasing to three from April 2013) that are provided in Scotland.

As in Scotland, English policy recognises assessing children's need for additional support to attain their health and development potential as an important component of CHS reviews, however formalising the outcome of the needs assessment process

by assigning categories such as the Health Plan Indicator is not recommended in England. English policy takes the approach of suggesting a 'menu' of additional services that may be offered to families with particular needs, such as parenting programmes with an established evidence base.

The childhood immunisation schedule in England is identical to that in Scotland, reflecting the UK wide remit of the Joint Committee on Vaccination and Immunisation (<http://www.dh.gov.uk/health/about-us/public-bodies/advisory-bodies/jcvi/>). As in Scotland, childhood immunisations in England are usually provided by Practice Nurses in primary care settings. Immunisations are not usually provided as part of wider CHS reviews. Childhood screening procedures offered in England are also the same as those provided in Scotland, except that vision screening tends to be provided to children during their first year of school rather than their pre-school year as in Scotland. Again, this similarity of approach reflects the UK wide remit of the National Screening Committee (<http://www.screening.nhs.uk/>).

5.2.2.3. Australia

The Royal Australian College of General Practitioners publishes guidance on preventive care that should be offered across the lifecourse, including recommendations on newborn bloodspot and hearing screening and Child Health Surveillance reviews (Harris et al. 2009, Litt 2006). This preventive activity is not primarily provided by GPs, however, although GPs do provide the majority of childhood immunisations as discussed below.

As previously noted, state governments in Australia are responsible for specifying and providing a range of public health services. All states/territories provide some form of maternal and child health (M&CH) community service that provides the Australian equivalent of the Child Health Programme. The M&CH service provided in Victoria is particularly well described hence is the one discussed here (Department of Education and Early Childhood Development 2011a).

The Victoria M&CH service provides support to all children from birth to six years. Specialist maternal and child health nurses, with a variety of qualifications including general nursing, midwifery, and child and family health, provide the service from a network of community M&CH centres. The service provides a core programme of Child Health Surveillance to all children and additional support to those that need it. The core CHS programme is built around ten key 'ages and stages' universal reviews that are offered between birth and five years of age (with the last actually provided when the child turns three and a half). A balance of 'medical' assessment, such as growth measurement and structured developmental surveillance, and broader health promotion/parenting support is provided. The health promotion topics covered within the ages and stages reviews are very similar to those covered in the Scottish CHP with the addition of sun safety.

Additional support provided through M&CH services includes a telephone helpline service and facilitation of nurse and/or parent led support groups. The M&CH service also offers an 'enhanced service' to families with children under two years that have specific risk factors for poor child outcomes. This comprises a specified number of hours of additional contact/support time. Victoria also offers a statewide network of parenting support of varying intensity e.g. from a helpline to intensive family intervention services based on the Triple P parenting programme (<http://www.triplep.net/>).

National guidance on childhood immunisations is provided by the National Health and Medical Research Council (NHMRC). State governments are then responsible for determining the exact schedule provided in their area. All immunisations recommended by the NHMRC are funded centrally through the Immunise Australia Programme hence in practice these core vaccines are provided in most if not all states. The immunisations offered in Victoria are shown in Table 22. Some differences to the Scottish schedule can be seen, in particular BCG is not used in Victoria whereas varicella, rotavirus, and, for some children, Hepatitis A vaccinations are provided.

In Australia, childhood immunisations are usually provided in GP practices but nurse-led provision from M&CH centres is the norm in some areas (Australian Institute of Health and Welfare 2010). In areas where immunisations are provided by GPs, the immunisation contacts noted in Table 22 are in addition to the 10 M&CH ages and stages contacts offered to all children, resulting in a much higher overall number of universal preventive care contacts for Australian compared to Scottish children. A prospective study of around 170 relatively affluent families living in Melbourne with first babies born in 1996 showed that families had on average 14 attendances at M&CH services and 11 GP visits for their baby over his/her first year of life (Goldfeld, Wright & Oberklaid 2003). All parents are given a personal child health record which records all preventive activity (e.g. M&CH developmental assessments and GP immunisation contacts) which in theory facilitates communication between M&CH services and primary care but in practice, poor integration between these services has been noted (Mbwili-Muleya, Gunn & Jenkins 2000).

The Human Genetics Society of Australasia produces national guidance on tests that should be included within newborn bloodspot screening but again state governments retain the authority to determine the detail of the service provided to their residents hence what is offered varies between states. Screening offered in Victoria is shown in Table 23. Screening for sickle cell disease is not offered in Victoria (although this is included in most states) but 20 other genetic/metabolic conditions are screened for that are not included in the Scottish programme. Victoria offers universal neonatal hearing screening but no hearing screening for older children. Pre-school vision screening is provided and this is integrated into the M&CH contact offered when children attain 3.5 years.

5.2.2.4. Canada

Like Australia's, Canada's health system is complex with the detail of many elements determined at province rather than national level. There has been a long standing interest in early child development in Ontario (McCain, Mustard 1999) and

services in that province are relatively well described hence Ontario has been included in this comparison.

Across Canada, core Child Health Surveillance is provided by primary care doctors, usually GPs but sometimes primary care paediatricians in urban areas. Most parents use one 'usual provider' for all their child's primary care contacts, both CHS and therapeutic. Professional guidance on the content of CHS is provided in the Rourke Baby Record (RBR). The RBR was first published in 1985 and has been updated a number of times (Rourke, Rourke 1985, Rourke et al. 2006, Rourke et al. 2010). The record is essentially a series of resources prompting the provision and recording of certain elements of care (e.g. assessment of specified developmental milestones and provision of age appropriate health promotion advice) at recommended CHS reviews and pointing providers to supporting evidence. Provincial health insurance plans specify the CHS reviews that will be reimbursed in their area. All plans reflect the review schedule specified in the RBR and this provides a strong incentive for doctors to provide care in line with the recommendations. The Ontario Health Insurance Plan funds CHS in line with the national RBR but also funds extended developmental assessment/screening within the 18 month review hence an Ontario specific version of the Rourke record is available as well as the national one (Rourke, Leduc & Rourke 2011). Doctors are not obliged to use the RBR when providing CHS but the record is endorsed by the College of Family Physicians of Canada and the Canadian Paediatric Society and in practice the majority of doctors do use it as part of their normal practice (Rourke et al. 2009).

The Rourke baby record recommends a total of nine universal and three selective CHS reviews between birth and five years of age. Each review involves detailed physical examination, growth monitoring, developmental surveillance, and health promotion advice. As noted, Ontario specifically offers additional developmental screening using the Nipissing assessment tools at the 18 month review. Reviews are provided within practices: physicians do not provide home visiting. The health promotion topics covered in the Rourke record are similar to those covered in Scottish policy with the addition of sun and firearm safety. Primary care nurses may

complement the CHS provided by GPs, particularly for families attending community health centres rather than more traditional doctor-only practices, by facilitating group sessions for parents focusing on postnatal support, injury prevention, or other relevant topics (Richard et al. 2005, Richard et al. 2003).

In addition to funding GP led Child Health Surveillance, the Ontario provincial government also provides a universal nurse-led family support programme called Healthy Babies Healthy Children (HBHC) (Healthy Babies Healthy Children Program 2001, Healthy Babies Healthy Children Program 2003). Under this programme, public health nurses working from community based public health units offer all parents a home visit within 48 hours of returning home with a new baby. This visit comprises holistic child/family needs assessment. Families found to be at increased risk of poor child outcomes are then offered intensive blended public health nurse and paraprofessional home visiting for children aged up to two years and referral to other community facilities such as breastfeeding support, parenting programmes, and enhanced child care and early education services for children aged up to six years. Families with older children thought to be in need of additional support such as home visiting can be referred into the public health nursing service at any point by doctors providing CHS. The two services (GP led CHS and nurse-led Healthy Babies Healthy Children) are therefore complementary and together provide a service similar to Scottish Child Health Surveillance, although the degree to which the two services work together in practice is not clear.

The National Advisory Committee on Immunisation provides a recommended childhood immunisation schedule although again provinces determine the specific schedule delivered in their area. The Ontario schedule is shown in Table 22. It can be seen that the schedule has many similarities to that offered in Scotland, but Ontario also provides universal influenza, varicella, rotavirus, and Hepatitis B vaccinations. Childhood vaccinations are provided either in primary care during CHS reviews or at separate clinics offered in public health units. How complete uptake for individual children, and hence good overall population coverage, is

ensured is not clear and Canada's reported immunisation coverage is notably poor (see Table 24 below).

Provinces are responsible for determining their own newborn bloodspot screening schedule. Ontario screens for the five conditions included in the Scottish screen plus an additional 20 conditions. The Ontario provincial government also provides universal neonatal hearing screening as a stand alone service. Surveillance of hearing skills is then recommended at each CHS review, with no further formal hearing screening provided to older children. Vision screening is also incorporated within CHS reviews, with repeated assessment of eye movement and visual acuity recommended. The Rourke record recommends selective testing of infants for iron deficiency anaemia and elevated blood lead levels and routine blood pressure screening for all children from the age of two years.

5.2.2.5. United States

Current US national guidance on preventive child health care is provided in the Bright Futures guidelines. The Bright Futures programme was jointly established by the Bureau of Maternal and Child Health and the Medicaid Administration and is supported by the American Academy of Pediatrics (AAP). The first Bright Futures guidelines were published in 1994 (Palfrey 2008), with updates issued in 2000 and 2008 (Hagan, Shaw & Duncan 2008). The guidelines are published by the AAP and the Academy also publishes related summary guidance (American Academy of Pediatrics 2007, American Academy of Pediatrics 2011).

In the US, primary care paediatricians are responsible for delivery of CHS reviews to children registered with their practice and covered by appropriate insurance. The exact schedule of preventive care that is covered can vary between different insurance providers and plans but in practice most follow the Bright Futures recommendations. Plans provided under the auspices of Medicaid and the State Children's Health Insurance Plan have been required to include preventive care cover in line with Bright Futures for some time, and the Patient Protection and Affordable Care Act has more recently placed a requirement on all plans provided through

health insurance exchanges to include access to approved preventive care (The Commonwealth Fund 2005, Committee on Child Health Financing 2012).

Bright Futures recommends a total of 14 universal Child Health Surveillance reviews between birth and age five years. Reviews are always provided in doctors' offices. Home visiting is not provided as part of core CHS but nurse-led home visiting programmes are available in some areas for doctors to refer families to (Council on Community Pediatrics 2009). Each CHS review includes detailed physical examination and growth monitoring. Structured developmental surveillance is recommended at every review, supplemented by formal screening using a validated questionnaire at the 9, 18, and 24 or 30 month reviews. Like in Canada, the core health promotion topics covered are similar to those included in Scotland, with the addition of sun and firearm safety.

The Advisory Committee on Immunization Practices provides national recommendations on childhood immunisations and these are endorsed by the American Academy of Pediatrics. Table 22 shows that, in addition to vaccines provided in Scotland, the US also recommends universal Hepatitis B, influenza, varicella, rotavirus, and Hepatitis A vaccination. Immunisation is provided within CHS reviews.

The American College of Medical Genetics and Genomics (ACMG) provides national recommendations on newborn bloodspot screening then states determine what is actually provided in their area. The ACMG recommendations are followed in many, but not all, states and several states continue to offer additional tests not included in the College list with associated problems of increased false positive rates (Newborn Screening Authoring Committee 2008). Table 23 shows that Washington state screens for the five conditions screened for in Scotland plus 24 other core conditions, with a further 13 conditions likely to be picked up as an incidental finding (Watson et al. 2006).

Bright Futures, the American Academy of Pediatrics and the US Preventive Services Taskforce together provide a range of other guidance on childhood screening procedures (See Table 23). Universal neonatal hearing screening is recommended although a few states persist in providing selective screening for high risk infants only. Provision of a number of screening procedures within the universal CHS reviews is recommended, in particular hearing screening for older children, repeated screening of eye movement and visual acuity, universal haemoglobin, blood pressure, and TB risk screening, and selective blood lead and blood lipids screening.

5.2.2.6. Sweden

The National Board of Health and Welfare is responsible for producing national guidance on the Swedish Child Health Programme. The most recent guidance was produced in 1991 (National Board of Health and Welfare 1991) and is currently undergoing revision. Updated guidance is due to be published in autumn 2013 (Margareta Bondestam, personal communication). A description of the current Swedish Child Health Programme is available in a number of other publications (Hagelin, Magnusson & Sundelin 2007, Blennow 2011, Edvardsson et al. 2011, Wickberg 2000, Kornfalt 2000, Bremberg 2000a, Baggens 2001, Baggens 2004, Nyqvist, Kylberg 2000, Bremberg 2000b, Hallberg et al. 2005). County councils are responsible for determining the exact schedule of Child Health Surveillance in their area. The schedule provided in Stockholm region is described in regular reports (Blennow 2010). In practice, despite this local autonomy, there is relatively little variation in the preventive care available to pre-school children across Sweden – most areas closely follow the national guidance.

In Sweden, Child Health Surveillance is provided from child healthcare centres (CHCs) that serve all children living in the local area. Families are encouraged to register their child with one CHC and registration rates are near-universal (Blennow 2010). CHS provision is led by specialist district nurses. GPs or paediatricians support the nurses and usually contribute to between three and five of the CHS reviews offered to pre-school children by providing physical and developmental examinations. Some CHCs provide general therapeutic primary care to children in

addition to preventive services however parents can choose to access therapeutic care through the general all age primary care health centres instead. In practice, CHCs and primary care health centres are often co-located, particularly in more rural areas, with the same GPs working across both settings, hence there is a high degree of integration between preventive and primary therapeutic health care for children.

Current guidance recommends a total of 18 universal child health reviews between birth and five years. The first review is a home visit with other reviews usually being provided in the CHC although more extensive home visiting can be provided if required. Most, if not all, contacts involve the district nurse. All contacts include consideration of children's health, growth, development and wider family well-being. Specific contacts (2, 6, 10, and sometimes 18 months and 5 years) also involve a physician offering additional physical and developmental examination. At the three year contact, the nurse focuses on detection of language problems and at the four year contact on the detection of problems with cognitive development such as mild learning disability. No specific developmental assessment tools are currently recommended. The core health promotion topics covered within the child health reviews are very similar to those included in Scotland. The CHCs also provide nurse facilitated group contacts that parents are free to attend in addition to their individual child health reviews. These focus on health promotion, parenting, and social support. It is estimated that most children have a total of 14-20 visits (individual and group contacts) to the CHC over the course of their first year alone (Blennow 2011).

The Swedish Institute for Communicable Disease Control provides national recommendations on childhood immunisations (see Table 22) that are followed across the country. The Swedish schedule is slightly less extensive than that provided in Scotland: Meningococcal C and selective influenza vaccination are not recommended. Immunisations are provided by district nurses during the child health reviews. The National Board of Health and Welfare provides national recommendations on newborn bloodspot screening. Screening is then centrally funded and all county councils are required to provide the same service. Sweden screens for a total of 24 conditions. Cystic fibrosis (CF) and haemoglobinopathy

screening is not provided in Sweden although there has been pressure to introduce CF screening (Schaedel et al. 1999). Universal neonatal hearing screening is provided nationwide through postnatal services. Hearing and vision screening for pre-school children (around four years of age) is provided by audiologists and orthoptists working alongside the district nurses in CHCs. In general, Swedish policy places a strong emphasis on positive mental health and children's social and emotional development. Reflecting this, some areas routinely screen mothers for postnatal depression during child health reviews using the Edinburgh Postnatal Depression Scale. No other formal screening procedures are offered to children through the Swedish CHP.

5.2.2.7. Summary

All the countries studied strive to provide Child Health Programme type services to their pre-school populations. The core elements of Child Health Surveillance, immunisation, and childhood screening procedures are provided in each country. Despite this superficial uniformity, the detail of how the services are provided and exactly what is included varies considerably between countries.

Regarding Child Health Surveillance provision, variation is seen in whether CHS is delivered by children's general primary health care providers or through a separate, parallel system; whether provision is by doctors, nurses, or a combination; and whether home visiting is viewed as part of core CHS or as a separate service that families can be referred into. It is difficult to be sure exactly what to 'count' as a CHS review in order to provide a fair comparison between countries (for example should immunisation only contacts in Scotland be 'in' or 'out'?) but it is clear that the number of proactive reviews offered to children varies considerably. Scotland and England offer the fewest reviews whereas Sweden and the US offer the most. The relative emphasis placed on the more 'medical' aspects of child health reviews (particularly physical examination) compared to the more health promotion/family support aspects also varies. Not surprisingly, when CHS reviews are provided by doctors, the medical aspects tend to receive more emphasis. There is a very high degree of consistency in the core health promotion topics covered within CHS

reviews. All the countries studied include the same core topics as Scotland. Additional topics covered in particular countries reflect local priorities, e.g. sun safety in Australia and firearm safety in North America.

The childhood immunisation schedules provided in each of the countries studied show both consistency and variation. Core vaccinations that have been available for decades, specifically Diphtheria, Pertussis, tetanus, polio, measles, mumps, and rubella, are used in all countries. Some newer vaccines, specifically *Haemophilus influenzae* B, *Pneumococcus*, and (for older children) Human Papilloma Virus, are also used in all countries studied. The use of other vaccines, specifically *Meningococcus* C, BCG, Hepatitis B, influenza, varicella, rotavirus, and Hepatitis A, varies between the different countries. Sweden is the only country providing a less extensive vaccination schedule than Scotland and England. Some countries, particular the US, offer considerably more childhood vaccinations than the UK. The countries studied also differ in whether routine childhood vaccinations are given as part of CHS reviews or during separate contacts, often by a different staff group. This in turn influences the total number of contacts that parents are asked to attend, and the extent to which immunisation contacts can operate as opportunities for general health promotion/family support rather than just delivery of vaccinations.

Screening procedures offered to pre-school children also show similarity and points of difference between countries. All countries offer newborn babies a comprehensive physical examination, usually provided through postnatal services, to detect key congenital anomalies. Similarly, all countries recommend universal neonatal hearing screening (although not all states in the US deliver this) and universal newborn blood spot screening. The conditions covered by bloodspot screening are highly variable between countries (and even within some countries). The longest-established screens for congenital hypothyroidism and phenylketonuria are offered in all areas. Of the other conditions screened for in Scotland, cystic fibrosis and haemoglobinopathy screening is common elsewhere but is not offered in Sweden (Schaedel et al. 1999). Medium chain acyl-CoA dehydrogenase deficiency is screened for in all other countries. All non-UK countries also screen for a wide

range of other conditions commonly including congenital adrenal hyperplasia, galactosaemia, and various amino, fatty, and organic acids disorders.

Screening procedures provided to children after the neonatal period also show some variation between countries. Provision of hearing screening for pre-school children is variable, with Victoria, Australia not offering this and Ontario, Canada just offering surveillance of children's hearing skills within the context of CHS reviews rather than formal audiometry. Pre-school vision screening is generally offered but again the detail is variable. Sweden is the only other country studied that provides orthoptist-led screening, other countries generally offer surveillance of visual skills and some assessment of eye movements and visual acuity within the context of CHS reviews. The two countries that provide physician led CHS also offer additional blood test (blood lead, haemoglobin, and in the US only blood lipids) and physical examination (blood pressure) based screening to some or all children.

Coverage of the various aspects of the CHP and child outcomes that at least in part reflect care delivered through the CHP for the different countries studied are considered in the next section.

Table 19 Sources of information on the recommended Child Health Programme in included countries

	Scotland	England	Australia (Victoria)	Canada (Ontario)	US	Sweden
National/regional guidance on CHP	Scottish Child Health Programme guidance: (Scottish Executive Health Department 2005b, Scottish Government 2011b, Scottish Government 2012b)	English Healthy Child Programme guidance: (Department of Health 2009b, Department of Health 2009c)	Victoria Maternal and Child Health Services guidelines: (Department of Education and Early Childhood Development 2011a)	Rourke baby record (Ontario version): (Rourke, Leduc & Rourke 2011) Ontario Healthy Babies Healthy Children programme: (Healthy Babies Healthy Children Program 2001, Healthy Babies Healthy Children Program 2003)	American Academy of Pediatrics and Bright Futures guidelines: (Hagan, Shaw & Duncan 2008, American Academy of Pediatrics 2007, American Academy of Pediatrics 2011)	National Board of Health and Welfare national CHP guidance (note this is currently being updated and an updated version is due in autumn 2013): (National Board of Health and Welfare 1991) The national programme is also described in (Hagelin, Magnusson & Sundelin 2007) and (Blennow 2011) The programme delivered in Stockholm region is described in (Blennow 2010)
Age group covered by guidance	Birth - school leaving	Pregnancy - school leaving	Birth - six years	Birth - five years for Rourke baby record (Separate Greig health record covers children 6-17 years: (Greig et al. 2010)) Pregnancy to six years for HBHC programme	Prenatal to 21 years	Birth to (pre) school entry (around 6 years)

	Scotland	England	Australia (Victoria)	Canada (Ontario)	US	Sweden
Additional guidance on immunisation	http://www.immunisation.scotland.org.uk/	http://www.nhs.uk/Planners/vaccinations/Pages/Landing.aspx	http://www.immunise.health.gov.au/	http://www.phac-aspc.gc.ca/naci-ccni/ http://www.phac-aspc.gc.ca/im/ptimprog-progimpt/table-1-eng.php	http://www.cdc.gov/vaccines/recs/ACIP/ (Committee on Infectious Diseases 2012)	http://www.smittskyddsinstitutet.se/in-english/about-smi/the-swedish-vaccination-program/
Additional guidance on childhood screening programmes	http://www.screening.nhs.uk/scotland	http://www.screening.nhs.uk/england	https://www.hgsa.org.au/2011/08/newborn-blood-spot-screening/ http://www.vcgspathology.com.au/sections/NewbornScreening/?docid=aa3a4d81-d44b-42ff-8340-99360112c7a7	http://www.newbornscreening.on.ca/ http://www.children.gov.on.ca/htdocs/English/topics/earlychildhood/hearing/index.aspx http://www.ndds.ca	(Duncan, Duncan & Swanson 2008) http://genes-r-us.uthscsa.edu/ Various AAP and US Preventive Services Task Force policies on screening for hearing (Harlor, Bower 2009, Joint Committee on Infant Hearing 2007), vision (US Preventive Services Task Force 2011), and development (American Academy of Pediatrics 2006, American Academy of Pediatrics 2010, Johnson, Myers 2007)	

All websites accessed June 2012

Table 20 Organisation and delivery of Child Health Surveillance in included countries

	Scotland	England	Australia (Victoria)	Canada (Ontario)	US	Sweden
Main provider of CHS	Specialist nurses (Health Visitors)	Specialist nurses (Health Visitors)	Specialist maternal and child health (M&CH) nurses	Mainly GPs but also primary care paediatricians in some (urban) areas (Guttmann et al. 2006). Public health nurses responsible for parallel system of family support	Primary care paediatricians	District nurses supported by GPs or paediatricians
Location of provision	Usually GP practices but there is a move to provision from community based clinics in some areas (NHS Highland and Highland Council 2012)	Varies between GP practices and community based Sure Start children's centres	Community M&CH centres	Primary care doctors work in single or group practices or large community health clinics that include a range of staff groups such as nurses. Public health nurses work out of public health units	Community based physician 'offices'	Child healthcare centres (CHCs)
Population served	HVs usually have individual case loads of children registered with the GP practice but models involving corporate caseloads and responsibility for geographical patches rather than practice lists also exist	Individual or corporate case loads based on practice list or geographical area depending on location of provision	Geographically defined M&CH catchment area	Patients are free to choose the primary care provider of their choice for each episode of care but in practice most parents use one 'usual provider' for all their child's care. Public health units/nurses are responsible for all children in their geographical area	Children registered with that provider and covered with an appropriate health insurance plan	Population registered with the CHC

	Scotland	England	Australia (Victoria)	Canada (Ontario)	US	Sweden
Integration with primary health care for children	Good, particularly when HVs are practice attached	Varies according to location of provision noted above	Although integration is encouraged, in practice M&CH and GP services can operate rather separately (Mbwili-Muleya, Gunn & Jenkins 2000).	Provision of CHS is an integral part of general primary care for young children	Provision of CHS is an integral part of general primary care for young children	General primary care for children can either be provided through the CHCs (in which case integration is high) or GP led general primary care health centres that provide care to all ages
Eligibility	All resident population eligible	All resident population eligible	All resident population eligible	All resident population eligible	Dependent on appropriate insurance coverage	All resident population eligible
Variability in provision across country	Minimal	Some dependent on local commissioning decisions	Considerable as state governments have the authority to determine the detail of the CHP provided in their area	Considerable as provincial governments have the authority to determine the detail of the CHP provided in their area	Variability between health plans is possible although many plans do follow the BF/AAP guidelines. State governments also have autonomy to determine some local services	Minimal

Table 21 Child Health Surveillance contacts provided to pre-school children in included countries

	Scotland	England	Australia (Victoria)	Canada (Ontario)	US	Sweden
1 week			✓	✓	✓	✓
2 weeks	✓	✓	✓	✓ selective		✓
3 weeks						✓
4 weeks			✓	✓	✓	✓
6 weeks						✓
2 months	✓	✓	✓	✓	✓	✓
3 months	✓ immunisation only	✓ immunisation only				✓
4 months	✓ immunisation only	✓ immunisation only	✓	✓	✓	✓
5 months						✓
6 months				✓	✓	✓
7 months						
8 months			✓			
9 months				✓ selective	✓	✓
10 months						✓
11 months						
12 months	✓ immunisation only	✓	✓	✓	✓	✓
15 months				✓ selective	✓	✓
18 months			✓	✓	✓	✓
2 years	✓ currently selective*	✓	✓	✓	✓	
2.5 years					✓	
3 years	✓ immunisation only	✓ immunisation only	✓		✓	✓
4 years				✓	✓	✓
5 years					✓	✓
Total number of holistic, universal CHS reviews birth to 5 years	2/3	4	10	9	14	18

* A holistic CHS review will be universally offered at this age from April 2013 onwards

Note that all countries studied also provide a universal review including full physical examination to neonates. This is usually provided through maternity services on post-natal wards rather than through Child Health Surveillance services so has not been included here.

	Scotland	England	Australia (Victoria)	Canada (Ontario)	US	Sweden
Home visiting offered as an integral part of CHS?	Yes. First review usually provided in the home. Further universal reviews and additional support can also be provided in the home as required	Yes. First review usually provided in the home. Further universal reviews and additional support can also be provided in the home as required	Yes. First review usually provided in the home. Further reviews usually provided in M&CH centres although home visits can be provided as part of additional care	No. Home visits not done by doctors providing CHS. Home visiting is part of the public health nursing service	No. Home visits not done by doctors providing CHS. Separate home visiting programmes are available in some areas	Yes. First review usually provided in the home. Further reviews usually provided in the CHC although home visits may be offered if required
Approach to physical examinations within CHS reviews	Full examination at 6-8 week review, otherwise as required	Full examination at 6-8 week review, otherwise as required	Physical examinations provided as required	Physical examination at every contact	Physical examination at every contact	Physical examinations provided by physicians at selected contacts - usually 3-5 per child between birth and 5 years
Approach to growth monitoring within CHS reviews	Weight measurement recommended at every contact but in practice not usually offered at immunisation only contacts. Height measurement at 6-8 week review, otherwise as required	Relatively little emphasis on growth monitoring - to be done if required/in response to concerns	Weight and length/height measurement at every contact	Weight and length/height measurement at every contact	Weight and length/height measurement at every contact along with calculation of weight for length (<24 months) or BMI (≥24 months)	Weight and length/height measurement at every contact

M&CH = maternal and child health centres
CHC = child healthcare centres

	Scotland	England	Australia (Victoria)	Canada (Ontario)	US	Sweden
Approach to developmental assessment within CHS reviews	Relatively little focus on developmental assessment in 2005 policy. Developmental screening actively discouraged. 24-30 month review guidance recommends developmental surveillance based on parental concerns/ developmental history/ structured observation supported by validated assessment tools/questionnaires as required (Scottish Government 2012b)	Developmental surveillance based on parental concerns/ developmental history/ structured observation supported by validated assessment tools as required at every holistic CHS review	Developmental surveillance based on parental concerns/ developmental history/ structured observation at every review. A version of the PEDS is included in the parent held child health record and used to support these discussions. The Brigrance system is used when more in depth developmental assessment is required (http://www.brigrance.net/br_sys.htm) (Cothier, McGill 2010)	Developmental surveillance based on milestone review and observation at every review. Rourke baby record lists milestones that should have been attained by each review to support this. Ontario has also made the Nipissing developmental screening materials available to all parents and relevant services to promote consistent assessment of ECD. Ontario funds an extended 18 month review including universal provision of the Nipissing developmental screen. The M-CHAT is recommended for selective use in response to concerns at 18-24 months.	Developmental surveillance based on parental concerns/ developmental history/ structured observation supported by validated assessment tools as required at every review. Universal developmental screening (all domains) using validated assessment tools at 9, 18, and 24 or 30 month contacts. Additional autism specific screening using the M-CHAT at the 18 and 24 month contacts	All contacts include consideration of children's development. Specific contacts focus on development in more detail, namely 2, 6, 10, 18 months and 3, 4, and 5 year contacts. The 3 year assessment focuses particularly on language development and the 4 year contact on cognitive development. Specific validated tools are not recommended.

ECD = early child development

PEDS = parents' evaluation of developmental status

M-CHAT = modified checklist for autism in toddlers

Table 22 Childhood immunisations provided in included countries

	Scotland	England	Australia (Victoria)	Canada (Ontario)	US	Sweden
Pre-school immunisations						
Diphtheria	✓	✓	✓	✓	✓	✓
Pertussis	✓	✓	✓	✓	✓	✓
Tetanus	✓	✓	✓	✓	✓	✓
Polio	✓	✓	✓	✓	✓	✓
Haemophilus influenzae B	✓	✓	✓	✓	✓	✓
Meningococcus C	✓	✓	✓	✓	Selective	
Pneumococcus	✓	✓	✓	✓	✓	✓
Measles	✓	✓	✓	✓	✓	✓
Mumps	✓	✓	✓	✓	✓	✓
Rubella	✓	✓	✓	✓	✓	✓
BCG	Selective	Selective		Selective	Highly selective	Selective
Hepatitis B	Selective	Selective	✓		✓	Selective
Influenza	Selective†	Selective†	Selective	✓	✓	
Varicella			✓	✓	✓	
Rotavirus	†	†	✓	✓	✓	
Hepatitis A			Selective		✓	
Additional school age/adolescent immunisations						
Human papilloma virus	✓	✓	✓	✓	✓	✓
Meningococcus C, A, Y, W135					✓	
Hepatitis B				✓		
Integration of immunisation and CHS review delivery						
Delivery of pre-school immunisations	Usually in primary care separately from generic CHS reviews	Usually in primary care separately from generic CHS reviews	Usually in primary care separately from M&CH service provision*	Either in primary care within the relevant CHS contacts or separately in regional public health offices	Usually by paediatricians within the relevant CHS contacts	Usually by nurses within the relevant CHS contacts

BCG = Bacille Calmette-Guérin, BCG is only used in the US very occasionally

† Universal rotavirus vaccination for infants and influenza vaccination for school aged children have recently been recommended in the UK but these are not yet implemented – see Appendix 3

* (Australian Institute of Health and Welfare 2010)

Table 23 Childhood screening programmes provided in included countries

	Scotland	England	Australia (Victoria)	Canada (Ontario)	US	Sweden
Newborn bloodspot screening						
Congenital hypothyroidism	✓	✓	✓	✓	✓	✓
Phenylketonuria	✓	✓	✓	✓	✓	✓
Cystic fibrosis	✓	✓	✓	✓	✓	
Sickle cell disease	✓	✓		✓	✓	
MCADD	✓	✓	✓	✓	✓	✓
Other conditions	None	None	State governments determine the programme provided in their area. CH, PKU and CF screening is offered across Australia. Victoria screens for a total of 24 conditions including various amino acid and fatty acid disorders. Galactosaemia and haemoglobinopathy screening is common elsewhere but not offered in Victoria	Provinces determine the programme provided in their area. Ontario screens for a total of 25 conditions including CAH, galactosaemia, and various amino acid and fatty acid disorders	States determine the programme provided in their area. Washington screens for a total of 29 core conditions including CAH, galactosaemia, and various organic, amino, and fatty acid disorders. Another 13 conditions are likely to be detected and reported as a by-product of the screening process	Newborn bloodspot screening is centrally funded and all county councils are required to provide the same service. Sweden screens for a total of 24 conditions, including CAH, galactosaemia, and various amino and fatty acid disorders. CF and haemoglobinopathies are not screened for in Sweden (Schaedel et al. 1999).

MCADD = medium chain acyl-CoA dehydrogenase deficiency

CH = congenital hypothyroidism

PKU = Phenylketonuria

CF = cystic fibrosis

CAH = congenital adrenal hyperplasia

	Scotland	England	Australia (Victoria)	Canada (Ontario)	US	Sweden
Hearing screening	Universal neonatal hearing screening. Modified audiometry screening at school entry	Universal neonatal hearing screening. Modified audiometry screening at school entry	Universal neonatal hearing screening	Universal neonatal hearing screening. Surveillance of hearing skills at every CHS contact	Universal neonatal hearing screening recommended by AAP. States determine the programme provided in their area – most provide universal screening but some still provide selective screening only. Surveillance of hearing skills at every CHS contact and audiometry screening at the 4 and 5 year visits also recommended.	Universal neonatal hearing screening. Audiometry screening at around 4 years at CHCs
Vision screening	Orthoptist led pre-school vision screening	Orthoptist led vision screening at school entry	Pre-school vision screening offered as part of the 3.5 year contact	Red reflex at every CHS contact. Corneal light reflex at every contact from 1 month. Cover/uncover test at every contact from 6 months. Visual acuity at every visit from 2 years	AAP/BF guidance recommends surveillance of vision skills, light reflexes and cover/uncover test at every CHS contact with additional vision screening at the 3, 4, and 5 year visit. The US PSTF recommends vision screening at least once between the age of 3 and 5	Orthoptist led pre-school vision screening is offered at around 4 years through the CHCs

AAP/BF = American Academy of Pediatrics/Bright Futures

PSTF = preventive services task force

CHC = child healthcare centre

	Scotland	England	Australia (Victoria)	Canada (Ontario)	US	Sweden
Other childhood screening programmes	None	None	None	Selective testing for iron deficiency anaemia at 6-12 months. Selective testing of blood lead level at 6-12 months. Blood pressure monitoring at every contact from age 2 onwards	Universal haemoglobin screening at 12 months, otherwise as indicated. Selective screening for lead levels from 6 months and for dyslipidaemia from 24 months. Universal blood pressure screening from 3 years (selective before then). As BCG is essentially not used in the US, screening for TB risk is also recommended from birth onwards	Some areas screen for maternal depression using the EPDS

BCG / TB = Bacille Calmette-Guérin / tuberculosis
 EPDS = Edinburgh postnatal depression scale

5.2.3. *Child Health Programme access and outcomes*

5.2.3.1. Access to CHP services

As previously noted, the overall impact of the preventive interventions offered through the CHP depends both on their effectiveness and on the population coverage attained. For most interventions, if effectiveness and uptake are comparable across population subgroups at different levels of risk, a straightforward linear relationship between increasing coverage and increasing impact on outcomes at population level could be expected. For some interventions, notably vaccinations, the relationship between coverage and outcomes may be more substantially more complex, for example due to herd immunity effects (Anderson, May 1985, Fine 1993).

No internationally comparable data on the coverage of recommended Child Health Surveillance reviews are published but some relevant information from most of the countries studied is available. Data on CHS review coverage in Scotland is presented in Chapter 6 of this thesis. Only data for the universal reviews managed through the CHSP-PS national information system are available. Coverage of the 10 day review is very high at around 99% with coverage of the 6-8 week review somewhat lower at around 95%. Coverage in general is lower in deprived compared to more affluent areas.

England has no national information system supporting provision of CHS and national data on review coverage are not currently available. Recent work has resulted in an agreed national data set to be returned centrally on completed 6-8 week reviews which should, in time, provide robust coverage data for this review (<http://www.ic.nhs.uk/services/maternity-and-childrens-data-set/children-and-young-peoples-health-services-cyphs-secondary-uses-data-set>). Attempts are currently (2012) being made to develop a comparable data set to be returned on completed two year reviews (Mitch Blair, personal communication).

Coverage of the 10 key ages and stages contacts provided through the Victoria Maternal & Child Health Service is presented in the service's annual report

(Department of Education and Early Childhood Development 2011b). Coverage is generally high but, as in Scotland prior to the change in CHS schedule introduced from 2005 (see Chapter 6), it declines somewhat for contacts offered at older ages e.g. 100% for the first visit, 82% for the 12 month review, and 63% for the three and a half year review in 2010/11.

There is no published routine information on coverage of recommended physician-provided CHS contacts in Ontario or Canada. One study has reported that there is a wide variation in the supply of primary care physicians across Ontario, and that supply tends to be lower in poorer and more rural areas (Guttmann et al. 2010). This study also showed that the adjusted odds of receiving none of the recommended CHS contacts increased as primary care physician supply decreased, suggesting that coverage is far from universal and that inequalities in coverage exist. No published information is available on the coverage of Healthy Baby Healthy Children services such as the initial universal public health nurse home visit.

In the US, there are no routine data available on the uptake of recommended child health reviews, but a number of relevant special studies, based mainly on analysis of either insurance payment or national survey data, have been reported. They have demonstrated that a substantial proportion of children receive no, or fewer than recommended, 'well child care' visits. Estimates from individual studies vary widely, but it is likely that only around half to two thirds of US pre-school children receive the full recommended programme of 'well child care' reviews (Chung et al. 2006). Factors identified as increasing the risk of inadequate review coverage include lack of insurance, lack of a usual healthcare provider, non-white ethnicity, not having English as a first language, and low parental education level (Yu et al. 2002, Ronsaville et al. 2000, Byrd et al. 1999, Van Berckelaer, Mitra & Pati 2011). Whilst lack of insurance is a key risk factor for non receipt of preventive care in the US, many children with private or public insurance still fail to receive recommended levels of preventive child health care (Kenney et al. 2011, Cassedy, Fairbrother & Newacheck 2008, Patterson, Gregg 2012). This situation is analogous to the less than complete coverage seen in countries that offer universal access to free

preventive care to all resident children such as Scotland, and emphasises that barriers to accessing preventive care are complex.

There is further information on the coverage of certain elements of care within US well child care reviews. Incomplete coverage of recommended screening procedures such as blood lead assays (Chung et al. 2006) and of advice on age appropriate health promotion topics has been noted (Norlin et al. 2011). There has been a particular focus on exploring the proportion of children receiving the developmental screening that is recommended at the 9, 18, and 24 or 30 month reviews. The minority of children receive formal screening incorporating use of a validated developmental questionnaire (Bethell et al. 2011, Earls, Shackelford Hay 2006, Coker, Shaikh & Chung 2012) although screening rates are increasing over time (Arunyanart et al. 2012).

Routine data on the uptake of specific child health contacts in Sweden is not available but in general parental engagement with the Child Health Programme and attendance at child healthcare centres is very high. The report on the Child Health Programme offered in Stockholm region in 2009 noted that 99.8% of eligible children were registered with a CHC (Blennow 2010). As previously noted, it has been estimated that most children have a total of 14-20 visits (individual and group contacts) to the CHC over the course of their first year alone (Blennow 2011).

In summary, coverage of recommended Child Health Surveillance reviews varies widely between the countries studied. Coverage is particularly high in Sweden. Lack of appropriate insurance precludes some US children from accessing recommended child health reviews. Even when children receive a review, coverage of specific recommended elements of care within the review, such as provision of advice on a particular health promotion topic or developmental screening, may not occur.

Internationally comparable information on vaccination uptake is routinely available from the World Health Organisation and relevant figures are shown in Table 24.

Figures are published for the more well-established vaccines that are provided in most countries across the world. Only figures for the UK as a whole are published by the WHO but vaccination coverage figures for the UK constituent countries are published by the Health Protection Agency. Coverage tends to be somewhat higher in Scotland than in England although the discrepancies are not large. In the quarter ending December 2011, 97.4% of children in Scotland reaching their first birthday had received three doses of the recently introduced 'five in one' combined diphtheria, tetanus, Pertussis, polio, and Hib vaccine compared to 94.7% in England. Similarly, 94.9% of children in Scotland attaining their second birthday had received one dose of combined measles, mumps, and rubella vaccine compared to 91.5% in England (Health Protection Agency 2012).

Overall the data show high coverage of the core vaccines in all the countries studied with the exception of Canada. Coverage of measles vaccine in Canada is high but coverage of the other primary vaccine courses is noticeably poor. In general, coverage of childhood vaccinations is higher than coverage of recommended child health reviews. This may reflect either the separate delivery mechanisms that exist for these elements of care, for example in Scotland, or prioritisation of 'well child care' visits that include immunisation, for example in the US system. Requirements for children to be fully immunised before admission to nursery or school is common in some countries, for example the US, and this also promotes high coverage rates.

No international data are available on the coverage of the various childhood screening programmes. In Scotland, uptake of newborn bloodspot screening (Scottish Newborn Screening Laboratory 2010) and newborn hearing screening (MacKinnon 2010) is near universal. No national data are reported on the uptake of pre-school vision or school entry hearing screening.

Table 24 Coverage of recommended childhood immunisations in included countries

Indicator	Units	Date	UK	Australia	Canada	US	Sweden
DPT x3 coverage by 12 months	%	2010	96	92	80	95	98
Measles x1 coverage by 24 months	%	2010	93	94	93	92	96
Hib x3 coverage by 12 months	%	2010	97	92	80	93	98

Data from WHO global health observatory <http://www.who.int/gho/en/>

DPT is Diphtheria, Pertussis and tetanus.

These vaccines are usually given together in one combined injection hence coverage for all three vaccines is presented as one figure.

Hib is Haemophilus influenzae type B.

Note that the number and timing of doses required to induce an adequate immune response varies between vaccines. For example, three doses of tetanus vaccine are required in infancy to provide initial immunity with further booster doses then required in the pre-school period, in secondary school, and at ten year intervals thereafter. Countries vary in the precise age at which some vaccines are given, for example in Scotland the initial three tetanus vaccines are given at 2, 3, and 4 months whereas in the US they are given at 2, 4, and 6 months. The WHO takes account of this variation when defining adequate coverage, for example adequate receipt of the primary course of tetanus vaccination is defined as receipt of three doses by the first birthday. This allows comparable figures to be provided for countries with different vaccination schedules.

5.2.3.2. Child health outcomes

Internationally comparable information on child health outcomes likely to be influenced, at least in part, by the preventive care delivered through the CHP is very limited but some relevant data are presented in Table 25. Again, internationally comparable figures are only available at all UK level but available data for constituent countries show that:

- Infant and child mortality is slightly lower in Scotland than England. Infant mortality in Scotland in 2010 was 3.7 per 1,000 live births and under five mortality was 4.4 per 1,000 live births (see <http://www.gro-scotland.gov.uk/statistics/theme/vital-events/general/ref-tables/2010/index.html>) Comparable figures for England and Wales were 4.3 and 4.9 per 1,000 live births (see <http://www.ons.gov.uk/ons/publications/reference-tables.html?edition=tcM%3A77-252939>).
- Breastfeeding rates are considerably lower in Scotland than England. The UK wide Infant Feeding Survey estimated in 2010 that 74% of babies born in Scotland received any breastfeeding after delivery compared to 83% in England (see <http://www.ic.nhs.uk/pubs/infantfeeding10>)

Comparison of the country specific information summarised above with that provided for the whole UK in Table 25 below shows that the WHO figures for infant mortality are marginally higher than those reported by national statistics authorities, from where the WHO figures should be derived. The reason for this minor discrepancy is not clear.

Overall, the available outcome data show substantial variation between the countries studied. In general the outcomes are exceptionally good in Sweden, with extremely low child mortality, very high breastfeeding, and reported high overall child well-being. Within the countries studied, child mortality is highest in the US and intermediate in the other countries. Breastfeeding is noticeably poor in the UK and overall child well-being is poor in both the UK and the US.

Table 25 Child health indicators relevant to the CHP in included countries

Indicator	Units	Date	UK	Australia	Canada	US	Sweden
Infant mortality rate	per 1,000 live births	2010	5	4	5	7	2
Under 5 mortality rate	per 1,000 live births	2010	5	5	6	8	3
Ever breastfed	%	2010	77	92	84.5	74.2	97.6
Exclusively breastfed at 4 months (3/6 months for US)	%	2010	7	46	38	(32/12)	60
Overall rank for child well-being	Rank out of 21 rich OECD countries (1 being highest well-being)	Variable - published 2010	21	Not included	12	20	2

Data from WHO global health observatory <http://www.who.int/gho/en/> and Unicef report card on child well-being in high income countries (Innocenti Research Centre 2007)
The overall child well-being ranks were based on composite measures of material, health and safety, educational, family and peer relationships, behaviours and risks, and young people's subjective well-being

5.3. Discussion

5.3.1. Summary

This chapter provides a comparative analysis of the Child Health Programme for pre-school children in a range of high income countries, namely Scotland; England; Australia; Canada; the US; and Sweden. The main findings can be summarised as follows:

- Despite considerable variation between countries in the overall health system model and the level of health spending, each country studied attempts to promote the health and development of its pre-school age children through the provision of a structured CHP that involves screening procedures, immunisations, and Child Health Surveillance reviews providing monitoring of children's health, growth, and development along with provision of health promotion advice and parenting support.
- Despite this superficial similarity, there are substantial differences between, and sometimes within, countries in the way the CHP is delivered and the amount of care that is offered.
- In some settings, notably North America, provision of CHS reviews is led by doctors responsible for children's general primary health care. Elsewhere, CHS provision is nurse led. Nurse-led provision can be closely aligned to primary care and delivered to registered children within GP practices (Scotland), entirely separate to provision of primary medical care and delivered from stand alone community clinics (Australia), or a more hybrid model (England and Sweden).
- The different models of CHS provision influence the degree of integration between CHS services and other services for young children. In general there is a trade off between vertical integration (i.e. with more specialised child health services) and horizontal integration (i.e. with early education and family support services).

- It can be difficult to specify exactly how many CHS reviews are provided to children in different countries but it is clear that Scotland offers relatively few reviews whereas Sweden and the US offer the highest number.
- Although all countries offer elements of more ‘medical’ assessment such as physical examinations and more ‘holistic’ activity such as health promotion advice and parenting support within their CHS reviews, in general doctor-led provision tends to be associated with a greater emphasis on ‘medical’ aspects.
- All countries include a focus on early child development within their CHS reviews, but approaches to assessing development vary. Scotland’s emphasis on developmental surveillance contrasts with the developmental screening approach recommended in the US.
- There is a high degree of agreement on the core health promotion topics addressed during CHS reviews in the different countries, namely immunisations; Sudden Infant Death Syndrome; breastfeeding, weaning and child dental health; safety and injuries; child development and parenting; and parental smoking. Other topics are included that reflect particular issues in different countries, for example advice on firearm safety in Canada and the US.
- There are a core suite of childhood vaccines that are offered in all the countries studied. Provision of some newer vaccines varies between countries. In general, the UK and Sweden offer relatively ‘light’ vaccine schedules whereas the US offers the most extensive programme.
- Whether immunisation is administered within the context of CHS reviews or as a stand alone procedure varies between countries. This can have a considerable impact on the overall number of preventive care contacts that parents are offered.
- Some childhood screening procedures are recommended in all countries studied, in particular the newborn physical examination, newborn blood spot screening, and newborn hearing screening.

- Although all areas offer newborn bloodspot screening, the range of conditions covered varies widely. The UK offers by far the most restricted programme.
- All countries (with the exception of Australia for hearing screening) offer some form of hearing and vision screening for older (generally pre-school age) children but the specific tests offered and the professional group providing the screening is quite variable.
- The US and Canada recommend particular screening procedures within CHS reviews that are not done elsewhere, in particular screening for anaemia, elevated blood lead levels, raised blood pressure, and (in the US) elevated blood lipids.
- Available information on the coverage of the different aspects of the CHP is limited.
- Sweden achieves particularly high parental engagement with its CHP and near universal coverage of recommended CHS reviews. In the US, coverage of CHS reviews is hindered mainly, but not entirely, by lack of appropriate insurance. Coverage of childhood immunisations is high in all countries studied with the partial exception of Canada.
- Internationally comparable information on child health outcomes that are influenced, at least in part, by the CHP is very limited.
- The information that is available suggests that Sweden has particularly good child health outcomes whereas the US and to an extent the UK have relatively poor outcomes. The UK fares particularly badly in relation to breast feeding and child well-being.

5.3.2. Strengths and limitations

This analysis was based on careful review of relevant policy documents, reports, and peer reviewed articles identified through structured literature and website searches. It can be difficult to get an accurate and complete picture of a country's overall health system or a component of it such as its CHP from such sources. Finding

multiple independent sources of information that corroborate the same point enhances confidence in findings and this was done where possible, for example multiple reports and papers giving consistent accounts of the Swedish CHP. Often only one source of information on any particular aspect of a country's CHP was available however, although this tended to be definitive, for example the recommended childhood vaccination schedule from a national organisation/committee. Checking the factual accuracy of findings and their interpretation with in-country experts provided important additional assurance about the validity of the analysis.

This study has a number of potential limitations that are common to many health system comparative studies, in particular limitations relating to the selection of the included countries and the availability and comparability of relevant data (Australian Institute of Health and Welfare 2012, McPake, Mills 2000, McManus, Thai 1998, Brown 2003, Horton 2006). The range of countries included in this analysis is relatively narrow and based mainly on pragmatic considerations. England was included as Scotland's nearest neighbour and because it provides a direct example of how the same professional guidance (HFAC reports) may be translated differently into policy recommendations in different settings. Australia, Canada and the US were included as other high income English speaking nations with overall health systems that are very different to the Scottish NHS. Sweden was included as a European comparator. There is also a particularly wide literature on the Swedish CHP and many Swedish websites contain English language summaries, making information on the CHP relatively accessible. Inclusion of a wider range of European countries with different models of CHP provision such as the Netherlands (Maas 2000, Einhorn et al. 2007) or France (Richardson 1994, Manciaux et al. 1990) would be beneficial but was deemed unfeasible given the time and resources available.

The information available on different countries' Child Health Programmes is limited. No comparable information on resources allocated to the CHPs (such as number of different staff groups or funding levels) was available and information on

access to particular elements of care and on relevant health outcomes was restricted. The access and outcome data that are available are generally limited to more easily measurable indicators such as infant mortality, although more complex assessments of overall child well-being have recently become available (Innocenti Research Centre 2007, Rees et al. 2012, Bradshaw, Richardson & Ritakallio 2007).

The slight discrepancy between the UK infant mortality figure available from the WHO and that calculated directly from birth and death data available from UK national statistical authorities (see section 5.2.3.2) is a reminder to view available ‘internationally comparable’ data with a degree of scepticism. It is often difficult or impossible to investigate the quality of data provided through organisations such as the WHO. The available data on immunisation coverage suggest that Canada has relatively poor coverage of primary immunisations. This is a consistent finding across several years’ of data. Whether this reflects underlying data quality issues or genuinely poor coverage is not clear. The Public Health Agency of Canada is currently running a project addressing immunisation data quality issues linked to the multiple potential providers of childhood immunisations such as GPs and public health unit clinics (see <http://www.phac-aspc.gc.ca/im/cirn-rcri/index-eng.php>) suggesting that data quality may be at least part of the explanation. Internationally comparable information on child health outcomes that are explicitly supported through the CHP but more difficult to measure, such as quality of parenting, parent-child relationships, and early child development is lacking.

This analysis is based primarily on review of available policy and guidance documents and published papers. These sources inevitably give limited information and often assume knowledge of local systems that may not be clear to outsiders, thus it can be difficult to use them to build up a coherent sense of a system of care. Furthermore, the relationship between policy and guidance documents and actual delivery of care is complex: it should not be assumed that what is recommended is always funded, provided by professionals, or taken up by families.

In England, there is evidence that the commissioning of the recommended Healthy Child Programme varies between areas, with many localities commissioning less-than-recommended levels of service for their local population, for example failing to commission the CHS reviews provided after infancy (Durham University Mapping Unit 2009). The issue of recommended Scottish CHS reviews that involve immunisation actually being reduced to ‘single issue’ contacts that focus solely on vaccination delivery has been discussed previously. Whether this also happens in other non-UK countries that provide immunisations within the context of CHS reviews is not clear. Even if it does, the other countries studied would still offer substantially more holistic CHS reviews than are currently provided in the UK. Lack of access to recommended CHP services in the US due to un-insurance (Chung et al. 2006); lack of uptake of recommended reviews by parents despite available insurance (Kenney et al. 2011); and lack of provision by paediatricians of specific elements of care within reviews (Earls, Shackelford Hay 2006, Norlin et al. 2011) has also been noted previously.

The links between recommended CHP services and actual care delivered can be influenced by factors such as the status of the recommendations (voluntary professional guidance vs. formal policy) and their relationship to decision making processes (federal/state governments). In the US, for example, Bright Futures provides voluntary professional guidance but the chance of the recommendations actually influencing the care provided to children is increased by government requirements that public and private health insurance plans cover recommended care. Implementation of national professional guidance can be particularly complex in countries with mixed national/federal and regional/state government structures. Focusing on particular states in Australia and Canada, and checking findings with in-country experts helped to deal with these issues.

Finally, this analysis focused on core, universally offered CHP services only. Although the general features of included countries’ overall health systems were considered to give information on the context within which the CHP operates, other children’s services were not considered in detail. As discussed in Chapter 3, the

CHP is just one element of a wider network of possible policies and services that together aim to protect and promote the health and development of young children. All the countries studied provide both specialist health services that complement the universal care provided through the CHP such as developmental paediatrics, and relevant non-health services such as early education and childcare.

Getting a complete picture of the whole range of children's services in the included countries, and understanding how the CHP interacts with other relevant services, would be a considerable challenge but some relevant information is available (Kamerman 2000). The Commonwealth Fund has undertaken a comparative analysis of how four countries (England, Australia, Canada, and the US) have incorporated the emerging understanding of early child development outlined in Chapter 3 into early childhood policies and services (Halfon et al. 2009). The report presents a structured narrative review for each country written by local experts and an overall cross-country comparative discussion. No methods are presented hence quality assessment is difficult but the contributors are well recognised experts in child health.

The report notes that all the countries studied have made more or less systematic attempts to create comprehensive systems of policies and services designed to promote early child development over recent years. The Sure Start initiative in England is acknowledged as a significant attempt to build coordinated systems of preventive health care, early education and childcare, and parenting and family support for local communities (Glass 1999, Roberts 2000, Eisenstadt 2011, Belsky, Melhuish & Barnes 2007). Other cited examples include programmes operating in Victoria, Australia (State of Victoria Department of Education and Early Childhood Development) and Ontario, Canada (Ontario Ministry of Children and Youth Services) (both coincidentally called Best Start) that aim to provide networks of high quality childcare and family support, and the Head Start and Early Head Start enhanced early education programmes operating across the US (Administration for Children and Families Early Childhood Learning & Knowledge Center). Other relevant services in the US include 'Part C' early intervention programmes for

children with developmental problems (Rosenberg, Zhang & Robinson 2008, Rosenberg et al. 2013) and other services such as targeted home visiting programmes for vulnerable families provided through ‘Title V’ Maternal and Child Health Services block grant funds (Maternal and Child Health Bureau 2000, Association of Maternal and Child Health Programs 2010).

Sweden was not included in the Commonwealth Fund report but it is clear that the Swedish CHP operates within a very comprehensive ‘social package’ of support provided to all families with young children. This includes generous parental leave entitlements and high parental (including maternal) employment rates paired with good availability of high quality early education and childcare (Blennow 2011). Early education provision can be as ‘open’ nursery (which non-working parents attend with their children), teacher-led nursery which follows a national curriculum, or pedagogue-led care provided in family centres: there is a formal pre-school year for six year old children then compulsory schooling starts at age seven (Government Offices of Sweden). Due to these complex networks of policies and services that influence young children’s lives, even when internationally comparable child health outcome data are available, it is very difficult to isolate and quantify the influence of a country’s CHP to the outcomes studied (Montague 2009).

5.3.3. Previous relevant work

Many international comparisons of countries’ overall health systems are available. One recent example is a comparison of the health care systems of 14 high income countries including England, Australia, Canada, the US and Sweden published by the Commonwealth Fund (Thomson et al. 2012). In this report, experts from each country provide a structured description of specific facets of their health system, such as financing and delivery mechanisms and approaches to quality improvement. The information is summarised in comparative tables and supplemented by quantitative information on the health system and population health measures. No methods are presented and there is no discussion of any potential limitations. Inevitably, much of the quantitative data is drawn from the same sources as used in this analysis, in

particular the WHO, World Bank and OECD. Overall, the findings of the Commonwealth Fund report are compatible with the brief overview of countries' overall health systems provided in this chapter.

Two previous studies comparing preventive health care for children in industrialised countries were identified through the literature review for this study. Both were conducted from a US perspective. The first (Chaulk 1994) compared the overall health care system, and the preventive health services available to pregnant women and children, in seven countries (UK, Canada, Sweden, US, France, Germany, and Japan). The second study (Kuo et al. 2006) compared the Child Health Surveillance system for pre-school children in ten countries (England, Australia, Canada, Sweden, Denmark, France, Germany, Japan, Netherlands, and Spain). The Kuo study was part of a wider project led by the Commonwealth Fund to 'rethink well-child care' in the US (see below).

The Chaulk study is now relatively out of date. It was based on document analysis alone, gave minimal description of methods, and presented the results mainly in narrative review format. The more recent Kuo study was based on document analysis supplemented by interviews with key informants from each country and site visits to five countries. A definition of the 'well child care' included in the study was provided and an explicit theoretical framework guided the aspects of different countries' systems that were compared. The comparison focused on the structure of the countries' CHS systems. The detailed content of CHS care delivered was not included and wider aspects of the CHP not delivered through CHS e.g. childhood screening were also excluded. No systematic information was provided on countries' overall health systems or their child health outcomes.

Despite the differences between the previous studies and the analysis presented here, the findings of the previous work resonate with this analysis and no significant discrepancies were found. The previous studies confirm that all high income countries that have been studied attempt to provide a Child Health Programme to their pre-school children; that there are fundamental differences in the systems

employed, e.g. in whether they are nurse- or physician-led and focused on holistic health promotion and parental support or on identifying and treating specific ‘deficits’; that the degree of integration of the CHP with other relevant services such as primary care for children varies; and that the US system stands out due to its singular inability to provide universal access to health care generally and CHP services specifically for its population. This study adds to these previous studies by being the first to consider international approaches to CHP from a UK perspective, and to consider both the detailed structure and content of all elements of the CHP within the framework of broader health systems.

5.3.4. Wider comments and conclusions

This analysis has shown considerable variation between, and in some cases within, countries in terms of elements of the Child Health Programme recommended for pre-school children. The underlying causes of this variation warrant further consideration.

The variation in vaccination schedules between countries may reflect different epidemiology of the target conditions in different settings, different interpretations of incomplete evidence about vaccine effectiveness, and/or different thresholds for considering vaccines sufficiently cost effective to be recommended. Each of these effects may operate, and the primary causes of variation may be different for different vaccines. In the case of varicella, pre-vaccine epidemiology of the condition was found to be very similar in Canada and the UK, with infection in childhood near-universal (Brisson et al. 2001). Despite this, whereas Canada has implemented universal vaccination, the Joint Committee on Vaccination and Immunisation has repeatedly recommended against routine childhood varicella vaccination in the UK (Joint Committee on Vaccination and Immunisation 2010). This suggests that, at least in this particular case, evidence interpretation and cost effectiveness threshold effects are likely to be important factors underlying the different policy decisions.

Newborn bloodspot screening recommendations differ substantially between countries. The incidence of cystic fibrosis varies substantially between populations with different genetic origins, but this variation in incidence is unlikely to explain the variation seen in screening recommendations. Caucasians are at highest risk of cystic fibrosis but Sweden is the only country that doesn't offer universal screening (Davies, Alton & Bush 2007). Similarly, the metabolic conditions screened for in many countries are rare in all populations hence variation in incidence is unlikely to explain all variation in screening practice. All non-UK countries studied screen for galactosaemia. Scotland used to include this target condition in its bloodspot screening until it was withdrawn in 2002 to bring the Scottish programme in line with advice provided by the National Screening Committee and the Health for All Children reports (Scottish Government 2001b). The National Screening Committee recommendation against galactosaemia screening is based on systematic reviews published by the Health Technology Assessment programme in 1997 and reflects a lack of evidence found by the reviews that screening and associated earlier diagnosis leads to significantly improved outcomes with this condition (Seymour et al. 1997, Pollitt et al. 1997). The recommendation was last reviewed in 2006 with no change made. The committee is currently re-reviewing its recommendations on newborn screening for galactosaemia and other inborn errors of metabolism and updated guidance is due in 2013 (see <http://www.screening.nhs.uk/galactosemia>).

It is likely that technological advances have had a particularly strong influence in extending the number of metabolic conditions screened for in many countries' newborn bloodspot programmes. Developments in the application of tandem mass spectrometry in particular have meant that single blood spot samples can be used to screen for a very large number of inborn errors of amino, fatty, and organic acid metabolism (Banta-Wright, Steiner 2004). Although the technology is expensive to set up, once implemented the marginal cost per additional condition screened for is relatively low. Similarly, although the various conditions potentially screened for are (sometimes very) rare, they generally have very adverse outcomes without treatment whereas relatively simple interventions such as dietary modification can have a major positive impact on prognosis. This leads to a situation in which it can seem

easy to screen for multiple conditions, and perhaps difficult to apply usual screening criteria to each condition independently.

Scotland does currently use tandem mass spectrometry technology in the newborn screening programme hence the question of extending the programme to be more in line with that seen in the other countries studied here is a very live issue (Scottish Newborn Screening Laboratory 2010). The UK Department of Health is currently funding a one year trial of extended bloodspot screening including testing for five inherited metabolic conditions using tandem mass spectrometry and the results of this trial will be considered by the National Screening Committee (see <http://mediacentre.dh.gov.uk/2012/04/08/430000-babies-to-be-screened-for-five-extra-rare-conditions-in-newborn-screening-pilot/>).

Recommendations for screening offered within CHS reviews vary between countries as documented. The recommendations can be controversial across and within countries (Dinkevich, Ozuah 2002). As previously discussed, the US recommendations in favour of formal developmental screening at certain CHS reviews have been repeatedly rejected in the UK (National Screening Committee). The US recommendations around blood lipid screening in childhood have been severely criticised within the US as being overly aggressive, and possibly reflective of guideline developers' conflicts of interest (Newman, Pletcher & Hulley 2012, Psaty, Rivara 2012, Gillman, Daniels 2012). Overall, the variation in the CHP offered in different countries demonstrates the complexities involved in policy/guidance development. It is not a simple process of translating evidence into recommendations but rather a messy and difficult process of considering limited evidence alongside other influences such as available resources and professional and public values and norms (Nutley, Walter & Davies 2007).

Policy does not stand still. Evidence constantly accumulates, political priorities shift, and public expectations change. It is clear that the debate about the appropriate scope and content of the CHP that has accompanied publication of the Health for All Children reports is not confined to the UK but rather is active internationally. In

Sweden, whilst in general there is widespread support for the broad package of services available to families with young children, there has been long standing debate about the effectiveness, and cost effectiveness, of the high number of universal child health reviews provided (Magnusson, Persson & Sundelin 2001, Magnusson 1997, Magnusson, Sundelin & Westerlund 2006). A national conference on the future of the CHP was held in 1999 in response to concerns that the service was not sufficiently evidence based or responsive to changes in child health epidemiology (Sundelin, Hakansson 2000). The conference recommended that physician contacts after the two month check should stop and all contacts should be nurse led and hence focused more on family support than detection of physical and developmental abnormalities. This recommendation has not yet been implemented. The conference also recommended that preventive activity should be increasingly focused on the first two years of life, should pay greater attention to parenting issues, should vary in intensity more in response to family needs, and should be better integrated with other early years services. The 1999 conference was followed by an action research study in Uppsala that attempted to systematically refocus the Child Health Programme on evidence based interventions to improve parenting and early child development. The study has been well described (Sundelin, Magnusson & Lagerberg 2005, Lagerberg, Magnusson & Sundelin 2005) but no outcomes have yet been reported. How the forthcoming updated guidance on the Swedish CHP will reflect this debate, and in particular whether it will recommend substantial changes to the number and content of child health reviews offered through the CHCs, is currently unknown.

In the US, the Commonwealth Fund has led a programme of work to ‘rethink well-child care’ (Schor 2004, Halfon, DuPlessis & Inkelas 2007). Again, this is driven by a desire to ensure that CHP services adequately address current child public health challenges such as developmental and behavioural problems, meet parents’ needs, are available to all, and are affordable and sustainable over the longer term. The rethinking programme has involved canvassing parent (Coker et al. 2009, Radeckiet al. 2009) and professional (Coker et al. 2006, Tanner et al. 2009) views on the US CHP, considering the US CHP against that provided in other countries (Kuo et al.

2006), and putting forward suggestions for reform (Bergman, Plsek & Saunders 2006). The programme has also involved development and trialling of a new model of CHS for children up to three years of age (the Healthy Steps programme) that employed team based rather than traditional physician led provision of CHS and a greater focus on supporting parenting and early child development (Lawrence, Magee & Bernard 2001, Guyer et al. 2000, Minkovitz et al. 2001, Minkovitz et al. 2007).

It is notable that suggestions for CHP reform in Sweden and the US reflect issues that have been discussed or implemented in Scotland, namely reducing the number of CHS reviews; strengthening the focus on holistic family health promotion and positive child-parent interactions; greater flexibility and individualised provision of CHS with additional services more actively targeted to vulnerable families; increased skill mix of providers; and better integration of elements of the CHP with other children's services. Overall, the extent of ongoing debate about Child Health Programmes suggests that each of the programmes summarised here will continue to evolve over time, although the precise changes that will occur remain to be seen.

In conclusion, this analysis provides a structured comparison of the CHP offered in a range of high income countries to aid understanding of the Scottish programme within an international context. All countries studied do attempt to promote the health and development of pre-school children through the provision of a CHP that involves screening procedures, immunisations, and Child Health Surveillance reviews. Despite this general similarity, although there are caveats around how policy/guidance translates into actual care provided to children in different settings, and limited information on some issues, it is clear that there is substantial variation between and sometimes within countries in the detail of how CHP services are delivered and exactly what is provided. This variation between countries probably reflects differential interpretation of incomplete evidence and differences in values and norms more than variation in populations' health care needs.

As the CHP is only one component of the range of policies and services designed to support young children, it is difficult or impossible to say which precise model of CHP provision has the most positive impact on children's outcomes in the most efficient way. Whole systems of care and support undoubtedly matter in terms of influencing children's outcomes however (Chung, Muntaner 2006, Richter et al. 2012). The high degree of income equity, extensive Child Health Programme with high coverage, generous parental leave, good quality and accessible early education and childcare provided by Sweden combine to achieve among the best child outcomes in the world. By contrast the incomplete and fragmented delivery of the extensive preventive child health care recommended in the US is associated with poor child health outcomes at the population level (Moreno-Serra, Smith 2012).

Overall, the CHP offered in Scotland is relatively limited compared to that recommended in all the other countries studied. Scotland offers the fewest Child Health Surveillance reviews, a relatively limited childhood vaccination programme, and much more restricted newborn bloodspot screening that is provided outwith the UK. Whether this represents an admirable commitment to evidence based policy making and provision of cost effective services, or a minimal approach to service delivery that may be difficult to sustain if public and professional expectations rise remains to be seen.

The following three chapters use (mainly) routinely available healthcare data to assess the impact of the 2005 policy on aspects of the CHP provided to pre-school children in Scotland.

Chapter 6 Coverage of Child Health Surveillance reviews

The next three chapters present a series of quantitative analyses that explore in more detail the impact of the changes introduced to the Scottish Child Health Programme (CHP) as a result of the 2005 policy on the preventive care provided to pre-school children. This chapter looks at the coverage of the universally offered Child Health Surveillance (CHS) reviews before and after the change to the review schedule. Chapter 7 assesses, after implementation of the 2005 policy, which children are being identified by Health Visitors (HVs) during their CHS reviews as being in need of enhanced professional support. Chapter 8 considers how the 2005 policy has influenced the totality of preventive care provided to pre-school children by HVs and General Practitioners. The analyses are all based on routinely available health service data and hence together explore the extent to which such data can inform investigation of the implementation and impact of the 2005 policy.

The Scottish CHP and how it changed after implementation of the 2005 policy is described in detail in Chapter 4 and summarised briefly here. In terms of universal CHS reviews, prior to the 2005 policy a total of six Health Visitor led reviews were offered to pre-school children when they attained 10 days; 6-8 weeks; 8-9; 22-24; 39-42; and 48-54 months of age. A national information system, Child Health Surveillance Programme – Pre-School (CHSP-PS), has been available to manage review call-recall and record the delivery of reviews and relevant findings since 1991. Use of CHSP-PS is voluntary and different Boards started using the system at different times (see Table 11). For Boards that used the CHSP-PS system prior to implementation of the 2005 policy, return and data entry of a completed review form was mandatory after each of the reviews except the 48-54 month review. Return and data entry of a completed review form after 48-54 month/pre-school reviews was optional.

NHS Boards implemented the revised programme of CHS reviews recommended in the 2005 policy at different times between 2005 and 2010 (see Table 13). After

implementation, the number of universal Health Visitor led reviews offered to pre-school children was reduced to two; for children aged 10 days and 6-8 weeks. An additional selective review for children aged two years was also offered if required.

As discussed in Chapter 4, although neither Health for All Children 4 (HFAC4) nor the 2005 CHP policy recommended reducing the number of child health reviews offered to pre-school children to the extent that actually happened in Scotland, both documents supported the basic approach of streamlining the core programme of CHS reviews in order to free up professional time to provide more individualised and intensive support to families according to their needs. HFAC4 cited a number of strands of evidence in support of this approach, including that families most in need had historically been least likely to access the reviews and that inequalities in child health outcomes were persisting, or even increasing, over time (Hall, Elliman 2003, p12).

HFAC4 noted specifically that '*coverage [of child health reviews] over 60-70 percent is hard to maintain after the first year of life*' (Hall, Elliman 2003, p355) however references were not provided in the HFAC4 report hence the basis for this statement is unclear. Reasons for less than complete review coverage suggested in HFAC4 included the interlinked issues of the difficult and resource-intensive nature of engaging some particularly disadvantaged groups such as children of travelling or homeless families (Hall, Elliman 2003, pp15, 355), and the geographical maldistribution of Health Visitors more based on historical accident than the relative needs of different areas/populations and hence the limited capacity of some local services to meet needs (Hall, Elliman 2003, pp358-366, Crofts et al. 2000, Steel, Reading & Allen 2001, Cowley, Bidmead 2009, Cowley, Cowley 2007b).

As noted, the Scottish 2005 CHP policy re-emphasised the need for a more tightly focused core programme of CHS reviews complemented by more intensive support for families in need. No information on coverage of the universally offered child health reviews is routinely published in Scotland, but in 2003 the NHS Scotland Information Services Division (ISD) undertook an ad hoc analysis of review

coverage to inform the group responsible for developing the 2005 policy. This analysis was led by then members of ISD's child health team and I was not involved. Detailed results were not presented in the 2005 policy but the overall findings were referred to. The 2005 policy stated that:

'Scottish data show that take up of health promotion advice and child health screening and surveillance contacts is much higher amongst parents from more affluent areas and circumstances, with children in need more likely to remain disadvantaged in health status and access to health care. When formal child health checks are made at 6-8 weeks, almost one in 10 children in deprivation categories 6 and 7 do not attend clinic appointments. By the time checks are made at 22-24 months, almost one in four children in deprivation categories 6 and 7 do not attend for clinic appointments, and this rises further to almost two in five children by the routine checks that currently take place at 39-42 months.' (Scottish Executive Health Department 2005b, p4).

Anecdotally, this ISD analysis was influential in determining the strong emphasis that was placed in the 2005 policy on reducing the core universal CHS programme in order to enable additional support for families in need.

Coverage of the universally offered child health reviews among different population subgroups is a useful measure of the degree to which the CHS service is reaching all children and hence its capacity to reliably identify children in need of additional professional support, to start to meet those needs, and to address inequalities in children's outcomes. Achieving higher and more equitable coverage of a reduced number of child health reviews was an implicit aim within both HFAC4 and the 2005 policy. The importance of high and equitable coverage has become particularly important in Scotland due to the very marked reduction in the child health review schedule that has occurred after implementation of the 2005 policy. The reduced review schedule means there are few 'safety net' points at which children can potentially be seen and have their needs assessed.

The analysis presented in this chapter therefore addresses the following questions:

- What proportion of children in Scotland receives each of the universally offered child health reviews?
- How does review coverage vary by deprivation?

- How have overall review coverage and inequalities in coverage changed over time, in particular before and after the reduction in the number of reviews offered associated with implementation of the 2005 policy?

Assessment of review coverage is based on analysis of data held in the CHSP-PS information system. Unlike some other national health datasets such as hospital discharge records (see <http://www.isdscotland.org/Products-and-Services/Data-Quality/>), CHSP-PS is not subject to regular data quality assessment. An audit of CHSP-PS data quality was therefore also undertaken to provide supporting information necessary to interpret results.

6.1. Methods

6.1.1. *Assessment of CHS review coverage*

6.1.1.1. Routine data sources used

How the CHSP-PS information system works to support and record delivery of the child health reviews was described in Section 4.3.1. In summary, when a child is due for a review, the system issues an invitation to the family and sends the relevant paper form (in triplicate) to the HV. When a review has been done, the parent is given one copy of the completed form for inclusion in the child's 'red book'; the HV retains one copy in the child's case notes, and one copy is returned to the NHS Board child health department where administrative staff key the findings into the electronic system. The data return pathway is more complex for reviews that involve additional staff in their provision. HVs are solely responsible for provision of the 10 day review whereas the 6-8 week review usually involves an initial assessment by the HV followed by a medical examination by the GP hence there is an additional step in the data return pathway (form passed from HV to GP then back to child health department). Pre-2005, GP involvement in reviews provided after 6-8 weeks was variable (see Chapter 8).

In more technical terms, CHSP-PS is one of a linked suite of national child health information systems. The other linked systems include the Scottish Immunisation Recall System (SIRS) and the Child Health Surveillance Programme – School system (CHSP-S). All three child health systems are also linked to the national GP registration system called the Community Health Index (CHI). When a child is born, or moves into Scotland and registers with a GP, a record for that child is created on the CHI database and the SIRS system. This information is then shared with the CHSP-PS or CHSP-S system as appropriate depending on the child's age. If a child subsequently moves between areas, when they re-register with a GP in their new area, the dynamic link between the CHI and the child health systems means that their details on the child health systems will be updated appropriately, and a flag

indicating their move will be created. Overall this process ensures that (as near as possible) complete and up to date child population denominator data is held on the child health systems and hence all children living in a particular area are called at the appropriate time for their child health reviews and immunisations.

ISD receives quarterly downloads of both the CHSP-PS and the SIRS systems for analytical purposes. Information received from CHSP-PS just relates to completed reviews. Information from SIRS relates to both completed immunisations and the complete child population living in different areas.

6.1.1.2. Cohorts included in the analysis

Four cohorts of children were studied and details are provided in Table 26. Cohorts 1 and 2 were selected as they had the opportunity to receive all five child health reviews offered prior to implementation of the 2005 policy that were included in the analysis. The old 48-54 month review was not included for cohorts 1 and 2 as recording provision of that review on CHSP-PS was non-mandatory. Cohorts 3 and 4 were selected as they had the opportunity to receive the reduced programme of two universal reviews after implementation of the 2005 policy. Cohort 3 had also had the opportunity to receive the 2005 policy selective 2 year review by the time the analysis was conducted.

Table 26 Cohorts of children included in the analysis of review coverage before and after changes to the CHS review schedule

Cohort	Date of birth range included	CHS reviews included	Upper age limit by which the review should be completed	Date of SIRS and CHSP-PS extracts used in analysis	NHS Board areas included
1	1 Nov 1998 – 31 Oct 1999	10 day 6-8 week 8-9 month 21-24 month 39-42 month	None specified 12 weeks 10 months 26 months 44 months	Nov 2003	Argyll & Clyde Ayrshire & Arran Borders Fife Forth Valley Greater Glasgow Lanarkshire Lothian Tayside
2	1 Nov 2000 – 31 Oct 2001	10 day 6-8 week 8-9 month 21-24 month 39-42 month	None specified 12 weeks 10 months 26 months 44 months	Nov 2005	Argyll & Clyde Ayrshire & Arran Borders Fife Forth Valley Greater Glasgow Lanarkshire Lothian Tayside
3	1 Apr 2006 – 31 Jul 2006	10 day 6-8 week 2 year (selective)	28 days 12 weeks 28 months	Feb 2009	Argyll & Clyde Borders Fife Forth Valley Greater Glasgow Lothian
4	1 Jul 2007 – 30 Jun 2008	10 day 6-8 week	28 days 12 weeks	Feb 2009	Argyll & Clyde Ayrshire & Arran Borders Fife Forth Valley Greater Glasgow Lanarkshire Lothian Tayside

Specification of the date of birth ranges and included NHS Board areas for the various cohorts took account of:

- The date of implementation of the CHSP-PS system and of the 2005 policy in different NHS Boards (see Table 11 and Table 13). Only Boards that were established users of the CHSP-PS system by November 1998 were included in any cohort to ensure, as far as possible, the same Boards were included for each cohort and hence comparability between cohorts was maximised.
- The child health reviews offered before and after implementation of the 2005 policy and the upper age limit by which these should be provided. The upper age limits are specified in the CHSP-PS clinical guidelines (see <http://www.isdscotland.org/Health-Topics/Child-Health/Child-Health-Programme/Child-Health-Systems-Programme-Pre-School.asp>). Health Visitors are advised that if a child attends for a review above the upper age limit, it should be recorded on CHSP-PS as an unscheduled contact however in practice such reviews are often recorded as the relevant age-specific review.
- Potential delays between HVs conducting a review and the data relating to that review being entered onto the CHSP-PS system and the dates on which the quarterly CHSP-PS extracts are received by ISD.
- Having sufficiently large numbers in each cohort to provide stable estimates of coverage. A full year of births was selected where possible.
- Examining periods immediately pre-and post-implementation of the 2005 policy and also periods more distant from the date of implementation to assess the consistency of findings.

For illustration, specifying cohort 2 (used to assess coverage of the old programme of child health reviews in the period immediately before implementation of the 2005 policy) took account of the following:

- The earliest Boards implemented the 2005 policy on 1 October 2005.
- The last pre-2005 policy child health review included in the analysis was the 39-42 month review – this should have been completed prior to children attaining 44 months of age.

- It is reasonable to allow up to 3 months for details of a completed 39-42 month review to be entered onto the CHSP-PS system.
- 47 months prior to end September 2005 is end October 2001.
- To allow a full 12 months of births to be included, cohort 2 should therefore include children born between 1 November 2000 and end October 2001.
- At 1 November 1998, Dumfries & Galloway, Grampian, Highland, Orkney, Shetland, and Western Isles did not use CHSP-PS. These Boards therefore could not be included for cohort 1 and were also excluded for cohort 2 to ensure comparability.
- The first CHSP-PS data download after 1 October 2005 was extracted and sent to ISD in early November 2005.

Note that NHS Argyll & Clyde was disbanded in 2006 and the area subsumed into NHS Greater Glasgow (which became NHS Greater Glasgow & Clyde) and NHS Highland. This meant that the total number of NHS Boards across Scotland reduced from 15 to 14. The CHSP-PS system still records information for the old NHS Argyll & Clyde area separately to enable analysis of long term trends. The old 15 Board structure has therefore been used throughout this analysis to ensure comparability between cohorts.

In order to allow coverage of the post-2005 selective two year review for cohort 3, the date of birth range for that cohort was of necessity restricted to a four month period rather than a full year, and the NHS Boards included were restricted to six early implementer Boards (implementation of the 2005 policy between October 2005 and April 2006). This cohort is therefore considerably smaller than the others. Even with these restrictions, as the February 2009 CHSP-PS extract was the most recent available to ISD at the time this analysis was specified, this meant that there was only a minimum of a two month period between the upper age limit for the two year review and the CHSP-PS data download for cohort 3 rather than the three months that was allowed for the other cohorts.

6.1.1.3. Calculating review coverage for the various cohorts

Once the cohorts were specified, four extracts from SIRS were taken to identify the relevant children. Children were selected if they were born within the relevant date range, were registered to receive their CHS reviews in one of the included NHS Board areas, and had been consistently registered in that Board since birth up to the time of the data extract for that cohort. Children who had moved NHS Board area or into/out of Scotland after birth, and those who had died, were excluded as they may not have had the opportunity to receive all the included CHS reviews and/or have them recorded on the CHSP-PS system. For example, if a child was born in November 2000 in a Board that did not use the CHSP-PS system at that time then moved to an included Board at age six months, whether or not they received their 10 day and 6-8 week reviews, they would not be recorded on CHSP-PS hence including this child would artificially deflate calculated coverage of those reviews in the new Board area for cohort 2.

Children's postcode of residence recorded on SIRS at the time of the data extract was used to determine whether they lived in the least or most deprived 15% of data zones and to allocate all children to a deprivation quintile using the Scottish Index of Multiple Deprivation (SIMD) 2006 (see <http://www.scotland.gov.uk/Topics/Statistics/SIMD>) (Scottish Executive 2006).

Data zones are aggregations of postcodes that are used to produce statistics relating to small geographical areas in Scotland (see <http://www.scotland.gov.uk/Publications/2005/02/20697/52626>). There are around 6,500 data zones in Scotland, each containing around 500 to 1,000 residents. The Scottish Index of Multiple Deprivation is an area based deprivation index. The SIMD uses a range of routine data relating to the population living in each data zone to assign each zone a deprivation score and hence rank. Individuals are then assigned to a SIMD score/rank based on their postcode and hence data zone of residence. The routine data used relate to seven key areas relevant to multiple deprivation namely income; employment; health; education, skills and training; housing; geographic access to services; and crime. The SIMD is periodically

updated as new routine data become available, reflecting the fact that areas can change over time. The first SIMD was published in 2004 with updates published in 2006, 2009, and 2012 (see <http://www.scotland.gov.uk/Topics/Statistics/SIMD>).

Once ranked, data zones can be assigned to different deprivation categories to facilitate analysis. For example, the 15% most and least deprived data zones in Scotland can be identified. This kind of categorisation is useful for comparing groups at the extreme ends of the deprivation spectrum. Alternatively, thresholds can be set that categorise all the data zones into five quintiles representing increasing levels of deprivation that each contain 20% of the resident Scottish population. This kind of categorisation is useful when looking at how outcomes of interest vary across all levels of deprivation. Both complementary approaches were used in this analysis.

Once the denominator of eligible children had been established using SIRS, CHSP-PS was used to identify children from the cohorts recorded as receiving each of the relevant CHS reviews. Whether children received their review within the recommended age range (see Table 26) was also noted for all reviews except for the 10 day review. No upper age limit for this review was specified prior to 2005 and in addition the age of the child at the 10 day review is incompletely (only around 70%) recorded in the CHSP-PS system.

Coverage of the various reviews (at any age or where possible within the recommended age range) by deprivation level and NHS Board was then calculated for each of the four cohorts. Confidence intervals for differences in coverage, for example between the least and most deprived groups, were calculated using the Newcombe-Wilson formula for the 95% confidence interval for the difference in two proportions using an online tool provided by Vassar College, New York, US (<http://vassarstats.net/>). Differences in coverage were also assessed by Chi squared tests with Yates' continuity correction using GraphPads Quick Calcs online tool (<http://www.graphpad.com/quickcalcs/Contingency1.cfm>).

Finally, the total number of births occurring within the corresponding date ranges and NHS Board areas according to National Records for Scotland (NRS) statutory birth notification data (see <http://www.gro-scotland.gov.uk/statistics/theme/vital-events/births/index.html>) was compared to the number of children included in the four cohorts to assess the number of children excluded from the coverage analysis due to moving or dying over the period of study.

6.1.2. Audit of CHSP-PS data quality

Due to the paper based nature of the CHSP-PS system, it may be that some children with no record of a particular review on CHSP-PS did actually receive their review but the completed review form went astray prior to data entry. This means that using CHSP-PS to quantify child health review coverage risks systematically underestimating coverage. The following audit of CHSP-PS data was conducted to quantify this potential for underestimation.

Two Community Health Partnership areas (West Glasgow, and Glenrothes and North East Fife) were selected for inclusion in the audit. Community Health Partnerships are administrative subunits of NHS Boards that are mainly responsible for delivery of primary and community based care (see <http://www.chp.scot.nhs.uk/>). Children from the most recent cohort (cohort 4) were included in the audit. The SIRS system was used to identify children born between 1 July 2007 and 30 June 2008 who were registered with a GP practice in one of the participating Partnerships at the data extraction date and who had been registered to receive their CHS in the same NHS Board since birth. The CHSP-PS system was then used to identify the subset of children with no record of receiving a 10 day and/or a 6-8 week review. These children comprised the audit sample. The audit was undertaken after the assessment of review coverage. The February 2010 SIRS and CHSP-PS extracts were available by the time the analysis was undertaken hence these (rather than 2009 extracts used in the coverage analysis) were used to identify children for inclusion.

An audit data collection form was developed. This included a cover sheet providing the child's identifiers including name, date of birth, gender, Community Health Index (CHI) number, GP practice, and Partnership. Subsequent sheets asked for additional information such as whether the apparently missing review had in fact been received and then either why it had been missed or why no record was available on CHSP-PS as appropriate. Two versions of the form were prepared – one for children who had no CHSP-PS record of a 10 day review and one for children with no record of a 6-8 week review. Each audit form was assigned a unique number that was included on each of the sheets. This ensured that results could always be related to the correct children/reviews.

Individual data collection forms were prepared for each child and each apparently missed review. The child's identifiers were inserted on the cover sheet of each form. The paper forms were then distributed to the HV managers in the relevant Partnerships who passed them on to the relevant GP practices following usual procedures for transfer of confidential information. The practices' HVs then completed the forms after reviewing the children's contemporaneous HV case notes.

Once the forms were completed, the HVs removed the cover sheets and returned them to the HV manager and thence ISD. The results were entered into a Statistical Package for the Social Sciences (SPSS) version 17.0 file. Codes to categorise the responses to questions asking for free text answers were developed after reviewing the completed forms and used when entering results into SPSS. Codes were initially developed by a Specialist Registrar in Public Health Medicine, Alex Stirling, and checked by me. The allocation of responses received in completed audit forms to the various codes was also done first by Alex then reviewed by me.

Additional variables including the child's sex, SIMD 2009 deprivation quintile based on postcode of residence recorded on SIRS, and the most recent Health Plan Indicator recorded on CHSP-PS at the time of data extract (February 2010) were obtained and merged into the SPSS file. As noted in Section 4.3.3, the Health Plan Indicator is the Health Visitor's overall assessment of a child's need for professional

support to help them attain their health and development potential and is categorised as core; additional; or intensive. The HPI can be assigned or updated at any point.

Results were then analysed within SPSS v17.0 using simple descriptive statistics.

Association between review status (i.e. whether the audit results suggested a child had or had not missed their child health review) and children's characteristics (i.e. deprivation quintile and Health Plan Indicator) was assessed by Fisher's exact test using an online tool provided by Vassar College, New York, US

(<http://vassarstats.net/>).

6.2. Results

6.2.1. *Assessment of CHS review coverage*

The number of children born in the included date of birth ranges and NHS Board areas relevant to each cohort is shown in Table 27 along with the number of children included in each cohort and the number for whom a SIMD 2006 deprivation score was available. The proportion of children included is higher for the later cohorts as these children had to remain resident in the same NHS Board area for a shorter period (up to 19 months cf. up to 60 months). The proportion of included children whose postcode of residence recorded on SIRS could not be mapped to a data zone and hence SIMD 2006 deprivation score was low in all cohorts. A small number of non-mapping postcodes are to be expected due to postcode recording error or the creation of new postcodes for new housing.

Table 27 Number of children included in each cohort

Cohort Date of birth range	Total number of births in included Boards in relevant date range*	Number (%) of children included in cohort	Duration for which children had to remain in the same NHS Board in order to be included	Number (%) of included children with deprivation score available
1 Nov 1998-Oct 1999	45,122	37,668 (83.5)	48-60 months	37,325 (99.1)
2 Nov 2000-Oct 2001	43,040	36,566 (85.0)	48-60 months	36,438 (99.6)
3 Apr 2006-Jul 2006	10,485	9,311 (88.8)	30-34 months	9,278 (99.6)
4 Jul 2007-Jun 2008	48,310	45,777 (94.8)	7-19 months	45,624 (99.7)

* Data source: NRS statutory birth registrations

The overall percentage of children from each cohort with a CHSP-PS record of receiving the included CHS reviews is shown in Table 28 and Figure 5. For cohorts 1 and 2, i.e. the cohorts offered the pre-2005 schedule of reviews, overall review coverage as recorded on CHSP-PS was very high for the 10 day review then progressively declined for reviews provided at older ages. Overall coverage for cohorts 1 and 2 was very similar for each of the reviews except the 39-42 month review: coverage of this review was lower for cohort 2 than cohort 1. As this was the review carried out closest in time to the implementation of the 2005 policy, this probably indicates that HVs were to some extent preparing for the withdrawal of this universal contact and were less assiduous in promoting coverage of the review during the immediate pre-implementation period.

For cohorts 3 and 4, i.e. the cohorts offered the post-2005 schedule of reviews, overall coverage of the remaining universally offered reviews (at 10 days and 6-8 weeks) remained very similar to that seen for cohorts 1 and 2. Coverage of the post-2005 selective 2 year review was clearly different to that of the universally offered reviews, with around a quarter of children from cohort 3 having a CHSP-PS record of receiving a 2 year review.

Recorded coverage for children living in the least and most deprived areas of Scotland is shown in Table 28, Table 29 and Figure 6. Recorded coverage was higher for children living in the least deprived areas compared to those living in the most deprived neighbourhoods for every universally offered review for every cohort. The difference in coverage between least and most deprived groups progressively increased for reviews offered at older ages. The difference was statistically significant for every review and every cohort except the 10 day review for cohort 3. In general confidence intervals for cohort 3 were wider than for the other cohorts due to the smaller numbers included.

The degree of inequality in recorded review coverage was very similar across cohorts. In particular there was no evidence of a reduction in inequality of coverage of the remaining universally offered reviews after the change in the review schedule.

Recorded coverage of the 10 day and 6-8 week reviews remained around 0.5% and 4% higher in the least compared to the most deprived groups respectively.

The association between recorded coverage and deprivation was different for the selective 2 year review compared to the universally offered reviews. Coverage of the 2 year review was much higher among cohort 3 children living in the most deprived areas compared to those living in the least deprived areas. Only around 13% of children living in the least deprived areas received this selective review compared to almost 40% of children living in the most deprived areas.

Table 28 Number and percentage of children with a CHSP-PS record of receiving the specified CHS reviews, by cohort
Whole cohort and children living in least and most deprived areas

Cohort and deprivation status	Number of children	Number (%) with CHSP-PS record of receiving specified CHS review									
		10 day		6-8 week		8-9 month		21-24 month / 2 year		39-42 month	
		N	%	N	%	N	%	N	%	N	%
Cohort 1											
Whole cohort	37,668	37,185	98.7	35,795	95.0	34,913	92.7	34,520	91.6	32,382	86.0
Least deprived	5,587	5,530	99.0	5,403	96.7	5,363	96.0	5,339	95.6	5,163	92.4
Most deprived	7,322	7,210	98.5	6,781	92.6	6,462	88.3	6,390	87.3	5,697	77.8
Cohort 2											
Whole cohort	36,566	36,024	98.5	34,735	95.0	33,848	92.6	33,627	92.0	29,966	82.0
Least deprived	5,274	5,211	98.8	5,112	96.9	5,064	96.0	5,037	95.5	4,730	89.7
Most deprived	7,565	7,421	98.1	6,995	92.5	6,641	87.8	6,582	87.0	5,544	73.3
Cohort 3											
Whole cohort	9,311	9,208	98.9	8,892	95.5			2,357	25.3		
Least deprived	1,577	1,560	98.9	1,537	97.5			210	13.3		
Most deprived	1,918	1,888	98.4	1,790	93.3			752	39.2		
Cohort 4											
Whole cohort	45,777	45,334	99.0	43,199	94.4						
Least deprived	5,726	5,678	99.2	5,528	96.5						
Most deprived	9,932	9,801	98.7	9,190	92.5						

Least and most deprived areas are the SIMD 2006 15% least and most deprived data zones in Scotland

Table 29 Difference in the percentage of children from the least and most deprived areas with a CHSP-PS record of receiving the specified CHS reviews, by cohort

Cohort	Number (%) with CHSP-PS record of receiving specified CHS review				
	10 day	6-8 week	8-9 month	21-24 month / 2 year	39-42 month
Cohort 1					
% difference (least-most deprived)	0.5	4.1	7.7	8.3	14.6
95% CI	0.1 – 0.9	3.3 – 4.9	6.8 – 8.6	7.4 – 9.2	13.4 – 15.8
p value	0.015	<0.0001	<0.0001	<0.0001	<0.0001
Cohort 2					
% difference (least-most deprived)	0.7	4.5	8.2	8.5	16.4
95% CI	0.3 – 1.1	3.7 – 5.2	7.3 – 9.1	7.6 – 9.4	15.1 – 17.7
p value	0.002	<0.0001	<0.0001	<0.0001	<0.0001
Cohort 3					
% difference (least-most deprived)	0.5	4.1		-25.9	
95% CI	-0.3 – 1.3	2.8 – 5.5		-28.6 – -23.1	
p value	0.274	<0.0001		<0.0001	
Cohort 4					
% difference (least-most deprived)	0.5	4.0			
95% CI	0.1 – 0.8	3.3 – 4.7			
p value	0.008	<0.0001			

Least and most deprived areas are the SIMD 2006 15% least and most deprived data zones in Scotland

Figure 5 Percentage of children with a CHSP-PS record of receiving the specified CHS reviews, by cohort

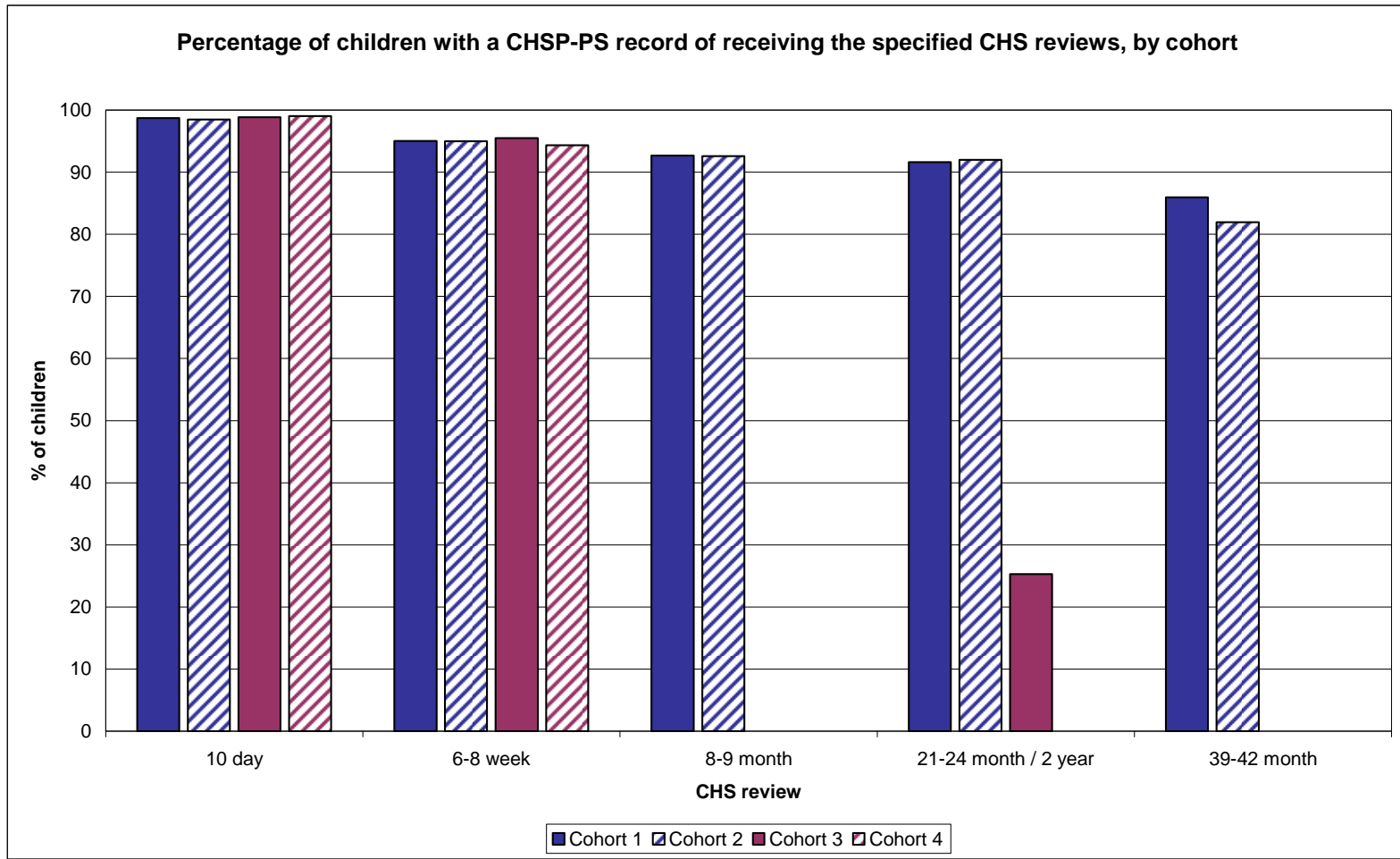
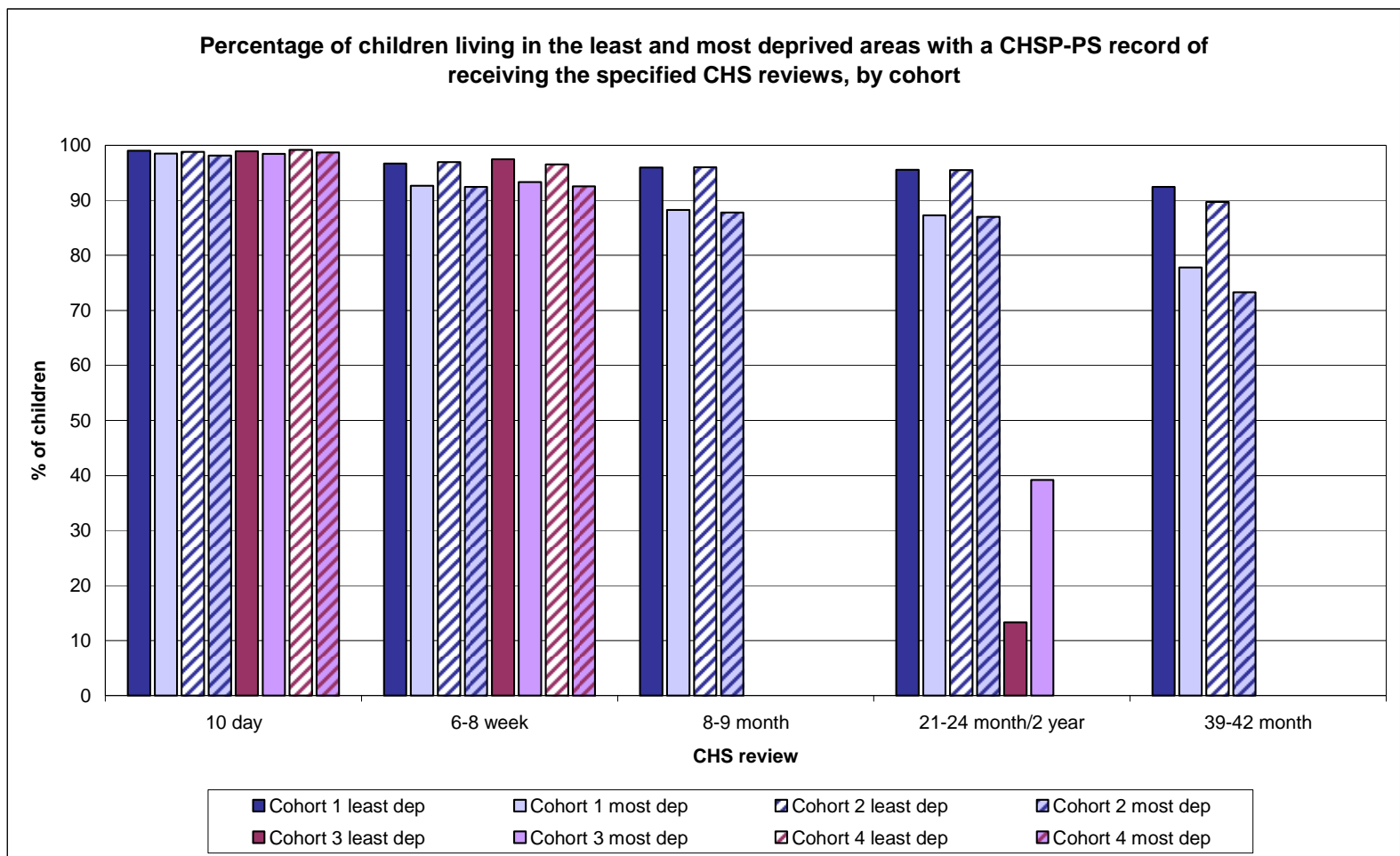


Figure 6 Percentage of children living in the least and most deprived areas with a CHSP-PS record of receiving the specified CHS reviews, by cohort



Least and most deprived areas are the SIMD 2006 15% least and most deprived data zones in Scotland

Table 30 and Figure 7 to Figure 10 show the recorded coverage for all the CHS reviews for children from each cohort living in each of the five deprivation quintiles rather than just the least and most deprived areas. A clear deprivation gradient is evident for the 6-8 week, 8-9 month, 21-24 month, and 39-42 month reviews for all cohorts that were offered these reviews. The slope of the gradient increases for reviews provided at older ages. The pattern across deprivation quintiles is less clear for the 10 day review. Recorded coverage of the 10 day review was high for all cohorts and although the least deprived quintile always had higher coverage than the most deprived quintile, no clear gradient was evident for the intermediate deprivation groups.

The pattern of recorded review coverage across the deprivation quintiles is very similar for each cohort. There is no evidence of a flattening of the gradient after the change in the review schedule.

The selective 2 year review shows a reverse gradient with deprivation. Cohort 3 children from increasingly deprived quintiles are increasingly likely to have a record of receiving this review.

Table 30 Number and percentage of children with a CHSP-PS record of receiving the specified CHS reviews, by cohort and deprivation quintile

Cohort and deprivation status	Number of children	Number (%) with CHSP-PS record of receiving specified CHS review									
		10 day		6-8 week		8-9 month		21-24 month / 2 year		39-42 month	
		N	%	N	%	N	%	N	%	N	%
Cohort 1											
Deprivation quintile 1	7,333	7,257	99.0	7,076	96.5	7,018	95.7	6,988	95.3	6,760	92.2
Deprivation quintile 2	6,552	6,476	98.8	6,331	96.6	6,217	94.9	6,144	93.8	5,886	89.8
Deprivation quintile 3	6,111	6,027	98.6	5,818	95.2	5,732	93.8	5,651	92.5	5,317	87.0
Deprivation quintile 4	7,763	7,657	98.6	7,372	95.0	7,141	92.0	7,055	90.9	6,631	85.4
Deprivation quintile 5	9,566	9,429	98.6	8,874	92.8	8,495	88.8	8,373	87.5	7,496	78.4
Cohort 2											
Deprivation quintile 1	6,902	6,818	98.8	6,694	97.0	6,627	96.0	6,586	95.4	6,132	88.8
Deprivation quintile 2	6,313	6,235	98.8	6,046	95.8	5,992	94.9	5,950	94.2	5,485	86.9
Deprivation quintile 3	6,098	6,004	98.5	5,833	95.7	5,737	94.1	5,711	93.7	5,146	84.4
Deprivation quintile 4	7,347	7,241	98.6	6,959	94.7	6,724	91.5	6,681	90.9	5,886	80.1
Deprivation quintile 5	9,778	9,603	98.2	9,084	92.9	8,656	88.5	8,584	87.8	7,224	73.9
Cohort 3											
Deprivation quintile 1	1,949	1,931	99.1	1,890	97.0			274	14.1		
Deprivation quintile 2	1,619	1,605	99.1	1,560	96.4			318	19.6		
Deprivation quintile 3	1,472	1,456	98.9	1,408	95.7			303	20.6		
Deprivation quintile 4	1,885	1,866	99.0	1,800	95.5			545	28.9		
Deprivation quintile 5	2,353	2,319	98.6	2,205	93.7			904	38.4		
Cohort 4											
Deprivation quintile 1	7,543	7,484	99.2	7,275	96.4						
Deprivation quintile 2	7,702	7,622	99.0	7,374	95.7						
Deprivation quintile 3	7,802	7,745	99.3	7,362	94.4						
Deprivation quintile 4	9,843	9,752	99.1	9,246	93.9						
Deprivation quintile 5	12,734	12,585	98.8	11,801	92.7						

SIMD 2006 deprivation quintiles: deprivation quintile 1 is the least deprived

Figure 7 Percentage of children with a CHSP-PS record of receiving the specified CHS reviews, by deprivation quintile, cohort 1

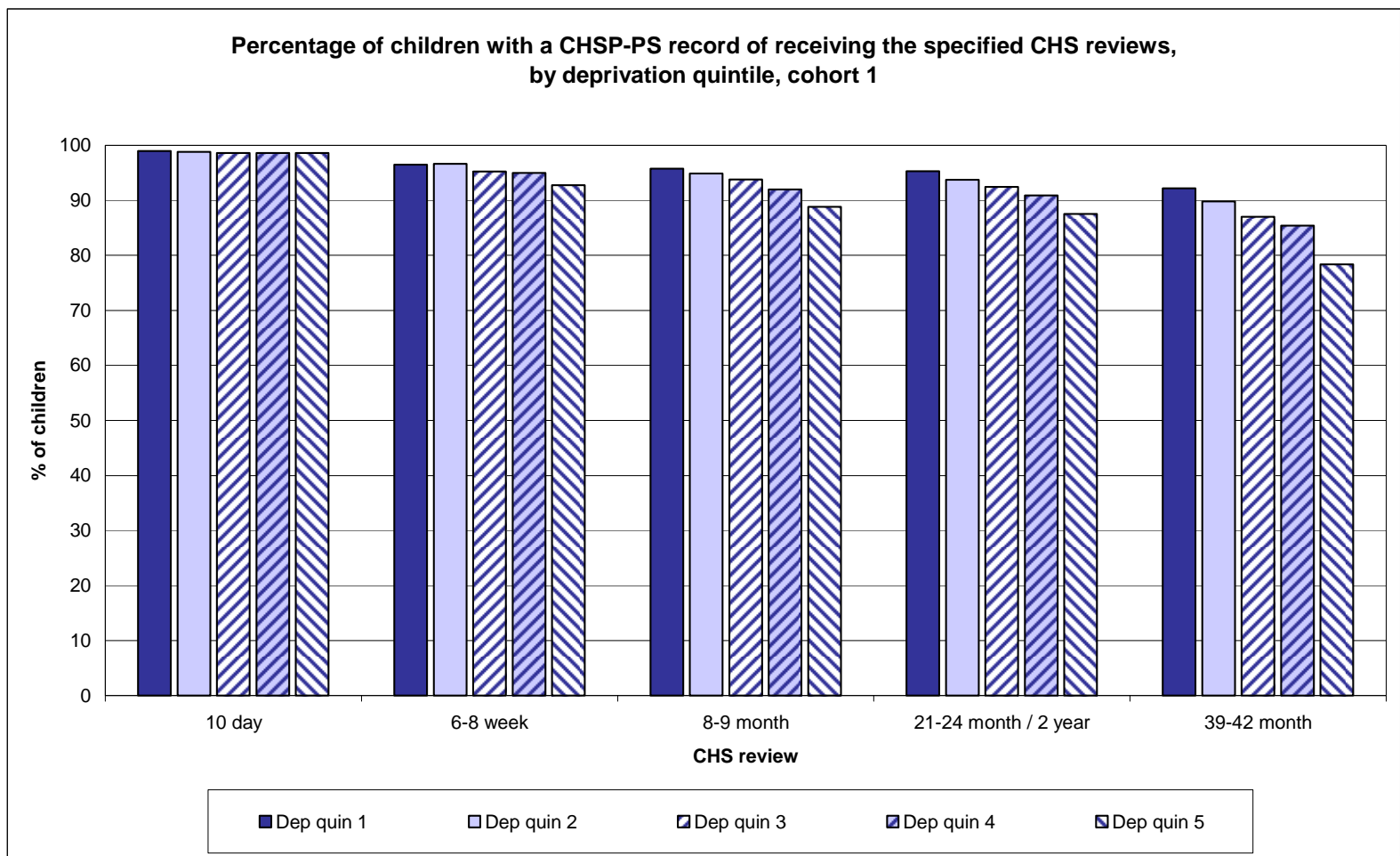
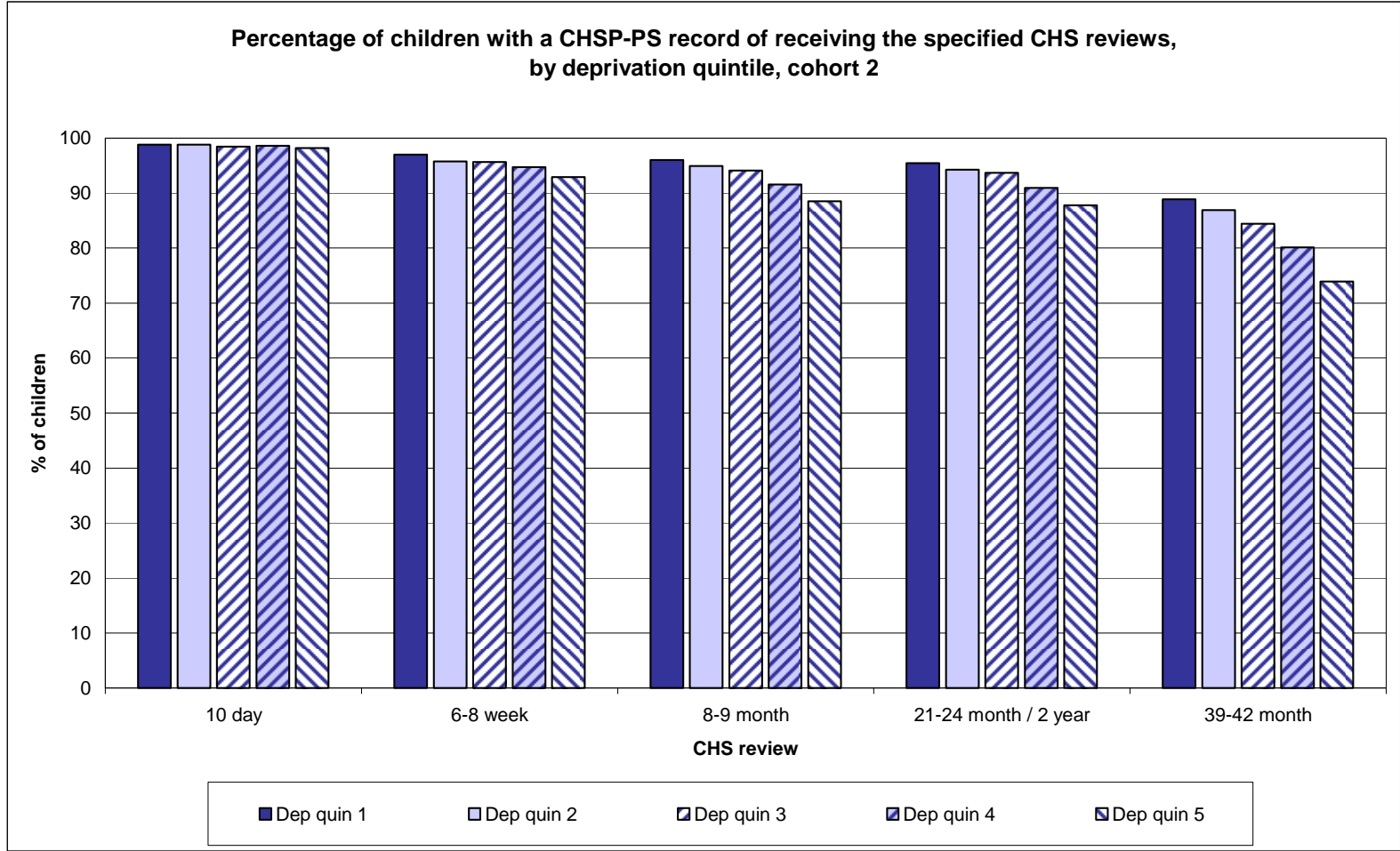
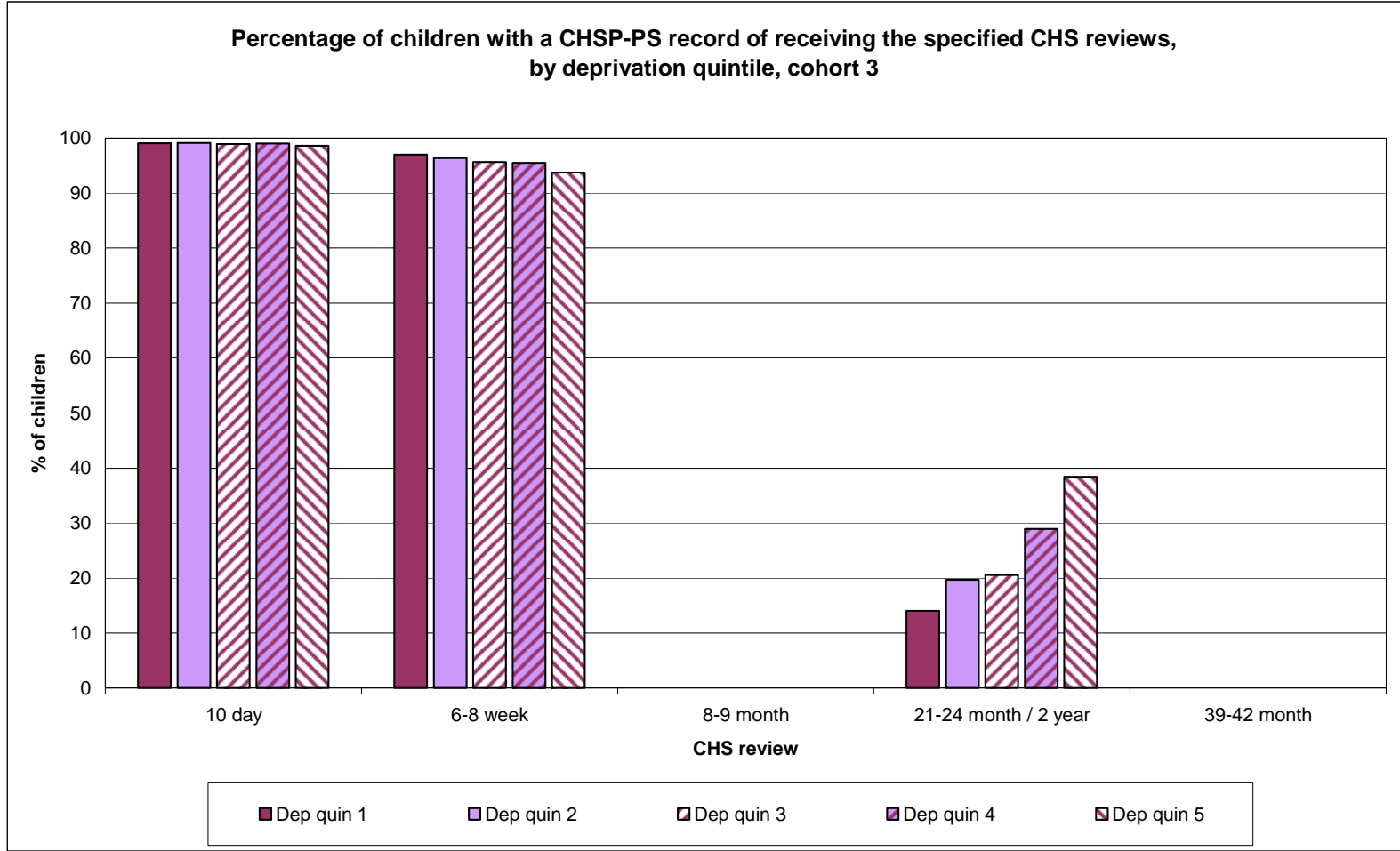


Figure 8 Percentage of children with a CHSP-PS record of receiving the specified CHS reviews, by deprivation quintile, cohort 2



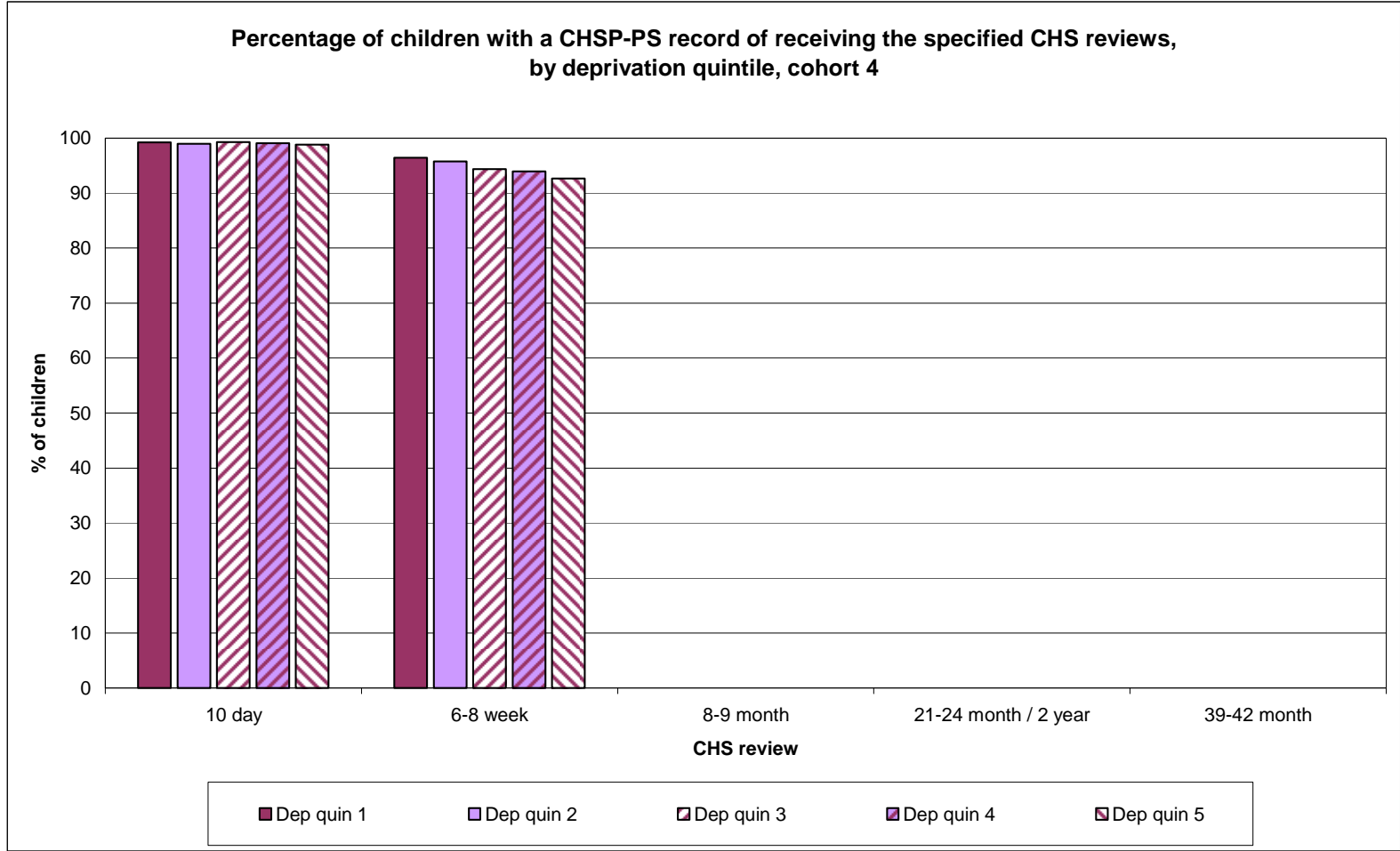
SIMD 2006 deprivation quintiles: deprivation quintile 1 is the least deprived

Figure 9 Percentage of children with a CHSP-PS record of receiving the specified CHS reviews, by deprivation quintile, cohort 3



SIMD 2006 deprivation quintiles: deprivation quintile 1 is the least deprived

Figure 10 Percentage of children with a CHSP-PS record of receiving the specified CHS reviews, by deprivation quintile, cohort 4



SIMD 2006 deprivation quintiles: deprivation quintile 1 is the least deprived

The percentage of children with a CHSP-PS record of receiving their child health reviews within the recommended age limit is shown in Table 31. Comparing Table 28 and Table 31 shows that considerable numbers of children are recorded as receiving their reviews above the recommended upper age limit. Around 3-4% of children with a CHSP-PS record of receiving a 6-8 week review are recorded as receiving this review late, i.e. after 12 weeks of age (see Table 26 for review upper age limits). The comparable figure for the later universally offered reviews is 5-6%. The 6-8 week review is scheduled for 6-8 weeks after a child's due date rather than their actual date of delivery if they were born preterm (<37 completed week's gestation), hence it is likely that some of the 'late' 6-8 week reviews are a result of appropriate gestational correction in review timing. This does not apply to reviews provided at older ages.

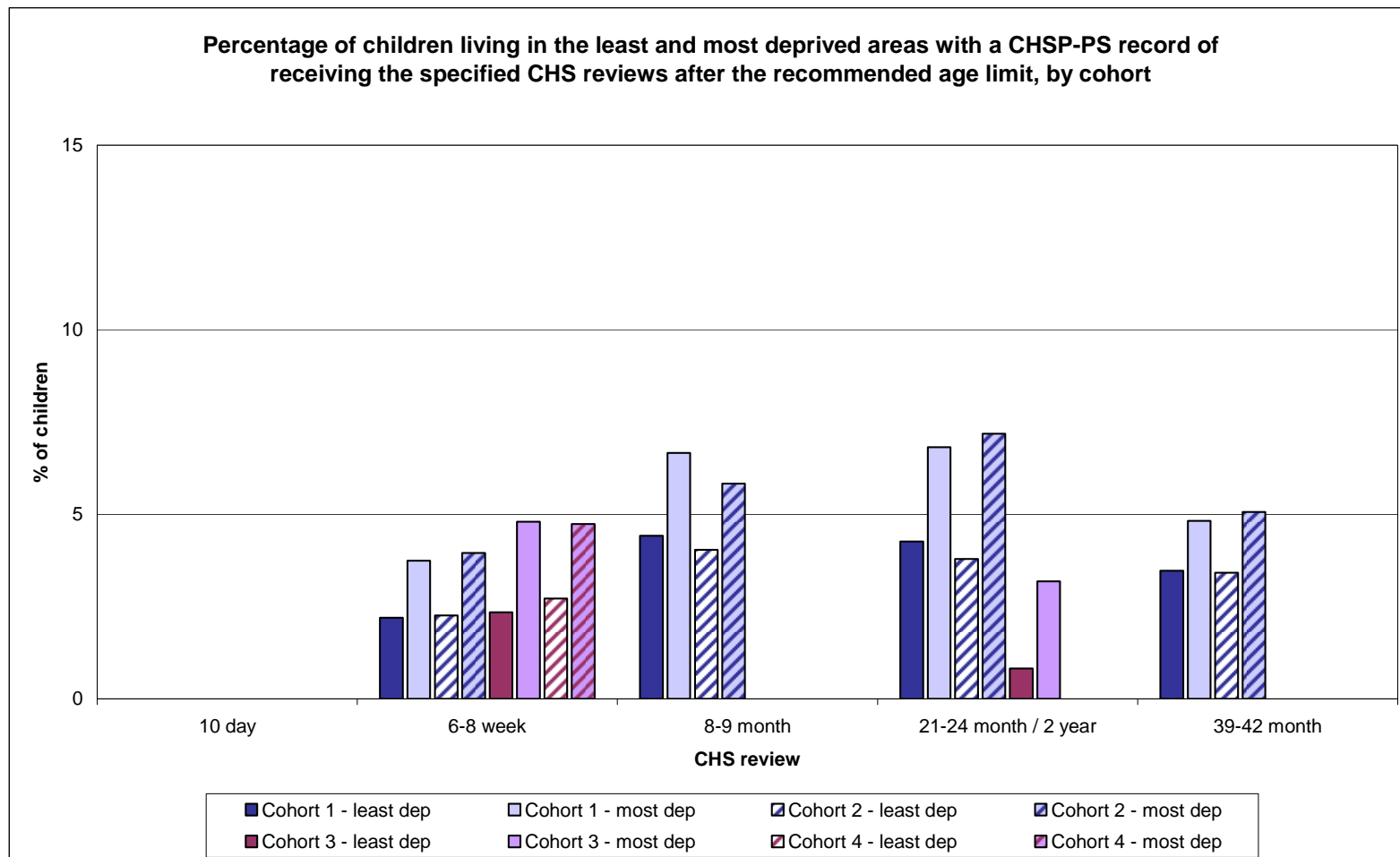
Table 31 and Figure 11 show that children from the least deprived areas are less likely than children from the most deprived areas to receive their reviews late. For example, for cohort 4, 93.8% of children from the least deprived areas had a record of receiving a 6-8 week review before 12 weeks of age (96.5% at any age, 2.7% discrepancy) compared to 87.8% of children from the most deprived areas (92.5% at any age, 4.7% discrepancy). The difference between least and most deprived groups is similar across all the cohorts. Overall this means that if only timely reviews (those recorded as provided within the recommended age range) were included, overall review coverage calculated using CHSP-PS would be substantially reduced and estimated inequalities in coverage between least and most deprived groups would be considerably wider. Some of the higher 'late' 6-8 week review rate for deprived babies may be explained by higher prematurity rates in deprived areas (see <http://www.isdscotland.org/Health-Topics/Maternity-and-Births/Births/>) and associated gestational correction in scheduling of the 6-8 week review as discussed above.

Table 31 Number and percentage of children with a CHSP-PS record of receiving the specified CHS reviews within the recommended age limit, by cohort
Whole cohort and children living in least and most deprived areas

Cohort and deprivation status	Number of children	Number (%) with CHSP-PS record of receiving specified CHS review within recommended age limit									
		10 day		6-8 week		8-9 month		21-24 month / 2 year		39-42 month	
		N	%	N	%	N	%	N	%	N	%
Cohort 1											
Whole cohort	37,668	N/a		34,676	92.1	32,801	87.1	32,426	86.1	30,609	81.3
Least deprived	5,587	N/a		5,280	94.5	5,116	91.6	5,101	91.3	4,969	88.9
Most deprived	7,322	N/a		6,507	88.9	5,974	81.6	5,891	80.5	5,344	73.0
Cohort 2											
Whole cohort	36,566	N/a		33,615	91.9	32,032	87.6	31,653	86.6	28,161	77.0
Least deprived	5,274	N/a		4,993	94.7	4,851	92.0	4,837	91.7	4,550	86.3
Most deprived	7,565	N/a		6,696	88.5	6,200	82.0	6,039	79.8	5,161	68.2
Cohort 3											
Whole cohort	9,311	N/a		8,544	91.8			2,177	23.4		
Least deprived	1,577	N/a		1,500	95.1			197	12.5		
Most deprived	1,918	N/a		1,698	88.5			691	36.0		
Cohort 4											
Whole cohort	45,777	N/a		41,418	90.5						
Least deprived	5,726	N/a		5,372	93.8						
Most deprived	9,932	N/a		8,720	87.8						

Least and most deprived areas are the SIMD 2006 15% least and most deprived data zones in Scotland

Figure 11 Percentage of children living in the least and most deprived areas recorded as receiving the specified CHS reviews after the recommended age limit, by cohort



Least and most deprived areas are the SIMD 2006 15% least and most deprived data zones in Scotland

Recorded review coverage for all children is shown for each NHS Board area and each cohort in Table 32 to Table 35 and Figure 12 to Figure 15. There is some variation in the overall recorded coverage of the child health reviews between different Boards and across cohorts but in general the pattern of coverage is broadly consistent, with coverage being highest for the 10 day review then declining for reviews provided at older ages. Particular points of variation include relatively low recorded coverage of the 6-8 week review for cohort 1 in Ayrshire and Arran; of the 39-42 month review for cohort 2 in Lanarkshire; and of the 6-8 week review for cohort 4 in both Forth Valley and Lanarkshire, but in general no systematic differences between Boards or between cohorts are evident.

Recorded review coverage for children living in the least and most deprived areas is also shown for each NHS Board area and each cohort in Table 32 to Table 35. The difference between least and most deprived groups is shown in Table 36 and in Figure 16 to Figure 19. Again, in general the level and pattern of inequality in coverage is similar between Boards and across cohorts. Inequality in coverage tends to be lowest for the 10 day review then increase for reviews provided at older ages. The results for NHS Borders appear somewhat discrepant but Borders is by far the smallest Board included in the analysis and the confidence intervals around its coverage rates are very wide.

All Boards show higher recorded coverage of the 2 year selective review among children living in the most deprived compared to the least deprived areas. NHS Greater Glasgow appears to have focused delivery of the selective review particularly strongly on children living in the most deprived areas.

Table 32 Number and percentage of children with a CHSP-PS record of receiving the specified CHS reviews, by NHS Board, cohort 1
Whole cohort and children living in least and most deprived areas

Cohort 1 NHS Board	Number of children	Number (%) with CHSP-PS record of receiving specified CHS review									
		10 day		6-8 week		8-9 month		21-24 month / 2 year		39-42 month	
		N	%	N	%	N	%	N	%	N	%
Argyll & Clyde											
Whole cohort	3,831	3,709	96.8	3,585	93.6	3,496	91.3	3,381	88.3	3,159	82.5
Least deprived	390	376	96.4	372	95.4	364	93.3	358	91.8	347	89.0
Most deprived	882	854	96.8	801	90.8	765	86.7	737	83.6	654	74.1
Ayrshire & Arran											
Whole cohort	3,283	3,211	97.8	2,870	87.4	2,849	86.8	2,773	84.5	2,727	83.1
Least deprived	385	380	98.7	325	84.4	351	91.2	346	89.9	349	90.6
Most deprived	575	563	97.9	508	88.3	495	86.1	458	79.7	428	74.4
Borders											
Whole cohort	843	840	99.6	793	94.1	809	96.0	804	95.4	715	84.8
Least deprived	66	66	100.0	61	92.4	62	93.9	62	93.9	57	86.4
Most deprived	22	22	100.0	20	90.9	22	100.0	22	100.0	18	81.8
Fife											
Whole cohort	3,177	3,120	98.2	3,022	95.1	2,955	93.0	3,026	95.2	2,740	86.2
Least deprived	353	349	98.9	338	95.8	339	96.0	334	94.6	301	85.3
Most deprived	432	423	97.9	411	95.1	386	89.4	398	92.1	367	85.0
Forth Valley											
Whole cohort	2,657	2,636	99.2	2,550	96.0	2,448	92.1	2,520	94.8	2,402	90.4
Least deprived	339	336	99.1	330	97.3	316	93.2	330	97.3	324	95.6
Most deprived	353	350	99.2	332	94.1	330	93.5	323	91.5	295	83.6

Cohort 1 NHS Board	Number of children	Number (%) with CHSP-PS record of receiving specified CHS review									
		10 day		6-8 week		8-9 month		21-24 month / 2 year		39-42 month	
		N	%	N	%	N	%	N	%	N	%
Greater Glasgow											
Whole cohort	7,229	7,108	98.3	6,870	95.0	6,721	93.0	6,588	91.1	6,090	84.2
Least deprived	1,130	1,108	98.1	1,100	97.3	1,094	96.8	1,086	96.1	1,047	92.7
Most deprived	2,562	2,519	98.3	2,370	92.5	2,286	89.2	2,256	88.1	1,981	77.3
Lanarkshire											
Whole cohort	5,796	5,738	99.0	5,537	95.5	5,381	92.8	5,265	90.8	4,895	84.5
Least deprived	481	476	99.0	472	98.1	461	95.8	458	95.2	438	91.1
Most deprived	1,011	1,000	98.9	933	92.3	888	87.8	892	88.2	772	76.4
Lothian											
Whole cohort	7,420	7,396	99.7	7,211	97.2	6,972	94.0	6,880	92.7	6,602	89.0
Least deprived	2,080	2,076	99.8	2,047	98.4	2,020	97.1	2,011	96.7	1,954	93.9
Most deprived	882	878	99.5	835	94.7	739	83.8	744	84.4	699	79.3
Tayside											
Whole cohort	3,432	3,427	99.9	3,357	97.8	3,282	95.6	3,283	95.7	3,052	88.9
Least deprived	363	363	100.0	358	98.6	356	98.1	354	97.5	346	95.3
Most deprived	603	601	99.7	571	94.7	551	91.4	560	92.9	483	80.1
All included Boards											
Whole cohort	37,668	37,185	98.7	35,795	95.0	34,913	92.7	34,520	91.6	32,382	86.0
Least deprived	5,587	5,530	99.0	5,403	96.7	5,363	96.0	5,339	95.6	5,163	92.4
Most deprived	7,322	7,210	98.5	6,781	92.6	6,462	88.3	6,390	87.3	5,697	77.8

Least and most deprived areas are the SIMD 2006 15% least and most deprived data zones in Scotland

Table 33 Number and percentage of children with a CHSP-PS record of receiving the specified CHS reviews, by NHS Board, cohort 2
Whole cohort and children living in least and most deprived areas

Cohort 2 NHS Board	Number of children	Number (%) with CHSP-PS record of receiving specified CHS review									
		10 day		6-8 week		8-9 month		21-24 month / 2 year		39-42 month	
		N	%	N	%	N	%	N	%	N	%
Argyll & Clyde											
Whole cohort	3,491	3,390	97.1	3,260	93.4	3,212	92.0	3,159	90.5	2,835	81.2
Least deprived	371	358	96.5	350	94.3	356	96.0	355	95.7	324	87.3
Most deprived	770	748	97.1	706	91.7	683	88.7	667	86.6	587	76.2
Ayrshire & Arran											
Whole cohort	3,213	3,108	96.7	2,911	90.6	2,805	87.3	2,905	90.4	2,498	77.7
Least deprived	319	314	98.4	297	93.1	289	90.6	296	92.8	263	82.4
Most deprived	611	581	95.1	551	90.2	503	82.3	531	86.9	435	71.2
Borders											
Whole cohort	871	863	99.1	816	93.7	818	93.9	842	96.7	703	80.7
Least deprived	55	55	100.0	51	92.7	48	87.3	53	96.4	42	76.4
Most deprived	25	25	100.0	22	88.0	25	100.0	23	92.0	19	76.0
Fife											
Whole cohort	3,136	3,089	98.5	3,031	96.7	2,919	93.1	2,960	94.4	2,686	85.7
Least deprived	383	377	98.4	363	94.8	362	94.5	374	97.7	347	90.6
Most deprived	421	416	98.8	403	95.7	379	90.0	391	92.9	343	81.5
Forth Valley											
Whole cohort	2,495	2,445	98.0	2,352	94.3	2,333	93.5	2,316	92.8	2,210	88.6
Least deprived	296	287	97.0	280	94.6	282	95.3	276	93.2	269	90.9
Most deprived	337	330	97.9	311	92.3	301	89.3	308	91.4	281	83.4

Cohort 2 NHS Board	Number of children	Number (%) with CHSP-PS record of receiving specified CHS review									
		10 day		6-8 week		8-9 month		21-24 month / 2 year		39-42 month	
		N	%	N	%	N	%	N	%	N	%
Greater Glasgow											
Whole cohort	7,501	7,331	97.7	7,028	93.7	6,853	91.4	6,657	88.7	5,994	79.9
Least deprived	1,171	1,148	98.0	1,139	97.3	1,130	96.5	1,104	94.3	1,048	89.5
Most deprived	2,866	2,792	97.4	2,610	91.1	2,503	87.3	2,447	85.4	2,084	72.7
Lanarkshire											
Whole cohort	5,428	5,394	99.4	5,179	95.4	5,044	92.9	4,981	91.8	3,966	73.1
Least deprived	438	435	99.3	428	97.7	421	96.1	423	96.6	357	81.5
Most deprived	1,037	1,033	99.6	973	93.8	921	88.8	892	86.0	660	63.6
Lothian											
Whole cohort	7,072	7,057	99.8	6,915	97.8	6,667	94.3	6,659	94.2	6,213	87.9
Least deprived	1,919	1,915	99.8	1,889	98.4	1,863	97.1	1,848	96.3	1,796	93.6
Most deprived	873	873	100.0	834	95.5	771	88.3	784	89.8	678	77.7
Tayside											
Whole cohort	3,359	3,347	99.6	3,243	96.5	3,197	95.2	3,148	93.7	2,861	85.2
Least deprived	322	322	100.0	315	97.8	313	97.2	308	95.7	284	88.2
Most deprived	625	623	99.7	585	93.6	555	88.8	539	86.2	457	73.1
All included Boards											
Whole cohort	36,566	36,024	98.5	34,735	95.0	33,848	92.6	33,627	92.0	29,966	82.0
Least deprived	5,274	5,211	98.8	5,112	96.9	5,064	96.0	5,037	95.5	4,730	89.7
Most deprived	7,565	7,421	98.1	6,995	92.5	6,641	87.8	6,582	87.0	5,544	73.3

Least and most deprived areas are the SIMD 2006 15% least and most deprived data zones in Scotland

Table 34 Number and percentage of children with a CHSP-PS record of receiving the specified CHS reviews, by NHS Board, cohort 3
Whole cohort and children living in least and most deprived areas

Cohort 3 NHS Board	Number of children	Number (%) with CHSP-PS record of receiving specified CHS review									
		10 day		6-8 week		8-9 month		21-24 month / 2 year		39-42 month	
		N	%	N	%	N	%	N	%	N	%
Argyll & Clyde											
Whole cohort	1,312	1,297	98.9	1,255	95.7			305	23.2		
Least deprived	128	127	99.2	124	96.9			20	15.6		
Most deprived	261	258	98.9	249	95.4			78	29.9		
Borders											
Whole cohort	337	329	97.6	323	95.8			79	23.4		
Least deprived	24	24	100.0	23	95.8			5	20.8		
Most deprived	15	15	100.0	15	100.0			6	40.0		
Fife											
Whole cohort	1,185	1,171	98.8	1,138	96.0			220	18.6		
Least deprived	170	169	99.4	164	96.5			19	11.2		
Most deprived	148	146	98.6	144	97.3			39	26.4		
Forth Valley											
Whole cohort	968	963	99.5	909	93.9			248	25.6		
Least deprived	109	107	98.2	105	96.3			19	17.4		
Most deprived	130	130	100.0	118	90.8			46	35.4		
Greater Glasgow											
Whole cohort	2,772	2,714	97.9	2,590	93.4			852	30.7		
Least deprived	375	363	96.8	359	95.7			33	8.8		
Most deprived	1,070	1,046	97.8	978	91.4			461	43.1		

Cohort 3 NHS Board	Number of children	Number (%) with CHSP-PS record of receiving specified CHS review									
		10 day		6-8 week		8-9 month		21-24 month / 2 year		39-42 month	
		N	%	N	%	N	%	N	%	N	%
Lothian											
Whole cohort	2,737	2,734	99.9	2,677	97.8			653	23.9		
Least deprived	770	769	99.9	761	98.8			114	14.8		
Most deprived	294	293	99.7	286	97.3			122	41.5		
All included Boards											
Whole cohort	9,311	9,208	98.9	8,892	95.5			2,357	25.3		
Least deprived	1,576	1,559	98.9	1,536	97.5			210	13.3		
Most deprived	1,918	1,888	98.4	1,790	93.3			752	39.2		

Least and most deprived areas are the SIMD 2006 15% least and most deprived data zones in Scotland

Table 35 Number and percentage of children with a CHSP-PS record of receiving the specified CHS reviews, by NHS Board, cohort 4
Whole cohort and children living in least and most deprived areas

Cohort 4 NHS Board	Number of children	Number (%) with CHSP-PS record of receiving specified CHS review									
		10 day		6-8 week		8-9 month		21-24 month / 2 year		39-42 month	
		N	%	N	%	N	%	N	%	N	%
Argyll & Clyde											
Whole cohort	4,127	4,100	99.3	3,930	95.2						
Least deprived	306	305	99.7	293	95.8						
Most deprived	1,000	996	99.6	959	95.9						
Ayrshire & Arran											
Whole cohort	3,770	3,724	98.8	3,633	96.4						
Least deprived	306	302	98.7	297	97.1						
Most deprived	750	743	99.1	726	96.8						
Borders											
Whole cohort	1,038	1,035	99.7	990	95.4						
Least deprived	69	68	98.6	66	95.7						
Most deprived	51	51	100.0	48	94.1						
Fife											
Whole cohort	4,067	3,997	98.3	3,925	96.5						
Least deprived	545	531	97.4	535	98.2						
Most deprived	541	534	98.7	523	96.7						
Forth Valley											
Whole cohort	3,269	3,238	99.1	2,971	90.9						
Least deprived	351	349	99.4	315	89.7						
Most deprived	462	460	99.6	413	89.4						

Cohort 4 NHS Board	Number of children	Number (%) with CHSP-PS record of receiving specified CHS review									
		10 day		6-8 week		8-9 month		21-24 month / 2 year		39-42 month	
		N	%	N	%	N	%	N	%	N	%
Greater Glasgow											
Whole cohort	9,695	9,503	98.0	9,013	93.0						
Least deprived	1,123	1,100	98.0	1,072	95.5						
Most deprived	3,932	3,838	97.6	3,592	91.4						
Lanarkshire											
Whole cohort	6,372	6,305	98.9	5,554	87.2						
Least deprived	403	400	99.3	353	87.6						
Most deprived	1,239	1,223	98.7	1,026	82.8						
Lothian											
Whole cohort	9,274	9,271	100.0	9,125	98.4						
Least deprived	2,287	2,287	100.0	2,267	99.1						
Most deprived	1,084	1,083	99.9	1,061	97.9						
Tayside											
Whole cohort	4,165	4,161	99.9	4,058	97.4						
Least deprived	336	336	100.0	330	98.2						
Most deprived	873	873	100.0	842	96.4						
All included Boards											
Whole cohort	45,777	45,334	99.0	43,199	94.4						
Least deprived	5,726	5,678	99.2	5,528	96.5						
Most deprived	9,932	9,801	98.7	9,190	92.5						

Least and most deprived areas are the SIMD 2006 15% least and most deprived data zones in Scotland

Figure 12 Percentage of children with a CHSP-PS record of receiving the specified CHS reviews, by NHS Board, cohort 1

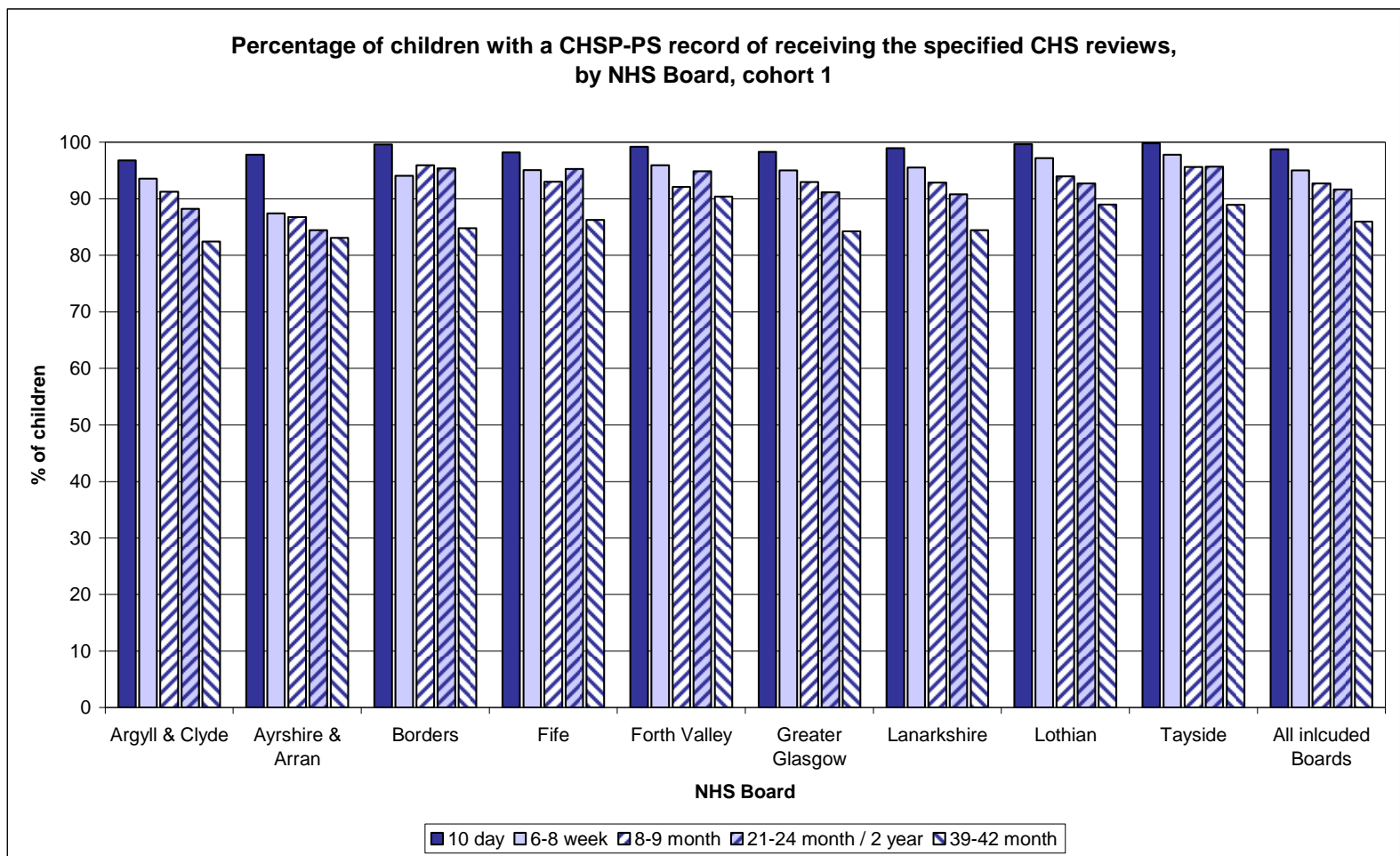


Figure 13 Percentage of children with a CHSP-PS record of receiving the specified CHS reviews, by NHS Board, cohort 2

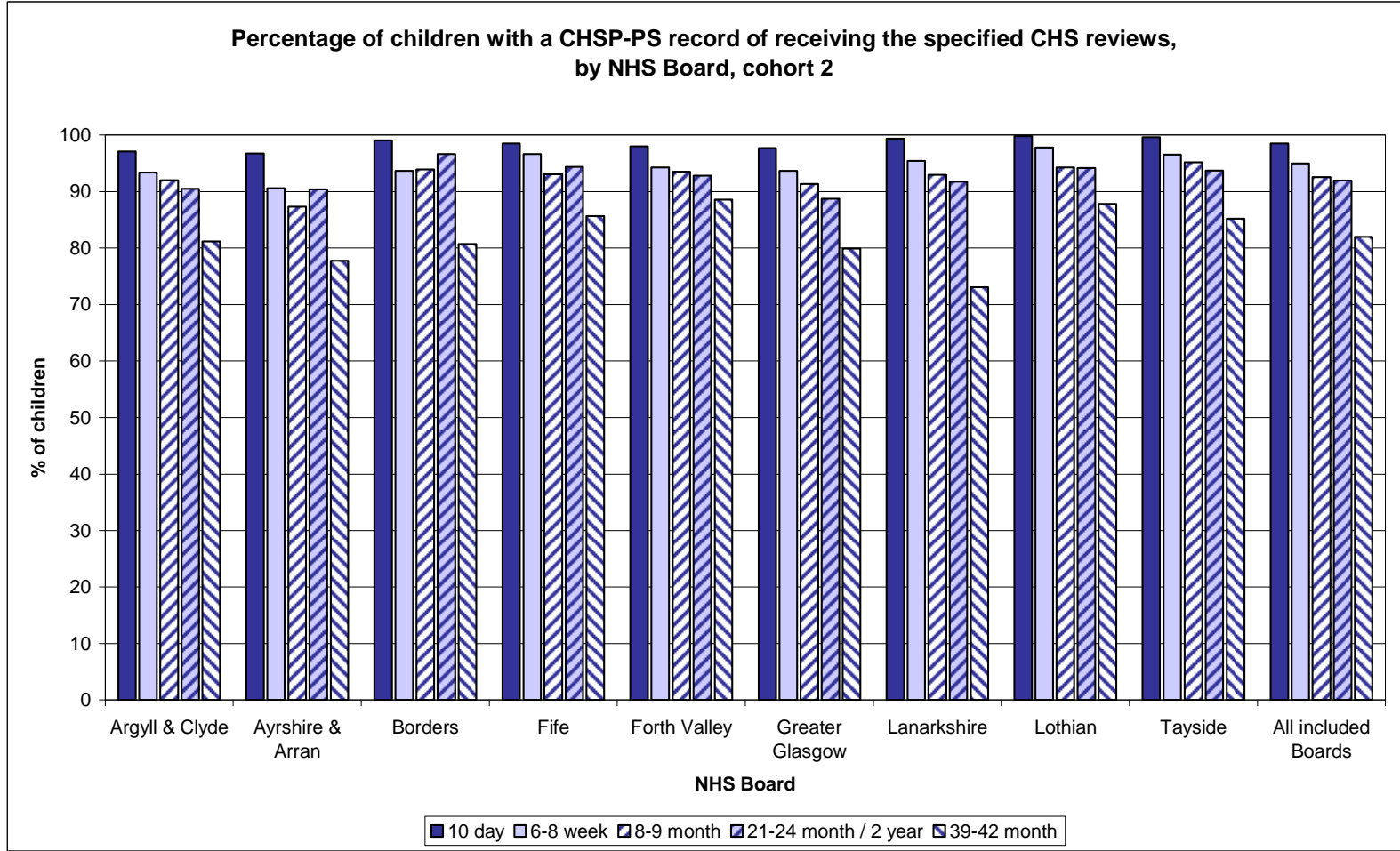


Figure 14 Percentage of children with a CHSP-PS record of receiving the specified CHS reviews, by NHS Board, cohort 3

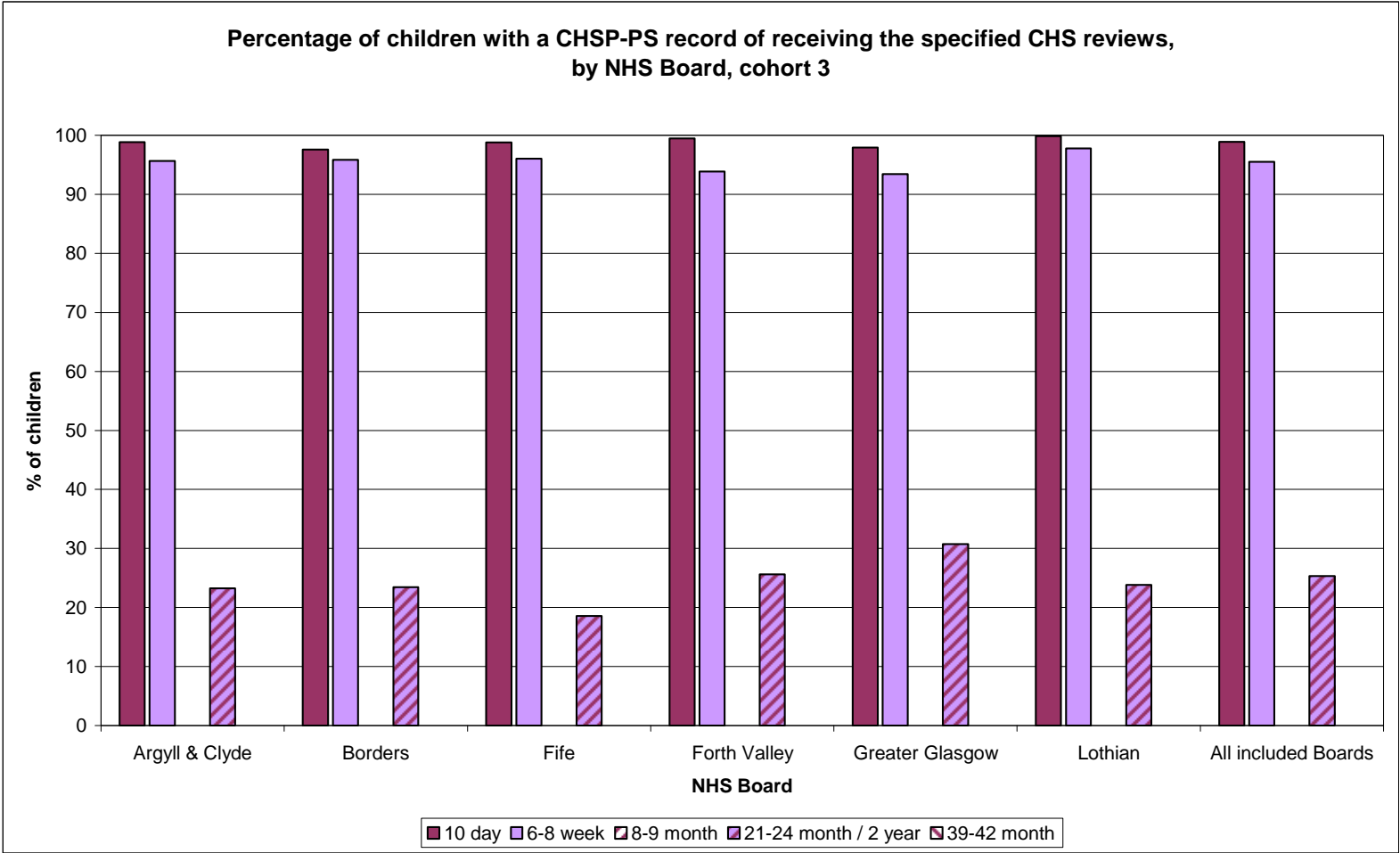


Figure 15 Percentage of children with a CHSP-PS record of receiving the specified CHS reviews, by NHS Board, cohort 4

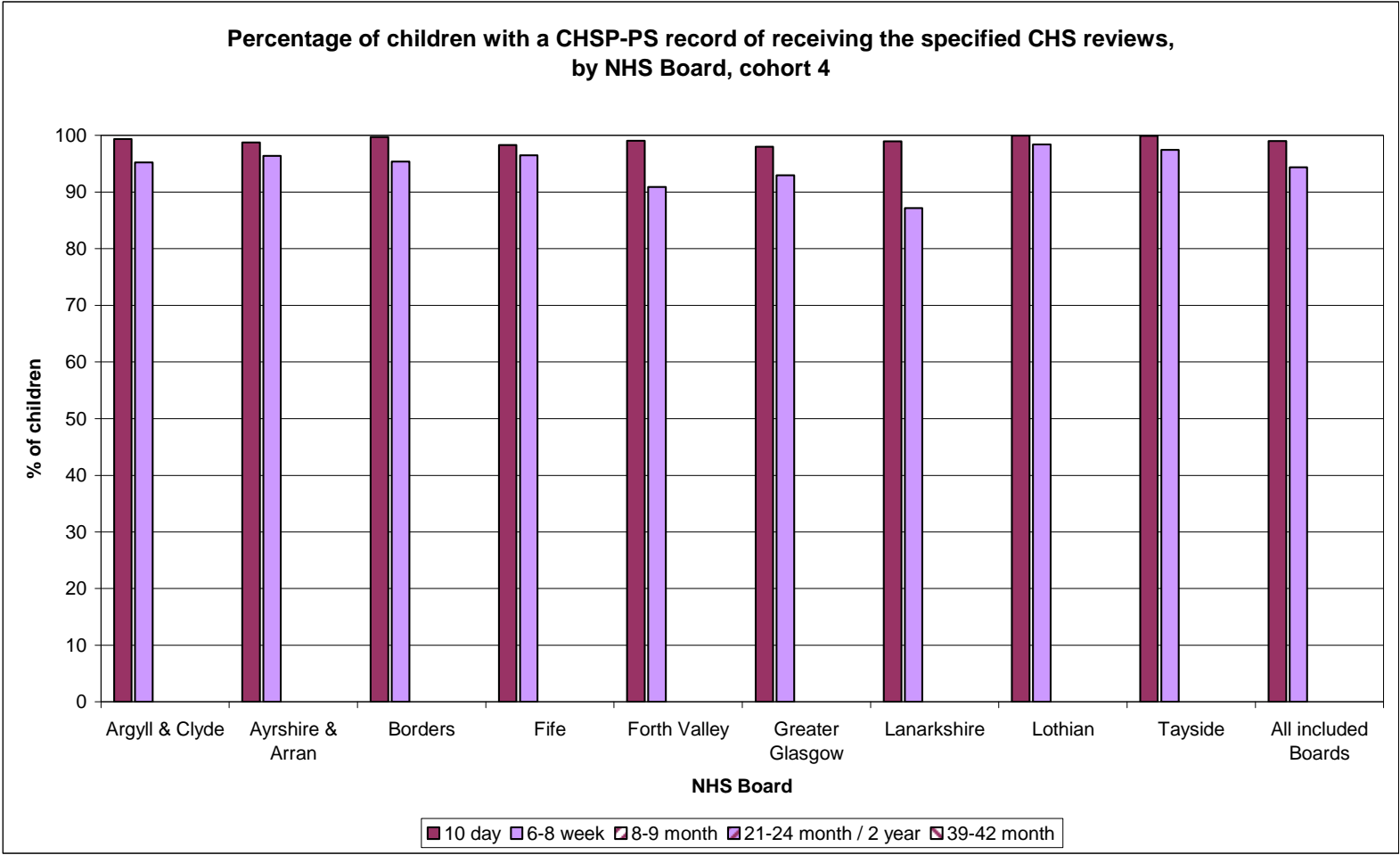


Table 36 Difference in the percentage of children from the least and most deprived areas with a CHSP-PS record of receiving the specified CHS reviews, by cohort and NHS Board

Cohort and NHS Board	Difference in the % of children from the least and most deprived areas with a record of receiving the specified CHS review														
	10 day			6-8 week			8-9 month			21-24 month / 2 year			39-42 month		
	Diff	95% CI		Diff	95% CI		Diff	95% CI		Diff	95% CI		Diff	95% CI	
Cohort 1															
Argyll & Clyde	-0.4	-3.0	1.6	4.6	1.5	7.2	6.6	3.0	9.8	8.2	4.3	11.7	14.8	10.4	18.9
Ayrshire & Arran	0.8	-1.1	2.5	-3.9	-8.5	0.4	5.1	0.9	9.0	10.2	5.6	14.6	16.2	11.5	20.7
Borders	0.0	-5.5	14.9	1.5	-9.6	20.7	-6.1	-14.6	9.3	-6.1	-14.6	9.3	4.5	-10.4	25.8
Fife	1.0	-1.1	2.9	0.6	-2.5	3.6	6.7	3.0	10.3	2.5	-1.1	6.0	0.3	-4.8	5.3
Forth Valley	0.0	-1.8	1.7	3.3	0.2	6.5	-0.3	-4.1	3.5	5.8	2.5	9.4	12.0	7.6	16.6
Greater Glasgow	-0.3	-1.3	0.6	4.8	3.4	6.2	7.6	5.9	9.1	8.0	6.3	9.7	15.3	13.0	17.5
Lanarkshire	0.0	-1.4	1.1	5.8	3.6	7.9	8.0	5.1	10.6	7.0	4.0	9.6	14.7	10.9	18.2
Lothian	0.3	-0.1	1.0	3.7	2.3	5.5	13.3	10.9	16.0	12.3	9.9	15.0	14.7	11.9	17.6
Tayside	0.3	-0.7	1.2	3.9	1.6	6.2	6.7	3.9	9.4	4.7	1.8	7.3	15.2	11.2	19.0
All included Boards	0.5	0.1	0.9	4.1	3.3	4.9	7.7	6.8	8.6	8.3	7.4	9.2	14.6	13.4	15.8
Cohort 2															
Argyll & Clyde	-0.6	-3.2	1.4	2.7	-0.7	5.6	7.3	4.0	10.2	9.1	5.7	12.1	11.1	6.4	15.4
Ayrshire & Arran	3.3	0.8	5.6	2.9	-1.0	6.4	8.3	3.6	12.5	5.9	1.7	9.6	11.3	5.5	16.6
Borders	0.0	-6.5	13.3	4.7	-8.0	23.2	-12.7	-24.0	2.1	4.4	-6.1	21.5	0.4	-17.5	21.9
Fife	-0.4	-2.3	1.4	-0.9	-4.1	2.1	4.5	0.8	8.2	4.8	1.9	7.9	9.1	4.4	13.9
Forth Valley	-1.0	-3.8	1.6	2.3	-1.7	6.2	6.0	1.8	10.2	1.8	-2.4	6.0	7.5	2.3	12.7
Greater Glasgow	0.6	-0.5	1.5	6.2	4.7	7.6	9.2	7.5	10.7	8.9	7.0	10.7	16.8	14.3	19.1
Lanarkshire	-0.3	-1.6	0.5	3.9	1.6	5.8	7.3	4.4	9.8	10.6	7.6	13.2	17.9	13.0	22.4
Lothian	-0.2	-0.5	0.3	2.9	1.6	4.6	8.8	6.6	11.2	6.5	4.4	8.8	15.9	13.0	19.0
Tayside	0.3	-0.9	1.2	4.2	1.4	6.7	8.4	5.1	11.4	9.4	5.7	12.8	15.1	9.9	19.8
All included Boards	0.7	0.3	1.1	4.5	3.7	5.2	8.2	7.3	9.1	8.5	7.6	9.4	16.4	15.1	17.7

Cohort and NHS Board	Difference in the % of children from the least and most deprived areas with a record of receiving the specified CHS review														
	10 day			6-8 week			8-9 month			21-24 month / 2 year			39-42 month		
	Diff	95% CI		Diff	95% CI		Diff	95% CI		Diff	95% CI		Diff	95% CI	
Cohort 3															
Argyll & Clyde	0.4	-3.2	2.6	1.5	-3.6	5.3				-14.3	-22.1	-5.3			
Borders	0.0	-13.8	20.4	-4.2	-20.2	16.5				-19.2	-46.1	9.0			
Fife	0.8	-2.1	4.2	-0.8	-5.1	3.6				-15.2	-23.8	-6.6			
Forth Valley	-1.8	-6.4	1.3	5.6	-1.1	12.2				-18.0	-28.4	-6.7			
Greater Glasgow	-1.0	-3.4	0.8	4.3	1.4	6.8				-34.3	-38.2	-29.9			
Lothian	0.2	-0.5	1.8	1.6	-0.1	4.2				-26.7	-32.9	-20.6			
All included Boards	0.5	-0.3	1.3	4.1	2.8	5.5				-25.9	-28.6	-23.1			
Cohort 4															
Argyll & Clyde	0.1	-1.5	0.8	-0.1	-3.2	2.1									
Ayrshire & Arran	-0.4	-2.4	0.9	0.3	-2.5	2.3									
Borders	-1.4	-7.8	5.7	1.5	-7.1	12.0									
Fife	-1.3	-3.1	0.4	1.5	-0.4	3.5									
Forth Valley	-0.1	-1.7	1.1	0.3	-4.0	4.5									
Greater Glasgow	0.3	-0.8	1.2	4.1	2.5	5.5									
Lanarkshire	0.5	-1.0	1.5	4.8	0.7	8.4									
Lothian	0.1	-0.1	0.5	1.2	0.4	2.3									
Tayside	0.0	-1.1	0.4	1.8	-0.5	3.5									
All included Boards	0.5	0.1	0.8	4.0	3.3	4.7									

* Diff is absolute difference in percentage of children with a CHSP-PS record of the specified CHS review calculated as least – most deprived areas
Least and most deprived areas are the SIMD 2006 15% least and most deprived data zones in Scotland

Figure 16 Difference in the percentage of children from the least and most deprived areas with a CHSP-PS record of receiving the specified CHS reviews, by NHS Board, cohort 1

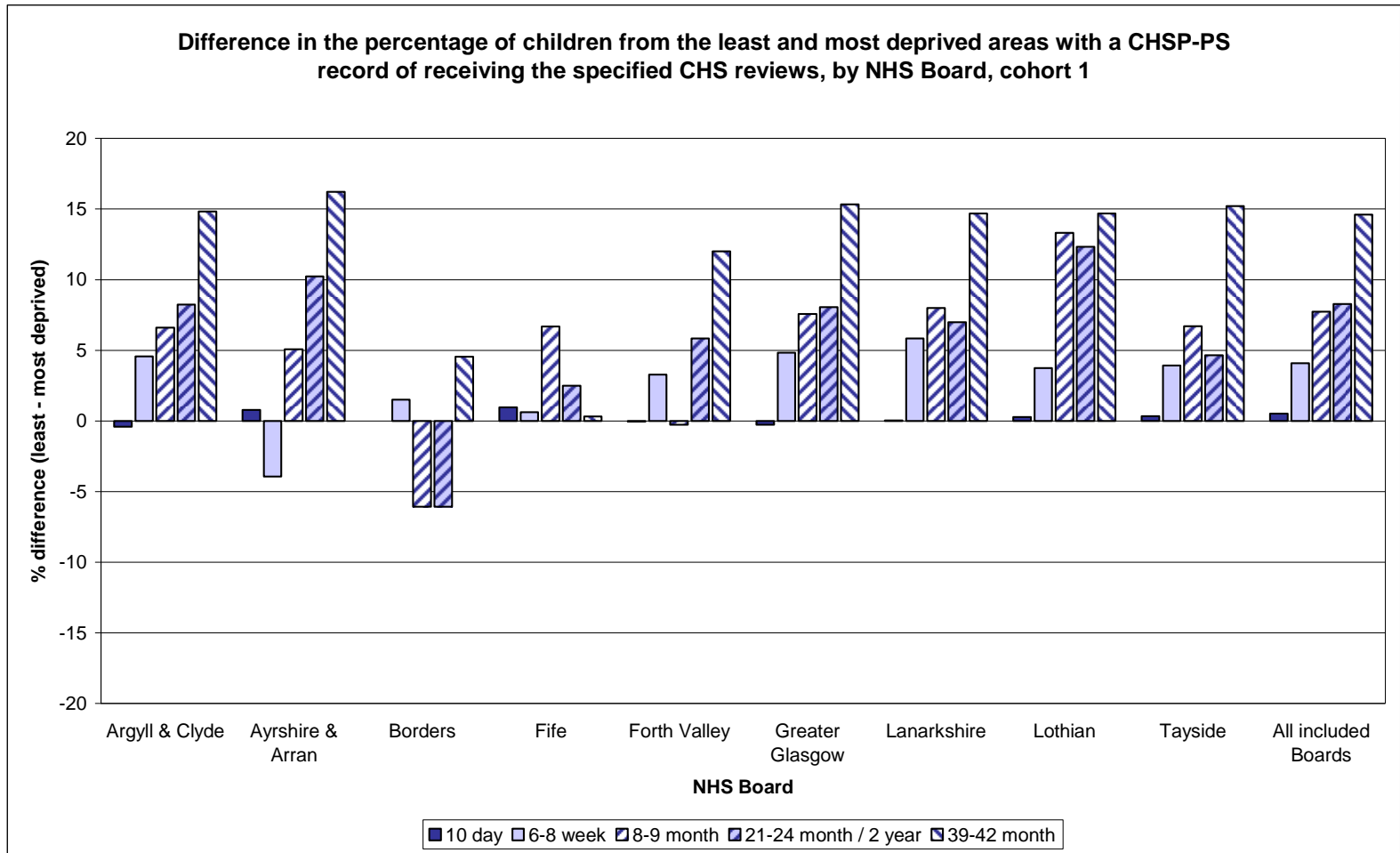


Figure 17 Difference in the percentage of children from the least and most deprived areas with a CHSP-PS record of receiving the specified CHS reviews, by NHS Board, cohort 2

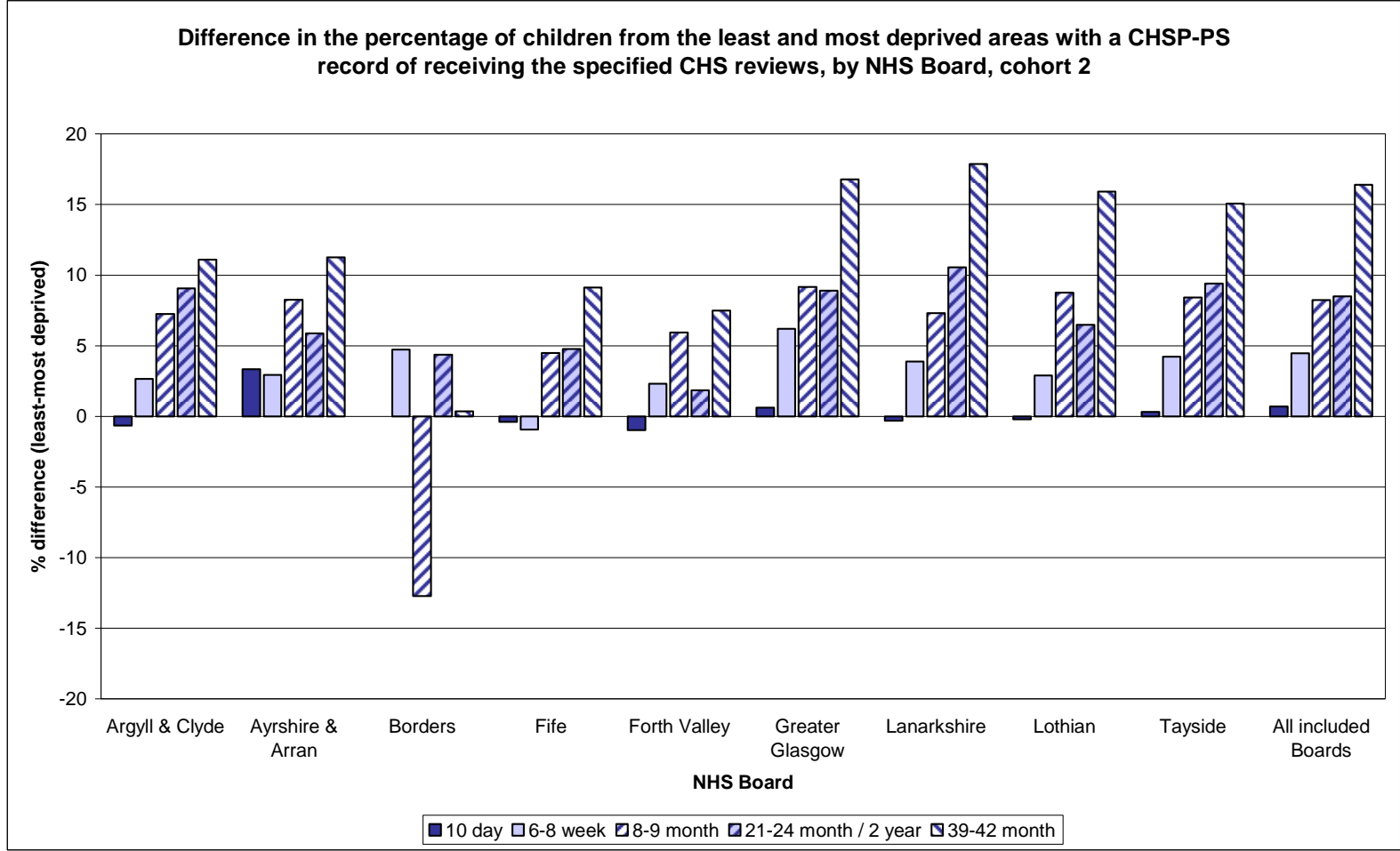


Figure 18 Difference in the percentage of children from the least and most deprived areas with a CHSP-PS record of receiving the specified CHS reviews, by NHS Board, cohort 3

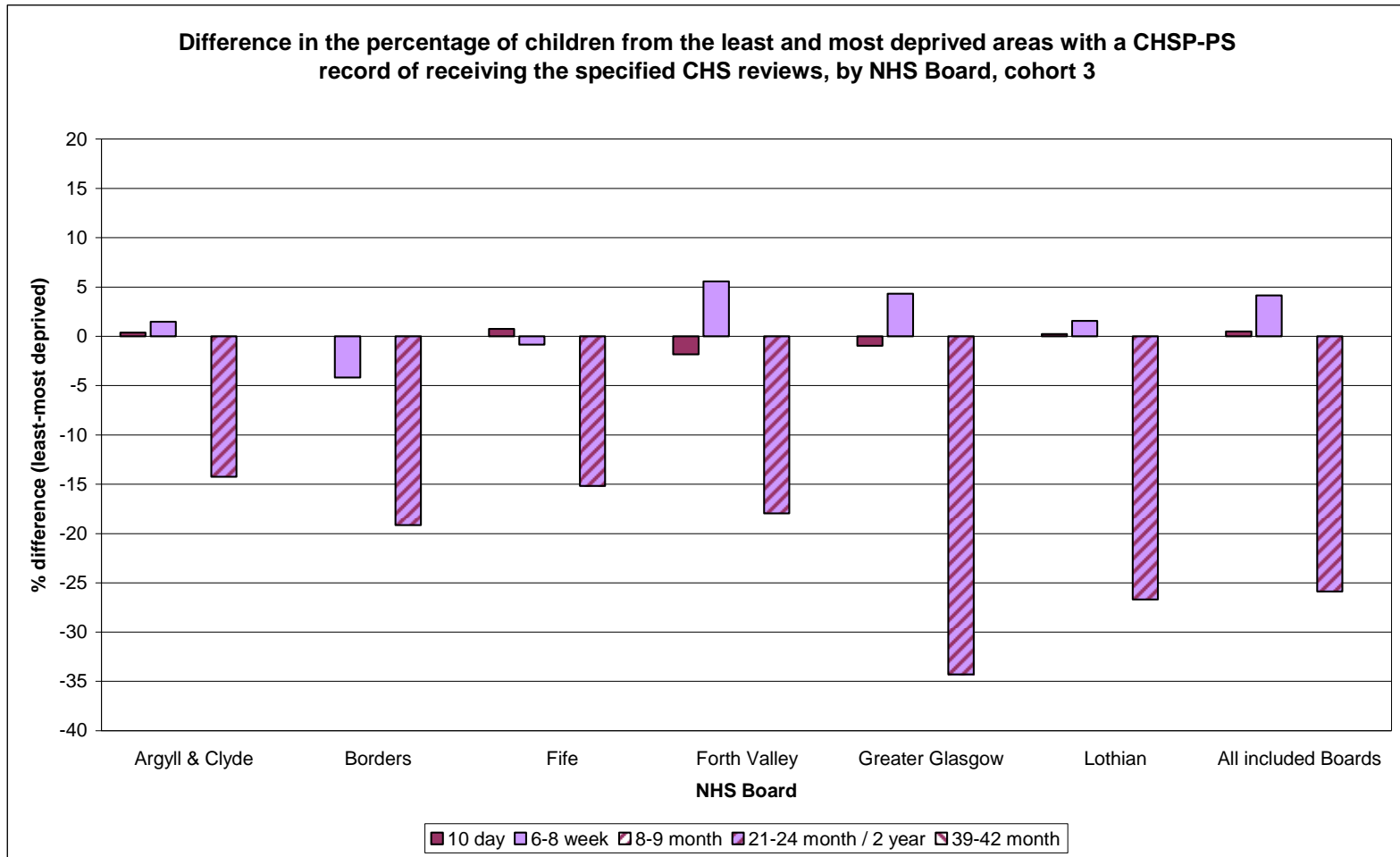
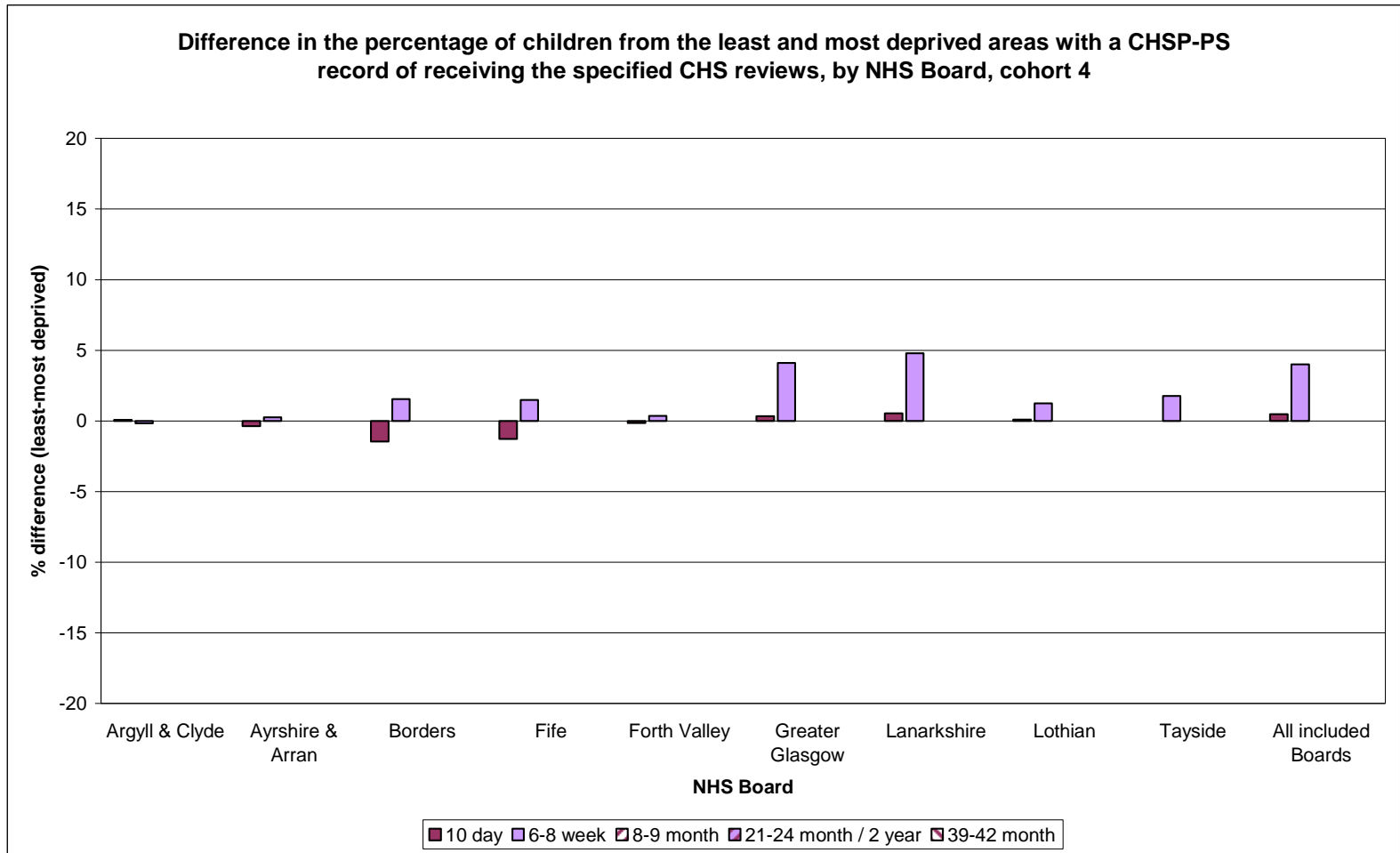


Figure 19 Difference in the percentage of children from the least and most deprived areas with a CHSP-PS record of receiving the specified CHS reviews, by NHS Board, cohort 4



6.2.2. *Audit of CHSP-PS data quality*

The full results of the CHSP-PS data quality audit are available in an ISD report (Wood, Stirling 2010) and are summarised here. A total of 2,784 children were eligible for inclusion in the audit, that is they were born between 1 July 2007 and 30 June 2008; they were registered with a GP practice in one of the participating Partnerships as at February 2010; and they had been registered to receive their Child Health Surveillance reviews in the same NHS Board area since birth.

Fifty one of the eligible children (1.8%) had no CHSP-PS record of a 10 day review and 131 (4.7%) had no record of a 6-8 week review. Six children were in both categories hence a total of 176 children with 182 unrecorded reviews were included in the audit. One hundred and five (58%) of the unrecorded reviews were for children living in West Glasgow and 93 (51%) were for male children. The audit results are summarised in Figure 20 and Figure 21. A very high rate of return (177/182, 97%) was achieved and in the large majority of cases (156/177, 88%) the child's clinical notes had been available to the HV hence the returned form was informative. In most cases when the HV indicated that the child's notes were not available, this was because the child had moved away from the practice after the data extract date (February 2010) and the time that the audit forms were issued to HVs (August 2010), or because the child had not been registered with that practice at the time the review should have been provided.

For 42 of the 45 (93%) children with no CHSP-PS record of a 10 day review (and who had an informative audit return), the clinical notes indicated that a review had actually taken place. This could mean either that the HV copy of a completed CHSP-PS review form was filed in the notes or some other contemporaneous record of the review was present. By contrast, a review had only been provided to 59 of the 111 (53%) children with no CHSP-PS record of a 6-8 week review.

Regarding children that had received their 10 day or 6-8 week review but had no record of this on the CHSP-PS system, in a small minority of cases HVs indicated

after reviewing the notes that this was because the wrong CHSP-PS form had been used (e.g. an unscheduled form had been used instead of a review specific form hence the review had not been entered into the system as a 10 day or 6-8 week review) or the correct completed CHSP-PS form had not been returned to the local child health department for data entry (e.g. both the HV and the child health department copies of the completed form were found in the notes). In the substantial majority of cases (97/101, 96%) no obvious reason for the absence of a CHSP-PS record of the review was evident (e.g. only the HV copy of the completed form was present in the notes) hence it was assumed that the child health department copy had been lost at some point during the process of being returned for data entry.

Only three children included in the audit (and for whom an informative audit return was available) had genuinely missed their 10 day review. Of these, in two cases the HV indicated that the review had been missed because the child was still in hospital at the time the review should have been carried out. No reason was provided for the third child. Fifty two children included in the audit had genuinely missed their 6-8 week review. The HVs indicated that in seven (13%) cases this was because the child was in hospital, in 21 (40%) because the family was uncontactable or repeatedly did not attend appointments, and in 24 (46%) no reason was given.

Figure 20 Audit of CHSP-PS data quality: results for children with no CHSP-PS record of a 10 day review

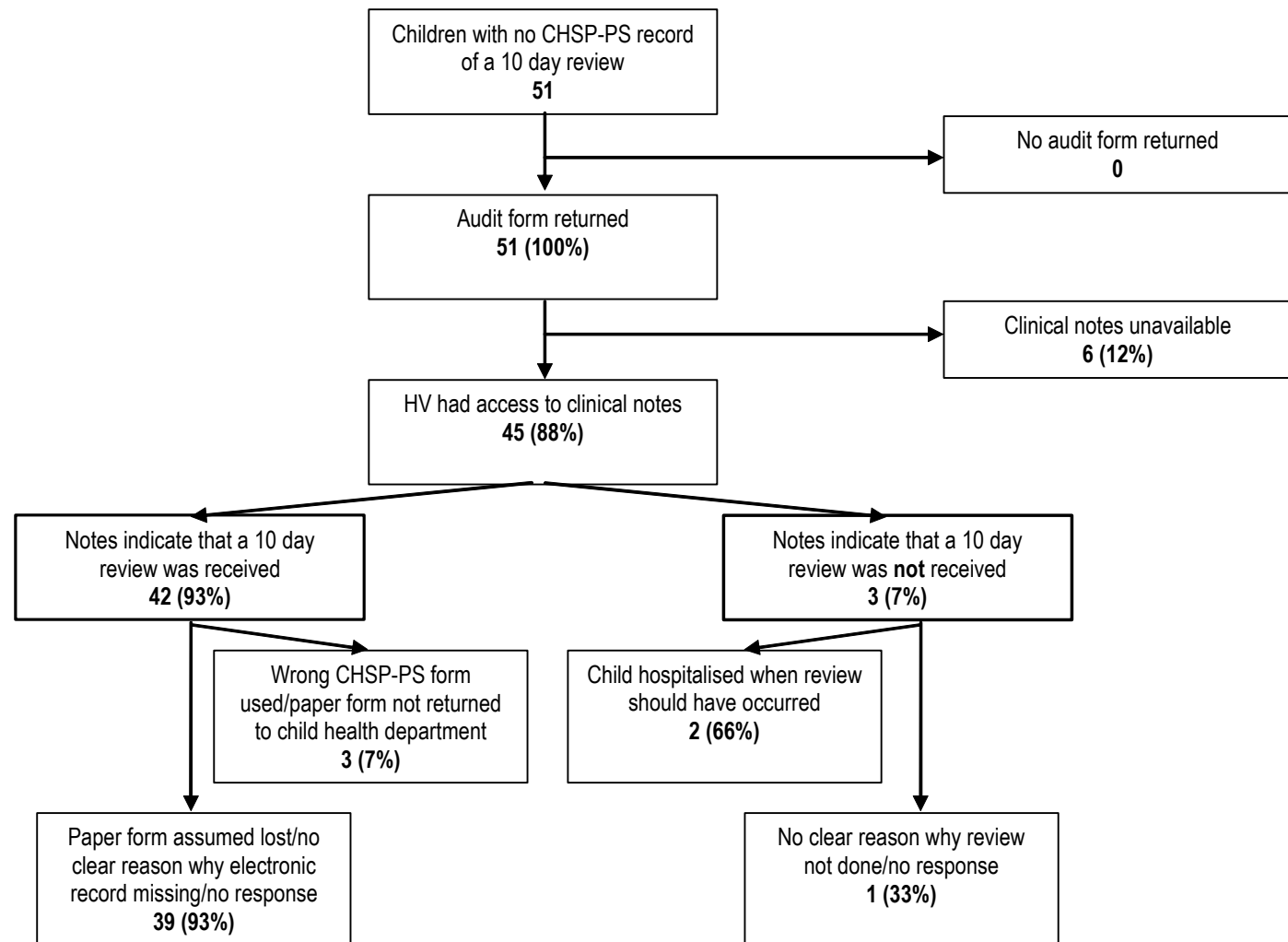
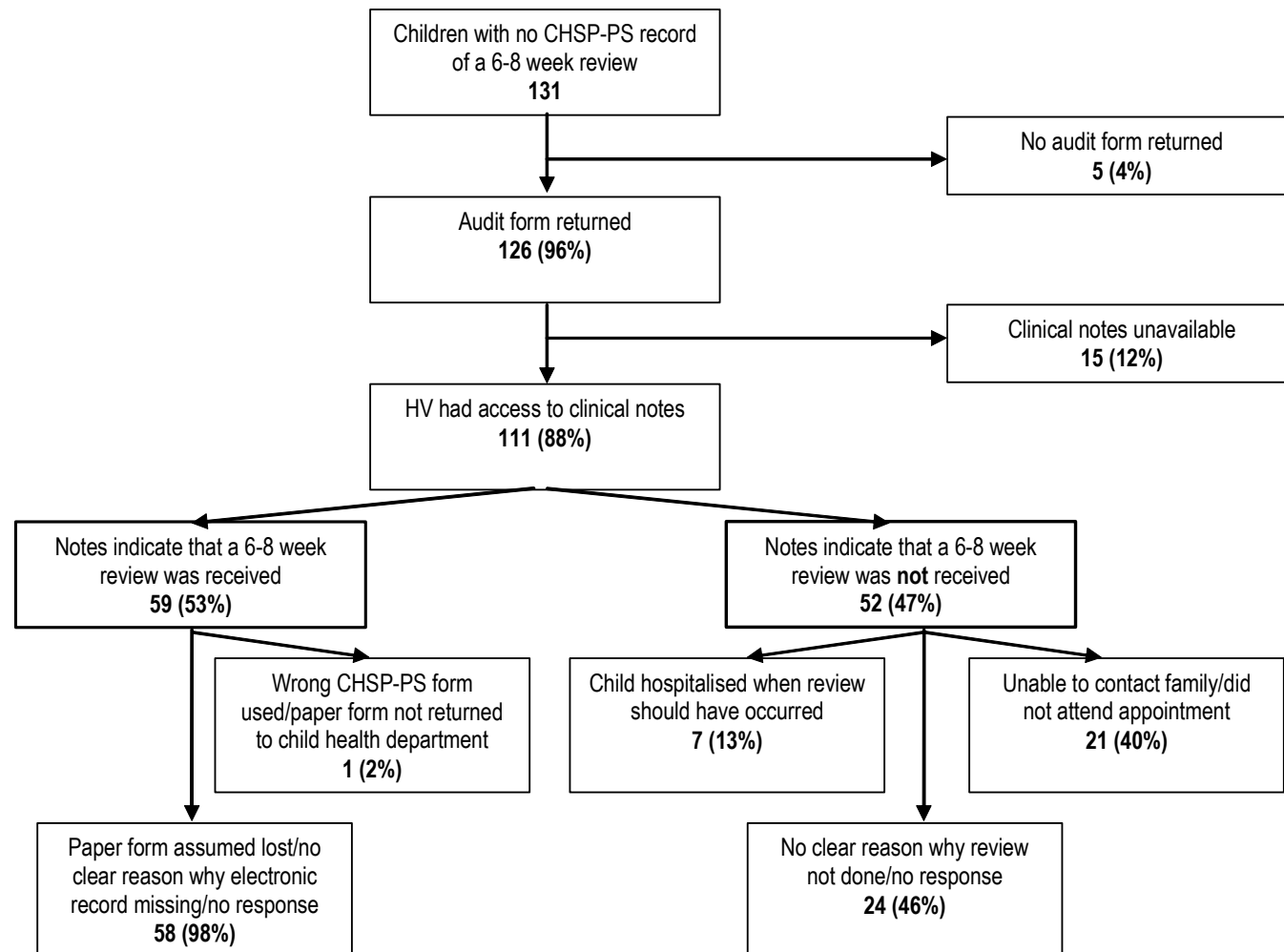


Figure 21 Audit of CHSP-PS data quality: results for children with no CHSP-PS record of a 6-8 week review



If review of the children's notes indicated they had genuinely missed their 10 day or 6-8 week review, HVs were asked whether the notes contained a record of any HV contact with the child around the time the review should have taken place (defined as child up to 28 days old for the 10 day review and child 4-12 weeks old inclusive for the 6-8 week review). Two of the three children who did not receive their 10 day review had no contact with their HV over the specified period recorded in their notes: in both cases this was because they were in hospital. The third child had a record of contact with the HV. Four of the 52 children who did not receive their 6-8 week review had no recorded contact with their HV over the specified period and again in all cases this was because the child was in hospital. In 45 cases, there was a record of HV contact with the child and in three cases no response was provided to this question.

The characteristics of children included in the audit who genuinely missed their 10 day or 6-8 week review were compared to those whose notes indicated they had received their review. Results are shown in Table 37. The very small number of children who had genuinely missed their 10 day review means there is no clear association between missing this review and either deprivation or Health Plan Indicator status. Regarding children with no CHSP-PS record of a 6-8 week review, there was a clear association between having genuinely missed the review and both higher deprivation and higher (i.e. towards intensive) Health Plan Indicator status. For example, 41/52 (79%) of the children who missed their review lived in one of the two most deprived quintile areas compared to 23/59 (39%) of the children who did receive the review. Similarly, 35/52 (67%) of children who missed their review had 'additional' or 'intensive' as the most recently recorded Health Plan Indicator status compared to 20/59 (34%) of children who received their review.

Table 37 Comparison of the characteristics of children included in the CHSP-PS audit who genuinely missed their review and those whose notes indicated they had received their review

Children with no CHSP-PS record of a 10 day review			
Deprivation quintile	Review missed	Review received	Comparison
1 (least deprived)	1	6	Fisher's exact test p=0.784
2	0	10	
3	0	10	
4	1	9	
5 (most deprived)	1	7	
Total	3	42	
Health plan indicator	Review missed	Review received	Comparison
Core	1	31	Fisher's exact test p =0.130
Additional	1	9	
Intensive	1	1	
Unknown	0	1	
Total	3	42	
Children with no CHSP-PS record of a 6-8 week review			
Deprivation quintile	Review missed	Review received	Comparison
1 (least deprived)	2	8	Fisher's exact test p <0.0001
2	1	12	
3	8	16	
4	8	5	
5 (most deprived)	33	18	
Total	52	59	
Health plan indicator	Review missed	Review received	Comparison
Core	17	36	Fisher's exact test p =0.0003
Additional	26	19	
Intensive	9	1	
Unknown	0	3	
Total	52	59	

Deprivation quintile is SIMD 2009 quintile based on postcode of residence on SIRS as at Feb 2010

The health plan indicator is the most recently recorded HPI on CHSP-PS as at February 2010

Note that calculation of the Fisher's exact test for association between deprivation quintile and review status was based on numbers in quintiles 1 and 2 combined; 3; and 4 and 5 combined

6.3. Discussion

6.3.1. *Summary*

This chapter reports an analysis of the coverage of the child health reviews offered to four cohorts of children as recorded on the CHSP-PS system. Cohorts 1 and 2 each included around 37,000 children, born in 1998/99 and 2000/01 respectively, who had the opportunity to receive the old programme of six Health Visitor led universal child health reviews over the pre-school period, five of which were subject to mandatory recording on CHSP-PS and were included in this analysis. Cohorts 3 and 4 included around 9,000 and 48,000 children born in 2006 and 2007/08 respectively who had the opportunity to receive the new programme of two universal reviews that was introduced following implementation of the 2005 CHP policy. Cohort 3 children had also had the opportunity to receive the new selective 2 year review by the time this analysis was specified.

The results for cohorts 1 and 2 are similar and show that, under the old child health review programme, recorded coverage of the 10 day review was high (99% for cohort 1) but it progressively declined for reviews provided at older ages (86% for 39-42 month review for cohort 1). Recorded coverage was higher in children living in the least compared to the most deprived areas for all reviews and the discrepancy progressively increased for reviews provided at older ages (92% and 78% coverage for the 39-42 month review in least and most deprived groups respectively in cohort 1). A clear gradient of declining review coverage with increasing deprivation was seen across deprivation quintiles for all reviews except the 10 day review. Children living in the least deprived areas were less likely than those from the most deprived areas to receive their child health reviews after the recommended upper age limit. The overall level of recorded review coverage, and the degree of inequality in coverage between least and most deprived groups, was broadly similar across NHS Boards.

The results for the universal reviews provided to cohorts 3 and 4 are also similar and show that there has been no change in the overall recorded coverage of the remaining 10 day and 6-8 week reviews. The level of inequality in recorded coverage between different deprivation groups has also remained very similar to that seen for cohorts 1 and 2. The reduction in the number of child health reviews offered to children associated with implementation of the 2005 policy has therefore not been associated with an increase in recorded coverage of the remaining reviews, or a reduction in inequality of review coverage.

Recorded coverage of the selective two year review is very different to that for the universally offered reviews. Results for cohort 3 suggest that around a quarter of children received this selective review, with children living in the most deprived areas much more likely to receive it than those living in the least deprived neighbourhoods.

An audit of CHSP-PS data quality was undertaken to assess the extent to which review coverage recorded on CHSP-PS reflects the true coverage of reviews actually provided to children. The audit results showed that almost all children with no CHSP-PS record of a 10 day review had in fact received their review. This suggests that coverage of the 10 day review, at least for cohort 4 children, is likely to have been near complete. By contrast, the audit results showed that only around half of all children with no CHSP-PS record of a 6-8 week review had in fact received their review: the other half appeared to have genuinely missed this review. Difficulty in contacting the family or repeated failure to attend appointments was the commonest specific reason given for why the 6-8 week review was missed suggesting that engaging a minority of parents in this review is challenging. These results suggest that, at least for cohort 4 children, actual overall coverage of the 6-8 week review may be as high as 97% rather than 94% as estimated using CHSP-PS.

The audit results confirm the association between missing the 6-8 week review and higher needs/vulnerability. Children who genuinely missed their 6-8 week review were more likely to live in an area of higher deprivation or have a higher Health Plan

Indicator than children who received their review. This suggests that whilst CHSP-PS is likely to somewhat underestimate overall review coverage, it is also likely to underestimate inequality in review coverage.

6.3.2. Strengths and limitations

6.3.2.1. Analysis of review coverage using CHSP-PS

To my knowledge, no papers on the coverage of child health reviews offered in the UK have previously been published hence the results presented in this chapter (and the associated paper (Wood et al. 2012a)) provide new insight into this issue. The reliability of the coverage results was enhanced by looking at four cohorts of children, two experiencing the old programme of child health reviews and two the new programme. Relatively large numbers of children were included, particularly in cohorts 1, 2, and 4, giving stable estimates of review coverage. Deprivation status was available for almost all children in each cohort, allowing robust analysis of the difference in recorded coverage between deprivation groups.

Not all Boards could be included in the analysis. For cohorts 1, 2, and 4, only Boards that were established users of the CHSP-PS system by November 1998 (i.e. by the time cohort 1 children were born) were included. The nine Boards included for these cohorts together contain around 82% of the Scottish population aged under five years.

Cohort 3 was smaller than the other cohorts, with both a narrower date of birth range and a restricted number of included Boards. The restrictions were necessary to define a cohort that would have had time to receive the new selective two year child health review by the time the analysis was undertaken, but they do mean that the results for this cohort are more uncertain and the results are not directly comparable to those for the other cohorts. The six Boards included for cohort 3 together contain around 56% of the Scottish population aged under five years.

In 2010, analysts at ISD (Judith Tait and Claire Nolan) undertook further investigation of coverage of the two year selective review in response to an information request from an NHS colleague. The new analysis was based on the analysis of coverage for cohort 3 reported here and used the same basic methodology. As the February 2010 SIRS and CHSP-PS data extracts were available by then, a full 12 month cohort (children born 1 April 2006 to 31 March 2007) and all nine Boards that were included in cohorts 1, 2, and 4 could be included. The results of the new analysis showed that 10,590 out of 40,639 (26.1%) of children were recorded on CHSP-PS as receiving a two year review. This is similar to the 25.3% found for cohort 3, suggesting that the results for cohort 3 are broadly representative of the coverage of the two year review across Scotland at that time.

The 48-54 pre-school review offered to all children under the old child health review programme was not included in the analysis as entry of the results of this review on the CHSP-PS system was optional hence it would not have been possible to tell if low coverage was genuine or a result of lack of data entry. This means that whether the general trend towards lower review coverage continues up to the pre-school review cannot be assessed.

The analysis of child health review coverage for children in cohorts 1 to 4 was restricted to those children who had remained in the same NHS Board area from birth up to the time they should have received the last review offered to their cohort that was included in the analysis. For children in cohorts 1 and 2, this meant that they had to remain in the same area until aged up to 60 months. Consequently, a relatively high proportion (around 15%) of children born within the date of birth range and NHS Board areas for these cohorts was excluded from the coverage analysis due to moving (or more rarely dying). Children in cohort 3 had to remain in the same area for a shorter time (up to 34 months) and in cohort 4 a shorter time still (up to 19 months). A corresponding lower proportion of these cohorts was therefore excluded from analysis (11% and 5% respectively).

In addition to the analysis of child health review coverage done in 2003 for the group developing the 2005 policy, colleagues at ISD also did a further ad hoc analysis of coverage in 2006. This second analysis was led by ISD's Consultant in Public Health Medicine then responsible for child health information, Jim Chalmers, and I was not involved. It was done as an internal research project and written up for publication but never submitted to a journal hence is not in the public domain. The draft paper was made available to me when I was planning the analysis presented in this chapter, however. The 2006 ISD analysis of review coverage did not use exactly the same methodology as was used in this analysis (see below for fuller discussion). The 2006 analysis included one cohort of children born in the calendar year 1999 and examined coverage of the 10 day, 6-8 week, 8-9 month, 21-24 month, and 39-42 month reviews. It included children from the same nine NHS Board areas that were included in cohorts 1, 2, and 4. As this analysis focused on the period prior to implementation of the 2005 policy, it did not have to deal with Boards implementing the new review schedule at different times. It therefore excluded children who moved out of Scotland or to an excluded Board area, but, unlike the analysis presented in this chapter, it included children that moved between the included Boards. The authors could therefore compare recorded review coverage for children who remained in the same Board area for the whole period of analysis (aged up to 82 months) to that for children who moved between Boards. Coverage was found to be marginally, but not significantly lower, for children who moved. The 2006 ISD analysis could not investigate review coverage for children who moved out of Scotland (or to Boards that did not participate in CHSP-PS) but emigration is known to be higher amongst the less deprived (Registrar General for Scotland 2004, Popham et al. 2010). Overall this suggests that the results presented here are likely to provide a reasonable estimate of the child health review coverage in the whole Scottish population.

6.3.2.2. Audit of CHSP-PS data quality

The audit of CHSP-PS data quality provided information not previously available that helped to quantify the uncertainty in the review coverage results. A very high return rate was achieved, mainly due to strong local support from HV managers, and

the included children's contemporaneous HV notes were available (and hence an informative response could be provided) for a high proportion of cases.

As in all data quality audits, a 'gold standard' data source that was assumed to provide complete and accurate information was compared against the data source being audited. In this case, the local HV clinical notes were assumed to provide a true record of whether a child had or had not received a particular child health review. Furthermore, HVs were assumed to accurately represent what was contained within the clinical notes in the audit forms. Neither assumption is necessarily infallible. The notes may not have contained a record of a review that was in fact provided, for example if the HV copy of the CHSP-PS form had been mislaid. Furthermore, HVs may have felt some pressure to report particular results on the audit forms, for example that children had in fact had their reviews even if this was not absolutely clear in the notes. Standard wording explaining the nature and purpose of the audit was provided to HVs and care was taken to avoid ambiguity in the wording of the audit form questions to try to counteract these issues.

Only two Community Health Partnerships were included in the audit. West Glasgow and Glenrothes and North East Fife together contain around 5% of births in Scotland (see <http://www.isdscotland.org/Health-Topics/Maternity-and-Births/Births/>). These areas were selected as they both had review coverage rates broadly similar to that seen for cohort 4 as a whole, they include a range of deprived/affluent and urban/rural areas, and they had HV managers who were enthusiastic to undertake the audit. The audit process of ISD preparing individual audit forms for children with no CHSP-PS record of a child health review, then local HVs retrieving and reviewing the child's contemporaneous notes to complete a structured audit form, then the results being returned to ISD for data entry and analysis was relatively time consuming. The two Partnerships, providing 176 children with 182 apparently missed child health reviews, were therefore felt to provide a reasonable number of children for inclusion in the audit whilst still keeping the audit as a whole manageable within available resources.

Perhaps more important than the restriction of the audit to two Partnership areas was the fact that it was also restricted to cohort 4 children only, i.e. it only included children born in 2007/08 and only looked at apparently missing 10 day and 6-8 week reviews. The audit cannot provide any information on whether CHSP-PS data quality relating to 10 day and 6-8 week reviews is consistent over time or on the likely level of error in the coverage of the 8-9, 21-24, 39-42 month or two year reviews calculated from data recorded on CHSP-PS. It would have been ideal to repeat the audit for children from cohorts 1 to 3 and for all the reviews offered to them but this would have involved a very significant amount of work for HVs and their managers as well as for me and other ISD staff. Also it is likely that the proportion of children for whom the contemporaneous notes could not be found (and hence for whom no relevant information could be provided) would have been considerably higher for children from the earlier cohorts making the results of an extended audit less reliable.

Overall, whilst these limitations to the audit are recognised, given that the CHSP-PS calculated coverage of the 10 day and 6-8 week reviews has been so stable over time and between areas, it is reasonable to assume that the audit results are broadly representative of data quality relating to these reviews on the CHSP-PS system. CHSP-PS data quality relating to later reviews remains unknown.

6.3.3. Previous relevant work

6.3.3.1. Previous estimates of child health review coverage

As previously noted, to my knowledge, no papers reporting the coverage of child health reviews provided in Scotland, or elsewhere in the UK, have previously been published, although information from the previous ISD coverage analyses were referred to in a paper providing a narrative overview of changes to the UK CHP recommended in HFAC4 that was published in 2006 (Blair, Hall 2006).

As noted above, the analysis of review coverage done by ISD in 2006 did not use exactly the same methodology as was used in this analysis. It included children born

in 1999 in the nine NHS Boards used in this analysis hence its results are most comparable to those for cohort 1. The different exclusion criteria used (exclusion only of children moving to an excluded Board or in/out of Scotland rather than all children moving Board) resulted in a higher proportion of children born in the date of birth range and included Boards being included in the analysis (95% compared to 84% for cohort 1). The 2006 analysis was based solely on data held within the CHSP-PS system and did not use SIRS to establish the population of children eligible to receive child health reviews. It assumed that coverage of the 10 day review was universal and used the population of children recorded on CHSP-PS as having a 10 day review as the denominator from which to calculate coverage of the later reviews. Further minor differences were that postcode of residence at the 10 day review (rather than at the time of data extract) was used to allocate children to different deprivation categories and the SIMD 2004 (rather than 2006) was used as the deprivation index. Coverage for children living in the 15% least and most deprived data zones in Scotland for each of the different reviews were the key results presented. Table 38 compares the results of the 2006 analysis to those for cohort 1. Despite the differences in methodology, the absolute levels of coverage are similar and the general pattern of declining overall coverage and increasing inequalities in coverage for reviews provided at older ages is evident from both analyses.

Table 38 Comparison of the results from the 2006 ISD analysis of coverage of child health reviews to those for cohort 1 from this analysis

	% of children with CHSP-PS record of receiving specified CHS review			
Review	Least deprived		Most deprived	
	2006 analysis N=6,109	Current analysis N=5,587	2006 analysis N=8,418	Current analysis N=7,322
10 day	100.0	99.0	100.0	98.5
6-8 week	96.9	96.7	92.2	92.6
8-9 month	95.2	96.0	85.5	88.3
21-24 month	93.9	95.6	84.4	87.3
39-42 month	91.3	92.4	75.5	77.8

As noted in the introduction to this chapter, the HFAC4 report stated that '*coverage [of child health reviews] over 60-70 percent is hard to maintain after the first year of life*' (Hall, Elliman 2003, p355). The results presented here suggest that, whilst review coverage is certainly not complete and substantial inequalities in coverage exist, this statement is over-pessimistic when viewed in light of the coverage achieved in Scotland. Overall recorded coverage of reviews up to and including the 21-24 month review offered to cohorts 1 and 2 was over 90% and even coverage of the 39-42 review was over 80%. It is not clear what the HFAC4 statement was based on, but it may be that review coverage was/is lower in England than in Scotland. Although England is now placing considerable policy emphasis on a strong Child Health Programme (Department of Health 2009b, Department of Health 2009a, Department of Health 2009c) and is systematically trying to increase Health Visitor numbers in order to improve programme delivery (Department of Health 2007, Department of Health 2011c), historical problems with inadequate commissioning of recommended services and HV shortages have been previously noted (Durham University Mapping Unit 2009).

Again, as noted in the introduction, the Scottish 2005 CHP policy suggested that around 10%, 25%, and 40% of children from the most deprived areas did not receive their 6-8 week, 21-24 and 39-42 month reviews respectively. These statements were apparently based on data supplied by ISD to the Scottish Government following the ad hoc analysis of review coverage conducted in 2003. No details of the methods used to produce these data were included in the 2005 policy. Both ISD and Scottish Government colleagues tried to provide me with details of the 2003 analysis in 2012 so it could be compared to the analysis presented here but due to the long time lag only partial records could be found.

As far as can be ascertained, the 2003 analysis appears to have looked at child health reviews provided in 2001 and compared the number of reviews provided to the number that would have been expected given the number of children born at the appropriate time (for example in 1999 for 21-24 month reviews). The number of Boards included varied for different reviews depending on when Boards had started

using CHSP-PS. How the analysis dealt with children who emigrated or moved between Boards is not clear. The Carstairs and Morris index was used as a marker of children's deprivation level as the Scottish Index of Multiple Deprivation was not available until 2004 (Carstairs, Morris 1991, McLoone 1994). The Carstairs and Morris index was a simpler index of material deprivation based on the proportion of people in postcode sectors with low social class; unemployment; overcrowding; and no car ownership. The Carstairs and Morris index allowed the population to be classified into seven 'deprivation categories' of incrementally increasing deprivation. The 'most deprived' children in the 2003 analysis were defined as those living in deprivation categories six and seven. Unlike deprivation quintiles, the deprivation categories explicitly did not aim to divide the population into equally sized groups: around 18% of the population lived in deprivation categories six and seven (McLaren, Bain 1988).

Even from these partial records, it is clear that the methods used in the ISD 2003 analysis were substantially different to those used in the ISD 2006 analysis and in the analysis presented here. Detailed results of the 2003 analysis are not available but the summary results quoted in the 2005 policy suggest review coverage levels in the most deprived areas that are considerably lower than those suggested by the subsequent analyses. It is likely that this discrepancy, at least in part, reflects methodological differences between the various analyses. It serves as a useful reminder that the absolute level of coverage in different deprivation groups, and hence the apparent level of inequality between groups, is sensitive to how 'least' and 'most' deprived groups are defined. Transparency in presentation of methods and results is therefore very important. As detailed results of the 2003 analysis were not available within the partial records found in 2012, how accurately the 2005 policy quotes the information that was provided by ISD to the Scottish Government cannot be commented on. Presentation of selected results in political documents always raises the possibility of potential 'cherry picking' of information that supports the arguments being made. The extent to which this did or did not occur in the 2005 policy cannot be commented on.

As noted in Section 5.2.3, standard information on the coverage of the various child health reviews provided in other countries is generally lacking. Some areas, notably Victoria in Australia, do publish comprehensive information on review coverage.

The participation rates for the ten key ‘ages and stages’ visits offered in Victoria and reported in the state’s Maternal and Child health Services annual report for 2010/11 (Department of Education and Early Childhood Development 2011b) were as follows:

- Initial home visit 100%
- 2 week 98%
- 4 week 97%
- 2 month 96%
- 4 month 94%
- 8 month 85%
- 12 month 82%
- 18 month 72%
- 2 year 69%
- 3.5 year 63%

No information is provided on how the participation rates are calculated or on the underlying data quality hence these results cannot be compared directly to the results for Scotland reported here. Nevertheless, if taken at face value, they do suggest that coverage achieved in Scotland is similar to that achieved in Victoria for reviews provided in early infancy. Coverage in Victoria then shows progressive decline for reviews provided at older ages as seen in Scotland prior to implementation of the 2005 policy but the rate of decline appears to be considerably steeper in Victoria. What is not known is how the overall number of reviews provided interacts with the coverage of the individual reviews. Although coverage of individual reviews offered after infancy is generally lower in Victoria than Scotland, does the larger number of reviews offered overall compensate for this such that any individual child is likely to be seen at least a core number of times over the pre-school period?

6.3.3.2. Approaches to measuring health inequalities

When assessing inequalities in review coverage, the analyses presented in this chapter have focused on differences in coverage rates between children living in areas with different levels of deprivation. Other indicators of potential disadvantage could theoretically have been used to assess inequalities in child health review coverage, for example family income, parental education level, ethnicity, etc. In general these alternative measures are not readily available within routine datasets such as CHSP-PS. Large scale surveys such as Growing Up in Scotland (GUS) could potentially be used to explore uptake of child health reviews amongst different groups of children/parents. To date, GUS has been used to assess parent reported uptake of a range of early years services but not child health reviews specifically (Mabelis, Marryat 2011). Permission is currently being sought to link GUS data to children's routine health records, including CHSP-PS child health review records (application submitted to the Privacy Advisory Committee by me and Paul Bradshaw in December 2012). If this linked dataset is approved, it could provide a rich resource for further exploration of inequalities in review coverage and family characteristics that are associated with low uptake.

Regardless of the indicator of disadvantage that is used, a number of different statistical approaches exist to measuring the level of inequality in an outcome of interest, such as review coverage. This chapter has focused on differences in the absolute level of coverage between different deprivation groups (both most and least deprived groups and all deprivation quintiles). Relative measures of inequality (such as simple ratios between most and least deprived groups or more complex measures that take account of the distribution of the outcome of interest across all deprivation groups) could also have been used however these were not considered to be of primary interest in this analysis (Scottish Government 2003, Scottish Government 2008f, Scottish Government 2012a, Frank, Haw 2011).

6.3.4. *Wider comments and conclusions*

The key conclusions of the analysis presented in this chapter are as follows:

- Not all children who are offered the ‘universal’ child health reviews actually receive them
- In Scotland, coverage of reviews provided in early infancy is high but under the pre-2005 programme of reviews, it progressively declined for reviews provided at older ages
- Children from the most deprived areas are less likely than children from more affluent areas to receive their reviews, and the discrepancy in coverage increases for reviews provided at older ages
- Since implementation of the 2005 CHP policy, there has been no change in the overall coverage of the remaining reviews or in the level of inequality in their coverage
- Calculation of review coverage is dependent on the availability of suitable routine data: understanding data quality and the potential impact this has on the accuracy of results is important
- Methodological details, such as how ‘most deprived’ groups are defined can have a substantial impact on the results and their interpretation: transparency of reporting is therefore essential

Broader questions that are raised by these results include:

- What reasons underlie the patterns seen in coverage of the universally offered child health reviews?
- Why are the observed patterns so consistent over time, and in particular why has the reduction in the number of reviews offered not had any impact on the coverage of the remaining reviews?
- What do the patterns of review coverage mean for equity in children’s outcomes?

The quantitative results presented here cannot provide much insight into why review coverage falls with age or is lower in more deprived areas, but the results of the

CHSP-PS audit do suggest that, at least for reviews provided in early infancy to cohort 4 children, unavailability (e.g. child in hospital) or lack of parental engagement (e.g. failure to respond to multiple invitations) are the most common underlying reasons for children missing their reviews. Some unavailability is inevitable but parental engagement is perhaps more amenable to change.

6.3.4.1. Parental engagement with child health reviews

It has been long recognised that people who are most in need of health services are often the least likely to access them and this has been expressed by Tudor Hart as the inverse care law (Tudor Hart 1971). People from deprived areas have been found to be particularly disadvantaged in terms of access to/uptake of preventive/proactive health care, and conversely tend to be high users of emergency/reactive care, even when differential levels of need are taken into account (Acheson 1998).

Qualitative research that explores the opinions and experiences of parents is required to more fully understand why parents from deprived areas are less likely to access preventive child health interventions. A small number of UK based studies directly relevant to universal Health Visiting services and Child Health Surveillance reviews are available (Roche, Cowley & Salt 2005, Knott, Latter 1999, Hogg, Worth 2009). When formally surveyed, parents generally report high overall satisfaction with the Health Visiting service (Bowns et al. 2000), and the qualitative work does uncover some very positive stories of women feeling meaningfully supported by their Health Visitors. Despite this, the qualitative studies also demonstrate the importance of the fit between parents' perceived needs and the support given by Health Visitors. They show that on occasion parents find 'routine' child health reviews bureaucratic and unhelpful. In addition, parents from deprived areas can report being distrustful of Health Visitors and finding them judgemental and not in tune with the pressures inherent in their lives.

Studies looking at parent's views of other preventive child health interventions provide less directly relevant, but still useful, information. One UK based study compared the characteristics of women who declined to participate in a trial of an

intensive Health Visitor led support programme designed to reduce the occurrence and impact of postnatal depression in high risk women to those of women who agreed to participate (Murray et al. 2003). Reluctance to participate in the intensive support programme was found to be associated with a wider pattern of lack of engagement with other preventive services such as antenatal care and universally offered Health Visitor support and high use of emergency services such as Accident and Emergency attendances. Reluctance to participate was also found to be associated with poorer child outcomes such as low birth weight.

A separate qualitative study conducted interviews with vulnerable young mothers who had refused to take part in an intensive Health Visitor led home visiting programme and explored their reasons for refusing the service (Barlow et al. 2005). The study found that reasons included mismatch in assessment of need/vulnerability between professionals and the women and distrust and scepticism among the women as to whether the intervention would address their 'real' needs.

Early Sure Start programmes faced considerable issues in engaging the most vulnerable families within programme areas in the services provided, and some of the learning that has come from that is likely to be of value to universal Health Visitor services (National Evaluation of Sure Start Team 2007, Northrop, Pittam & Caan 2008, Coe, Gibson & Spencer 2008). That improving parental engagement is not necessarily straightforward is demonstrated by a randomised controlled trial that found no impact of pre-visits from trained members of the local community on attendance at specific Sure Start services (Lever et al. 2005). Overall, these findings serve as a useful reminder of how Child Health Surveillance services need to consider parental views and consistently strive to remain relevant to and valued by parents to ensure good engagement whilst retaining an emphasis on evidence based interventions.

Lack of parental engagement with child health reviews is of particular concern if it is associated with a wider pattern of 'hiding' children from services that may indicate seriously dysfunctional parenting and risk of child neglect or abuse (NHS Greater

Glasgow & Clyde 2012). It is reassuring to note, therefore, that the CHSP-PS audit results suggest that almost all the children included in the audit who had genuinely missed their 6-8 week review had had some form of contact with their Health Visitor around the time the review should have been provided, suggesting it is very uncommon for children to be completely unknown to the health visiting service.

6.3.4.2. Child health review coverage over time

That there has been no increase in overall coverage, or decrease in inequality of coverage, of the remaining child health reviews (particularly the 6-8 week review) after implementation of the 2005 policy is disappointing. The policy explicitly linked streamlining of the core universal service offered to all families to improving the ability of the Child Health Surveillance service as a whole to consistently identify and meet the needs of children requiring additional professional support. Although coverage of the 6-8 week review is relatively high compared to that of reviews offered after infancy, and inequality in its coverage relatively low, a social gradient in coverage still persists which undermines the ability of the remaining child health reviews to improve equity of children's outcomes.

Why the change to the child health review schedule has had no impact on review coverage is unclear. It may be that coverage of the 10 day and 6-8 week review is already close to the limit of what can be achieved within the traditional model of CHS delivery. It is notable that the pattern of coverage is relatively stable across areas despite wide variation in deprivation levels, urban/rural profiles, and the overall level of Health Visitor staffing (see the results of the Health Visitor workforce survey presented in Chapter 7). It may also be that the Health Visitor time that was freed up by reducing the number of universally offered reviews, was directed more into providing additional support for some families rather than ensuring universal coverage of the remaining reviews. There is a lack of national data on the totality of Health Visitor led care that is provided to young children (see Chapter 8) hence this point is difficult to investigate.

6.3.4.3. Child health review coverage and equity in child health outcomes

There is no simple relationship between uptake of child health reviews and children's outcomes. Nevertheless, if children at higher risk of poor outcomes are consistently less likely to access their child health reviews, and hence have the opportunity to access effective follow on services in a timely manner, overall the Child Health Surveillance service runs the risk of exacerbating rather than ameliorating inequalities in children's outcomes. That preventive interventions may inadvertently increase inequalities in health outcomes (usually through higher uptake and impact on lower risk groups) is a well recognised phenomenon (White, Adams & Heywood 2009, Lorenc et al. 2012). The Scottish Government has tried to counteract this by incorporating requirements for equitable delivery across deprivation groups into many of the HEAT (Health improvement, Efficiency, Access, and Treatment) targets set for the NHS that refer to delivery of preventive interventions (see <http://www.scotland.gov.uk/About/Performance/scotPerforms/partnerstories/NHSScotlandperformance>). For example,

- The target for early access to antenatal care specifies that at least 80% of pregnant women *in each SIMD quintile* will book by the 12th week of gestation by 2015.
- The target for delivery of fluoride varnish to prevent dental decay specifies that at least 60% of three and four year olds *in each SIMD quintile* should receive at least two applications by year by 2014.
- The target for delivery of child healthy weight interventions to obese children by 2014 specifies that at least 40% of the interventions should be delivered to children living *in the two most deprived SIMD quintiles*.

The Scottish Government has acknowledged the risk that the new universal 24-30 month child health review may be preferentially accessed by lower risk families. The policy update that announced the Government's intention to introduce this review stressed the importance of achieving high and equitable review coverage, stating that '*It is important that contact is made with **all** [emphasis in original] families with children at this stage and no child misses out on the opportunity for a review.*' (Scottish Government 2011b, p6). The 24-30 month review guidance,

written by me after chairing the relevant working group, also emphasises the importance of achieving high and equitable coverage, and acknowledges the associated challenges and resource requirements (Scottish Government 2012b).

At the request of working group members, the 24-30 month guidance recommends that ISD should routinely publish information on the coverage of all universally offered child health reviews to reinforce the importance of coverage and to allow Boards to monitor their performance in this regard. It is anticipated that the methodology presented in this chapter will be used as the basis for such analyses/publications. Working group members also requested that an NHS performance target on coverage of universal child health reviews should be developed but whether the Scottish Government takes this forward remains to be seen.

The next chapter moves away from thinking about coverage of the universally offered reviews and focuses on, after implementation of the 2005 policy and associated revised review schedule, which children are being identified during their reviews as being in need of enhanced support to attain their health and development potential.

Chapter 7 Identification of children requiring enhanced Child Health Programme support

This chapter explores, in the period after implementation of the 2005 policy and associated reduced child health review schedule, the factors that are associated with children being identified as in need of enhanced professional support to attain their health and development potential.

As discussed in Chapter 4 and summarised here, HFAC4 and the Scottish 2005 policy recommended more active targeting of some elements of the Child Health Programme at both the area and the individual level in order to ensure that the programme as a whole made a more positive contribution to improving equity of children's outcomes. Targeting at the individual level was to be achieved by reducing the core programme of Child Health Surveillance reviews and using the released Health Visitor time to provide more intensive support to families that required it. The 2005 policy (but not HFAC4) further recommended that HVs should formally allocate all children by the end of their 6-8 week review to one of three categories of need for ongoing CHP support in order to make the targeting process more robust and explicit. Little guidance was provided on how assessment of need for ongoing CHP support should be carried out but the three categories were defined as:

- Core – need for the core universal programme only, with parents able to seek additional appointments as required,
- Additional – need for the core programme plus additional structured support from the HV, or
- Intensive – need for the core programme plus intensive multiagency support.

As part of the modifications made to the CHSP-PS information system to support implementation of the 2005 policy, an additional field was added to all child health review records to record the category of need that children had been allocated to.

This variable was called the Health Plan Indicator (HPI) and four response options – core, additional, intensive, and unknown were allowed. Updated CHSP-PS clinical guidelines reiterated the 2005 policy definitions of the level of ongoing support to be provided to children allocated to core, additional, and intensive HPI categories but they did not provide further guidance on assessment or allocation of children. The guidelines did state that the HPI should reflect the needs of the child and not the capacity of services to meet their needs, and noted that recording of an informative HPI (i.e. not unknown) was mandatory for newborn children by completion of their 6-8 week review. ‘Unknown’ HPI was to be used as a temporary category for newborn children or those who had recently moved into Scotland and were therefore still undergoing assessment.

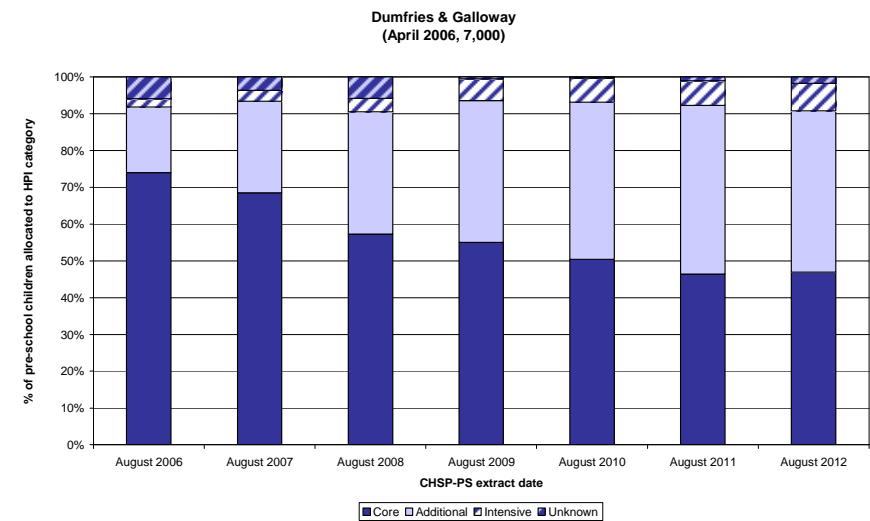
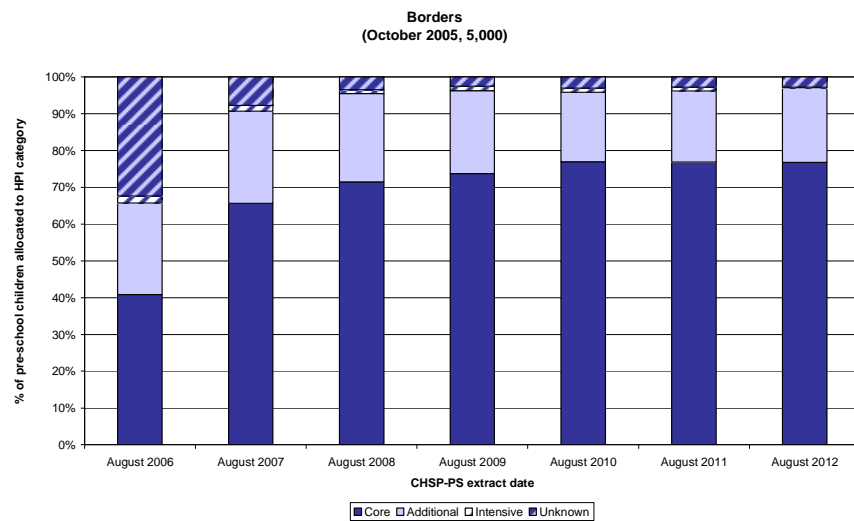
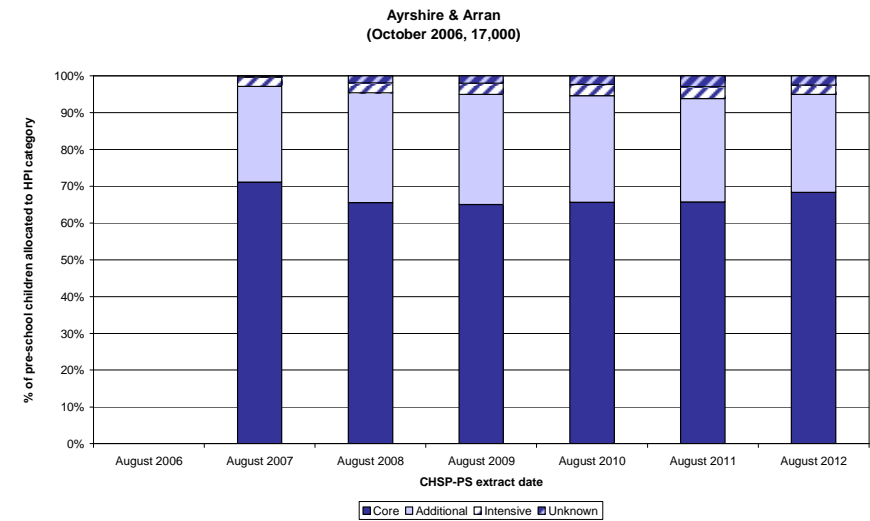
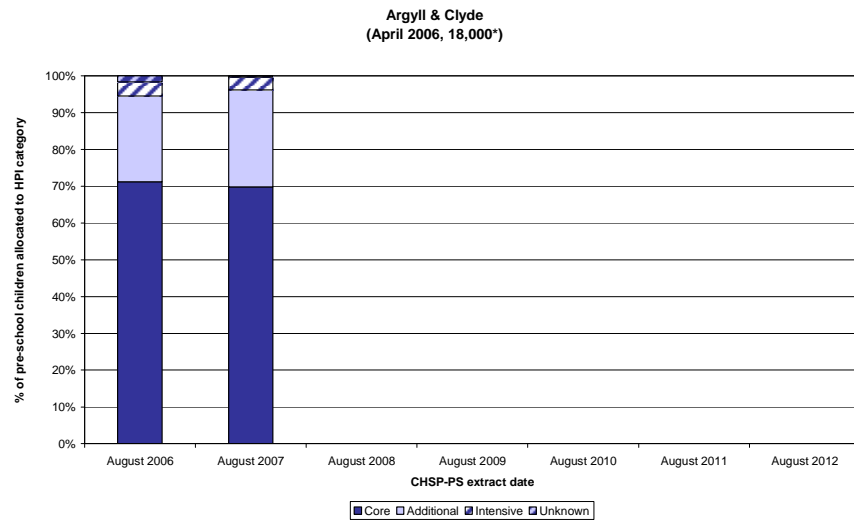
The HPI has been a contentious feature of the post-2005 reforms to the Scottish CHP. HVs have traditionally often operated some kind of prioritisation within their caseloads in order to focus their support on the families with the greatest needs and to make it clear to colleagues which families should not be allowed to ‘slip through the net’ should any individual HV be off work for a period of time. Often this has been a rather informal process that has relied on ad hoc local systems, such as attaching stickers to the paper notes of particular children or filing them in a specific location. The HPI attempted to make this kind of prioritisation much more explicit and consistent between areas. From soon after the implementation of the 2005 policy, however, concerns were raised that there was a lack of clarity about how the HPI should be used and what kinds of children with what kinds of needs should be allocated to the various categories.

The child health team in ISD provided the Hall 4 network group with quarterly information updates from February 2006 onwards. The updates were based on analysis of CHSP-PS data and were designed to support the group in its role of overseeing the implementation of the 2005 policy. Although the network group ceased to meet in 2009, ISD has continued to provide these updates to relevant staff within the Scottish Government and NHS Boards, with the most recent update available at the time of writing being that based on the August 2012 CHSP-PS

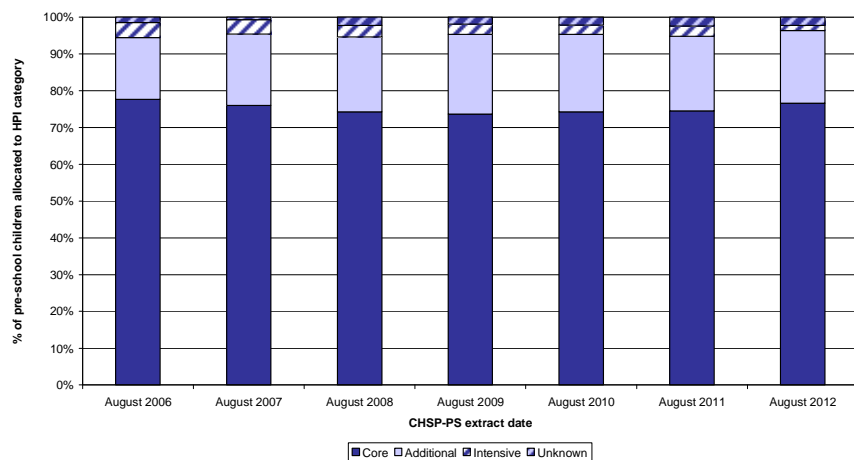
extract. The precise content of the updates has varied somewhat but all have primarily focused on how children in different areas of Scotland are being allocated to different HPI categories and hence they have been important in informing the debates around use of the HPI.

Figure 22 shows summary results from the ISD information updates. The figure shows the proportion of pre-school children registered for their Child Health Surveillance in the different NHS Boards that were assigned to the different HPI categories over time (August 2006 to August 2012). Some Boards, such as Tayside, ensured that the CHSP-PS records of all pre-school children in that area were updated to include an HPI category from very shortly after implementation of the 2005 policy. Other Boards, such as Shetland, have taken a more gradual approach to working through HV caseloads and assigning each child to an HPI hence a large proportion of children had an 'unknown' HPI in the period following implementation of the 2005 policy. Most Boards, for example Fife, have seen a very stable pattern of HPI allocation, i.e. the proportion of children allocated to the different HPI categories has been very consistent over time. Other Boards, in particular Dumfries & Galloway, have seen a shift in the pattern of HPI allocation over time. In Dumfries, the proportion of pre-school children allocated to a core HPI has fallen substantially between 2006 and 2012 and the proportion allocated to additional and intensive HPIs has correspondingly increased.

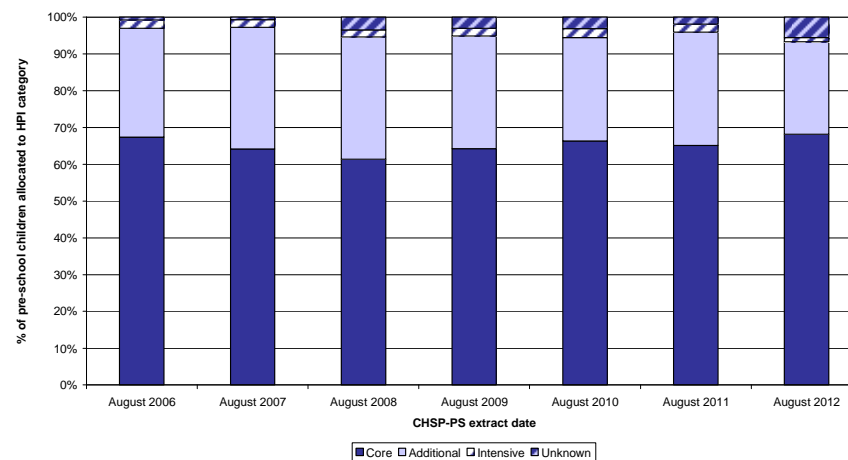
Figure 22 Percentage of pre-school children allocated to each Health Plan Indicator category, 2006-2012, by NHS Board



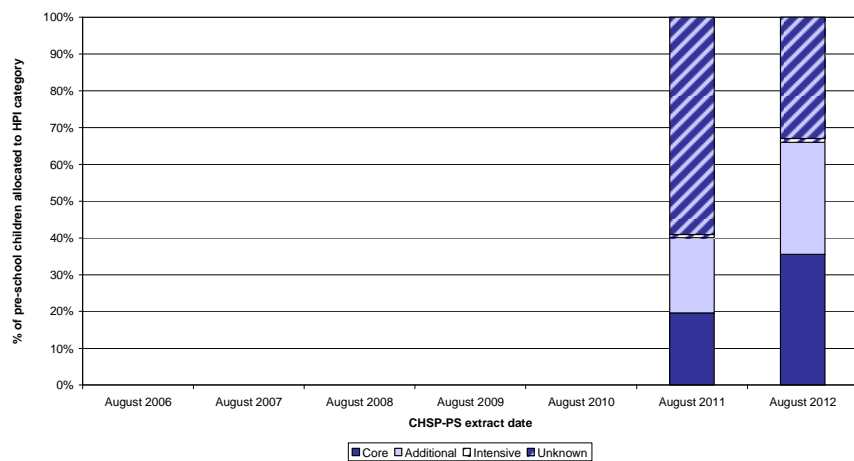
Fife
(April 2006, 18,000)



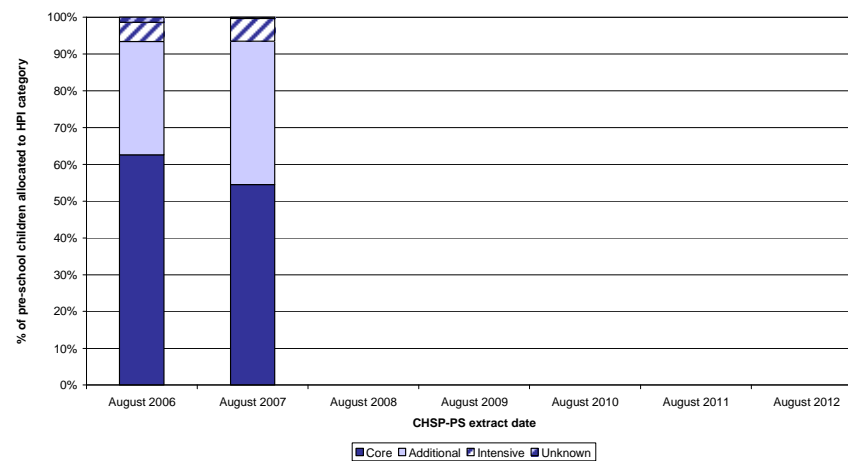
Forth Valley
(April 2006, 15,000)



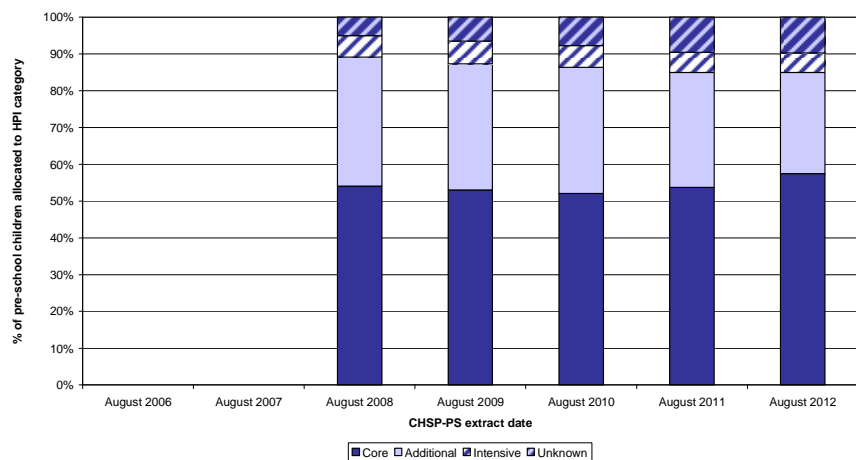
Grampian
(June 2010, 28,000)



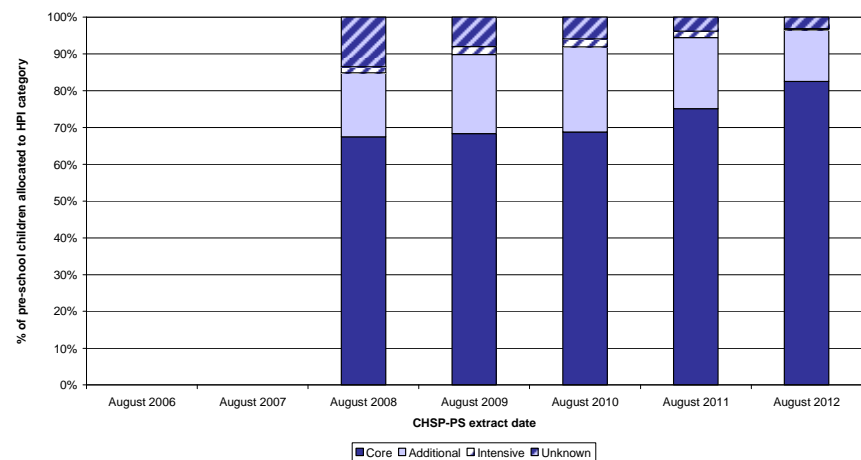
Greater Glasgow
(April 2006, 40,000)



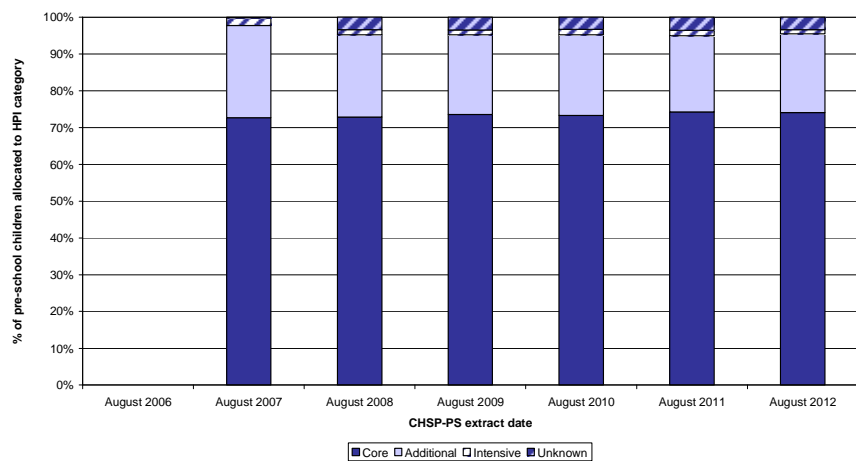
Greater Glasgow & Clyde
(April 2006, 60,000)



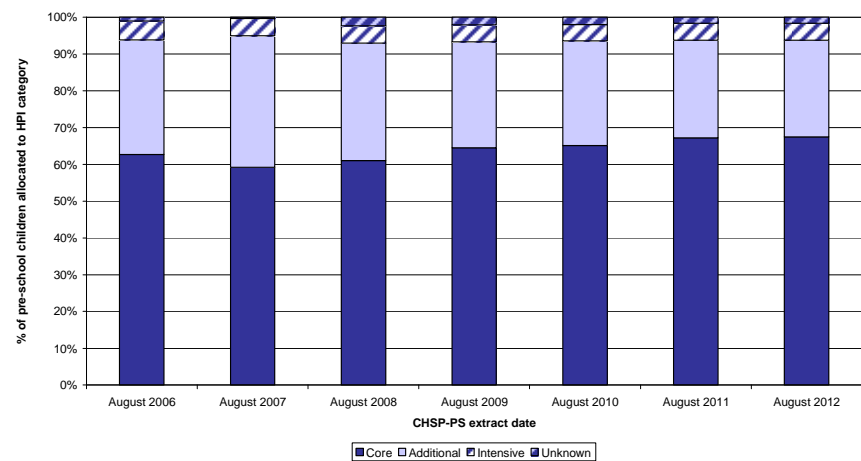
Highland
(May 2007, 14,000)



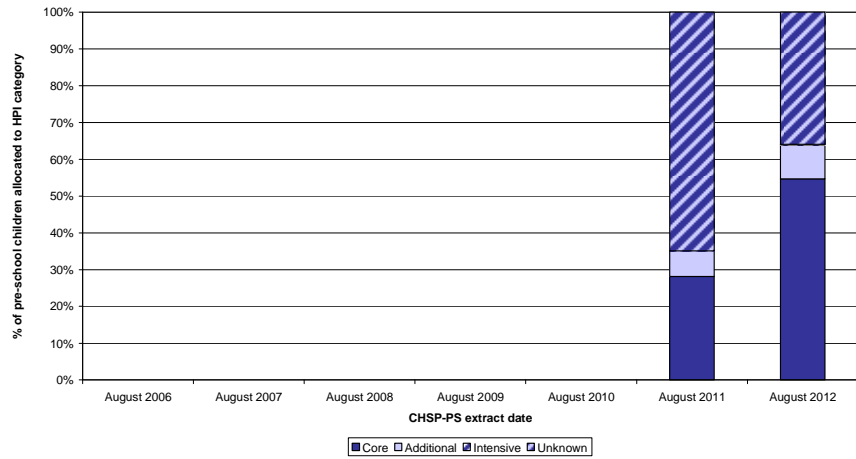
Lanarkshire
(December 2006, 29,000)



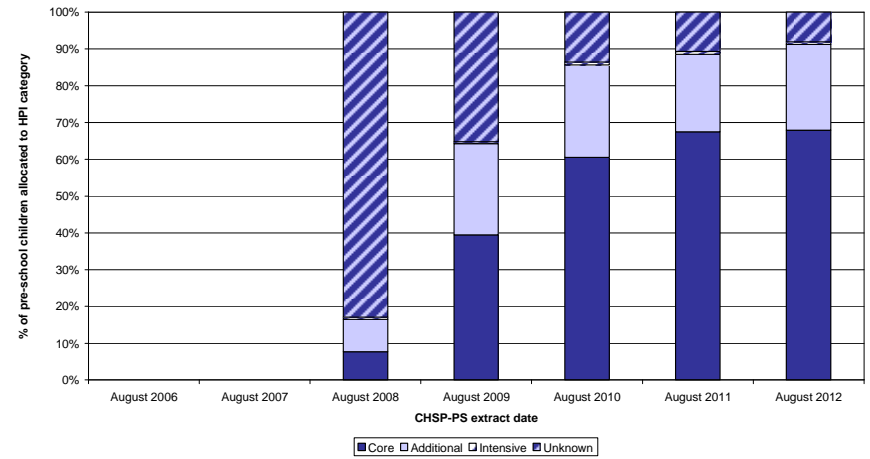
Lothian
(October 2005, 40,000)



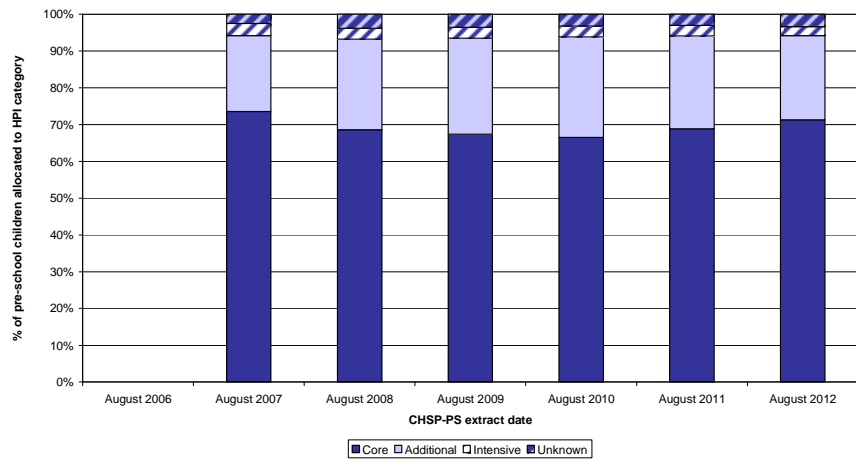
Orkney
(July 2010, 1,000)



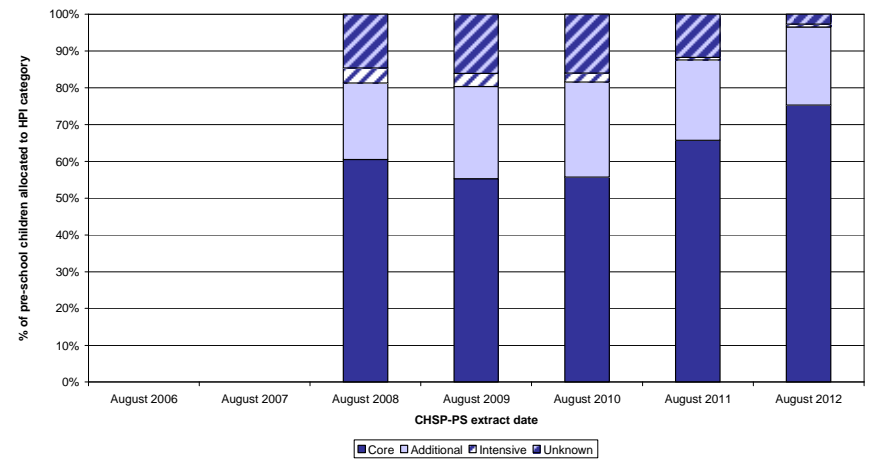
Shetland
(May 2008, 1,000)

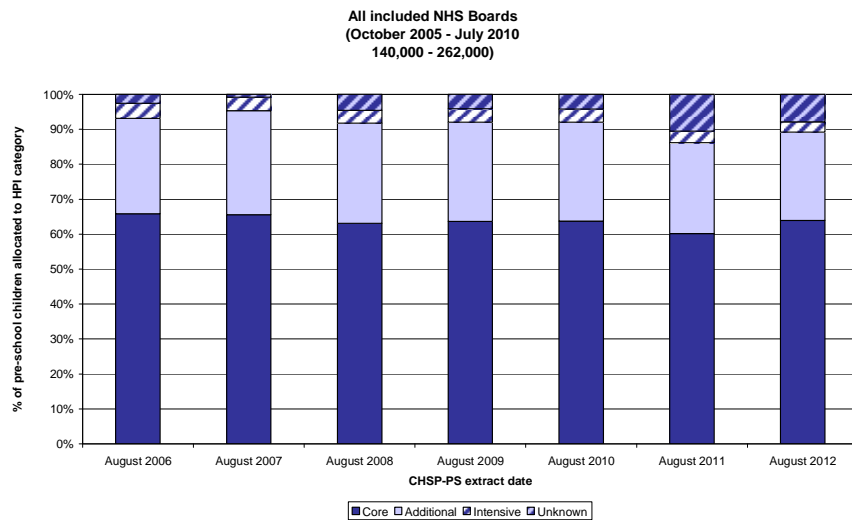


Tayside
(January 2007, 18,000)



Western Isles
(May 2006, 1,000)





* Information under NHS Board name is date of implementation of 2005 policy and average number of pre-school children registered on CHSP-PS at each of the extract dates included in the analysis

NHS Boards have only been included from the first August extract after they had implemented the 2005 policy

Pre-school children defined as those registered on CHSP-PS with date of birth from March four years prior to extract date, for example from March 2002 for the August 2006 extract

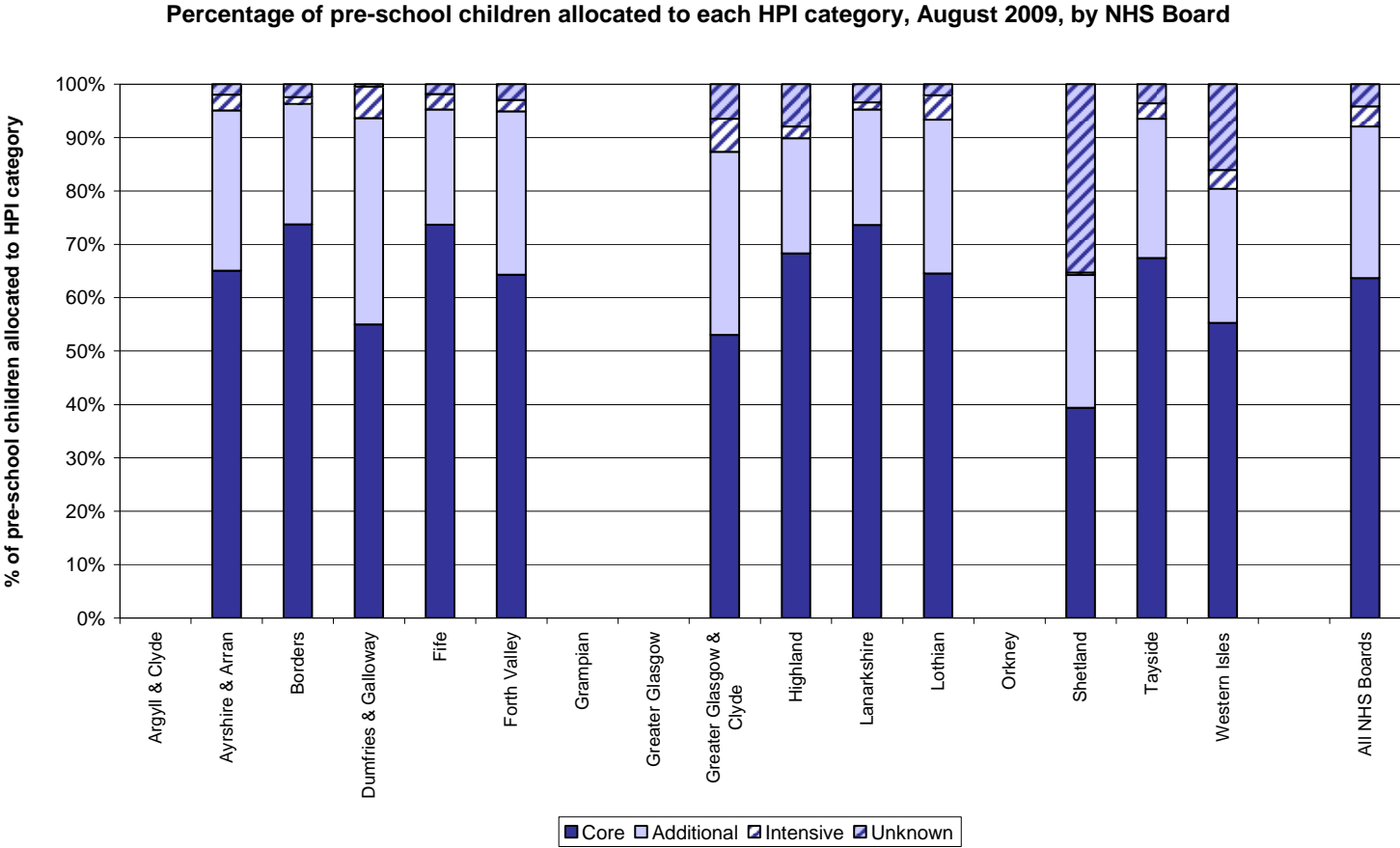
NHS Argyll & Clyde ceased to exist on 31 March 2006. The area was split into two sub-areas that were subsumed into NHS Greater Glasgow (which became NHS Greater Glasgow & Clyde) and NHS Highland. Although CHSP-PS has continued to use the 'old' 15 Board structure to collect data, children's postcodes of residence can be used to allocate those living in former A&C to either GG&C or Highland as appropriate. This was done by ISD for the analyses presented here from August 2008 onwards

Unknown HPI includes those who have been assigned to this category by their HV, i.e. they are still undergoing assessment, and those for whom no HPI has been assigned, e.g. newborn children, those who have recently immigrated into Scotland, and, in the period immediately following implementation of the 2005 policy, 'caseload' children who have not yet been reviewed and assigned to an HPI category

By August 2012, NHS Borders and NHS Highland were phasing out use of the intensive HPI category in line with the Scottish Government policy update issued in 2011 (Scottish Government 2011b) hence these areas had very few children assigned to this category

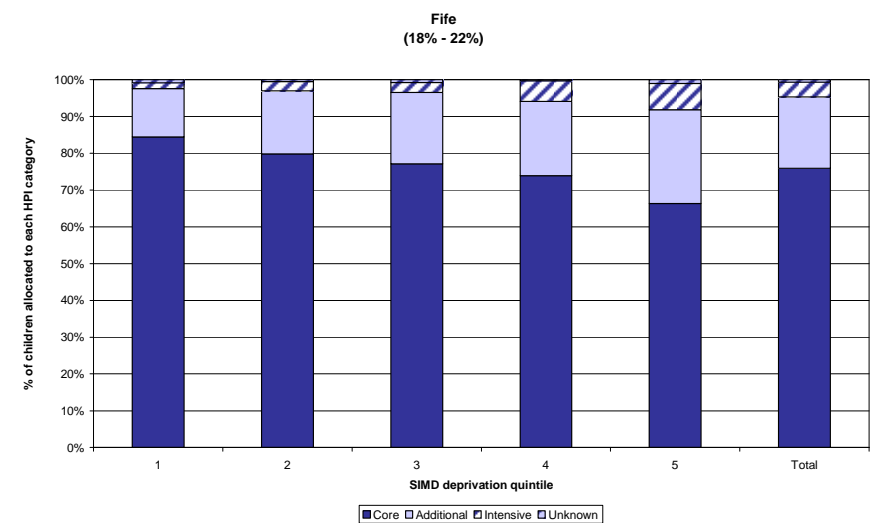
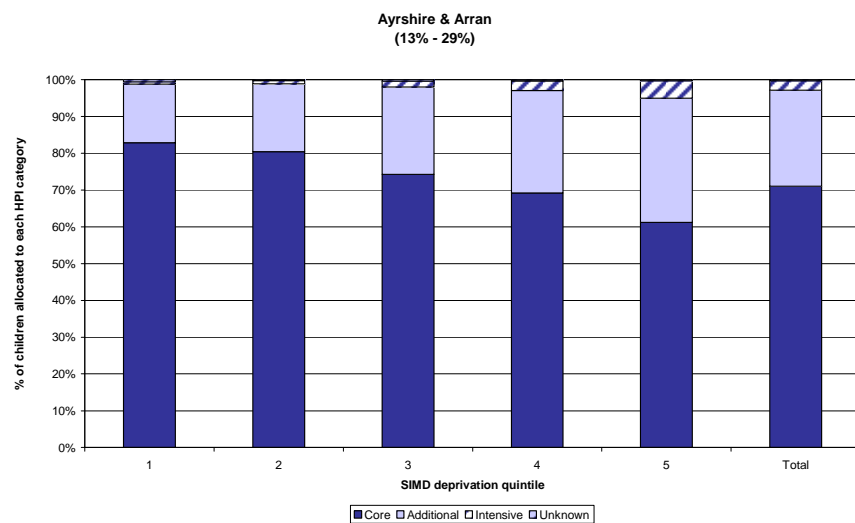
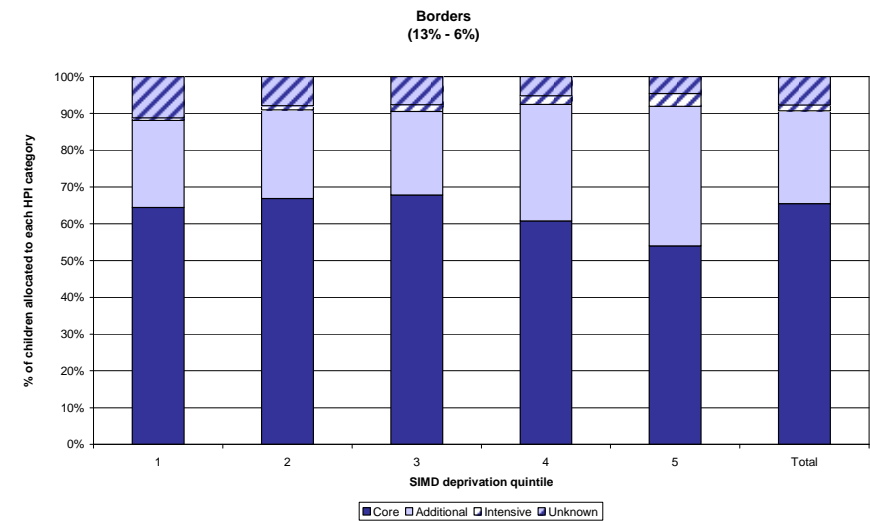
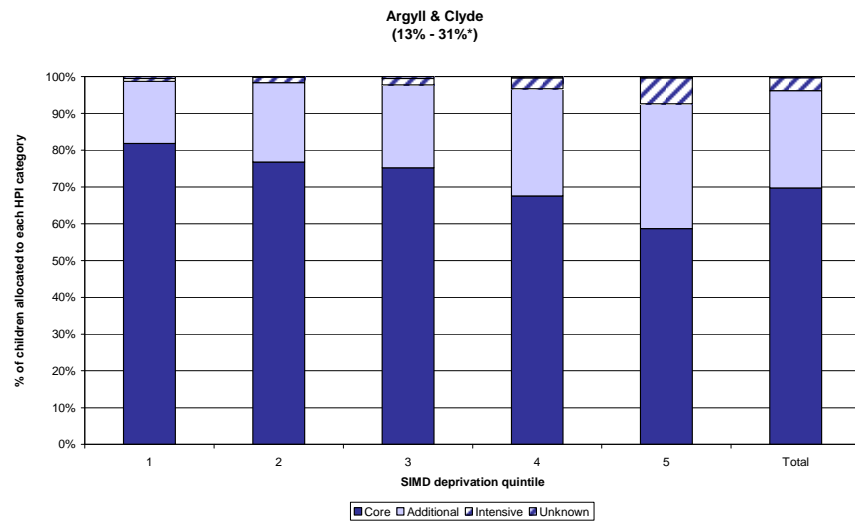
Looking across the results for the various Boards in Figure 22 shows that there is substantial variation in the pattern of HPIs allocated to pre-school children in different areas. Figure 23 shows the situation as at August 2009 (the mid time point) for all NHS Boards together to illustrate this more clearly. Some Boards, notably Shetland and Western Isles still had a large proportion of children with an unknown HPI at this stage but even between the other Boards, differences in the proportion of pre-school children allocated to core, additional, and intensive HPIs differed substantially. NHS Borders and NHS Dumfries & Galloway are both relatively small Boards in terms of resident population and both contain predominantly rural areas with some small towns. Borders has a much lower proportion of its pre-school children assigned to an additional or intensive HPI however. Similarly, NHS Greater Glasgow & Clyde and NHS Lanarkshire are both relatively large Boards that contain large urban areas with high levels of deprivation as well as more rural parts but Lanarkshire has a much lower proportion of its children assigned to an additional or intensive HPI.

Figure 23 Percentage of pre-school children allocated to each Health Plan Indicator category, August 2009, by NHS Board

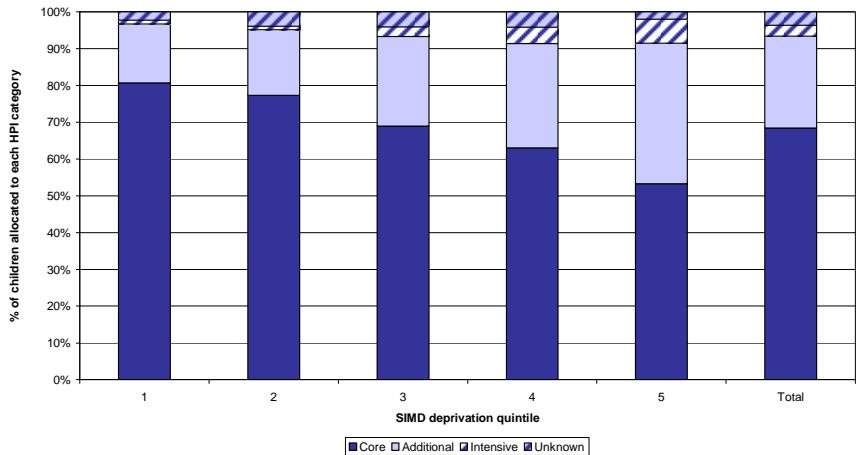


Child health analyst colleagues in ISD undertook some additional analysis for the information updates provided in 2007 and 2008 to explore the apparent variation in HPI allocation between Boards in more detail. Figure 24 shows for each NHS Board the percentage of pre-school children living in each SIMD deprivation quintile that were allocated to the various HPI categories as at August 2007. The size and deprivation profiles of the different Boards varies substantially but there is a clear tendency within each Board for children living in the most deprived quintile areas to be more likely to be assigned to an additional or intensive HPI category. Some Boards such as Fife and Greater Glasgow show a clear gradient of increasing chance of additional/intensive HPI with increasing deprivation. The slope of the gradient is particularly steep in Greater Glasgow. Other Boards such as Tayside and Borders show a less clear trend across the more affluent and intermediate quintile areas but it should be noted that percentages for some of the smaller Boards such as Borders can be based on small numbers of children in specific quintiles. Overall, Figure 24 shows that there is substantial variation between Boards in the proportion of pre-school children living in areas with similar levels of deprivation that are allocated to the different HPI categories. The percentage of children living in the least deprived quintile areas that were assigned a core HPI varied from 65% (Borders) to 84% (Fife). The comparable figures for children living in the most deprived quintiles areas were 40% (Greater Glasgow) to 67% (Lanarkshire).

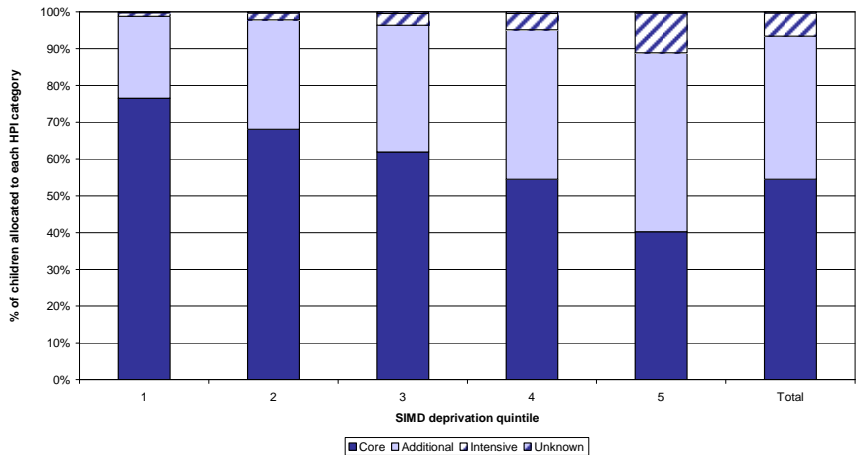
Figure 24 Percentage of pre-school children allocated to each Health Plan Indicator category, August 2007, by SIMD 2006 deprivation quintile and NHS Board



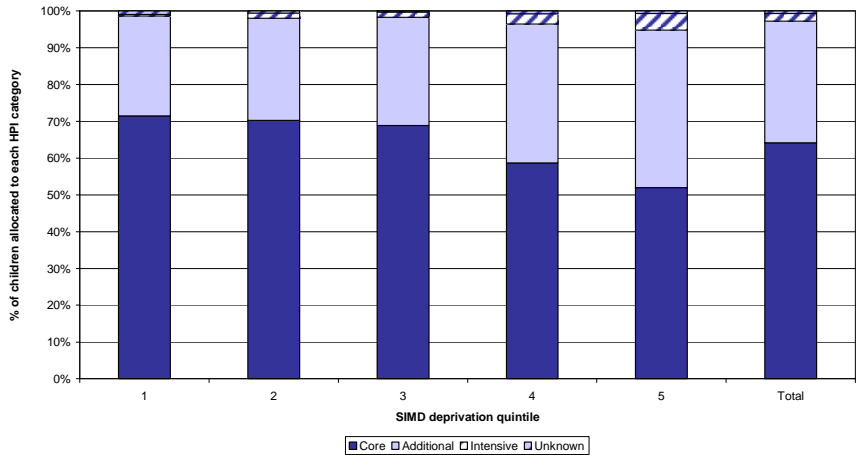
Dumfries & Galloway
(7% - 13%)



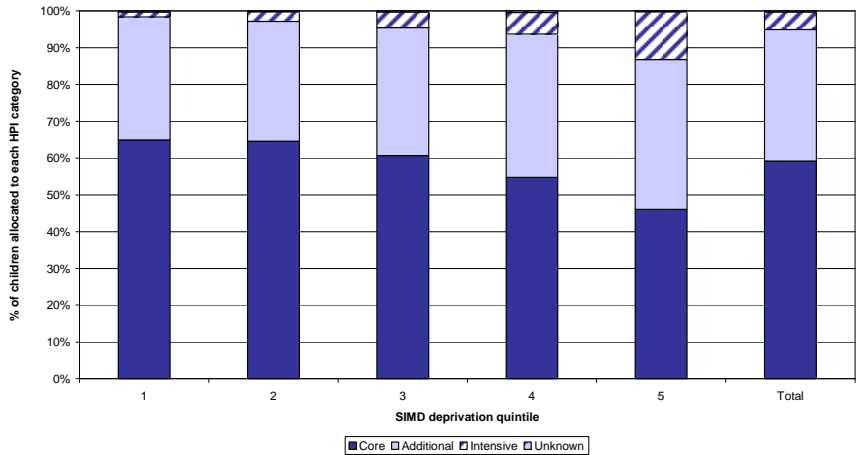
Greater Glasgow
(18% - 44%)



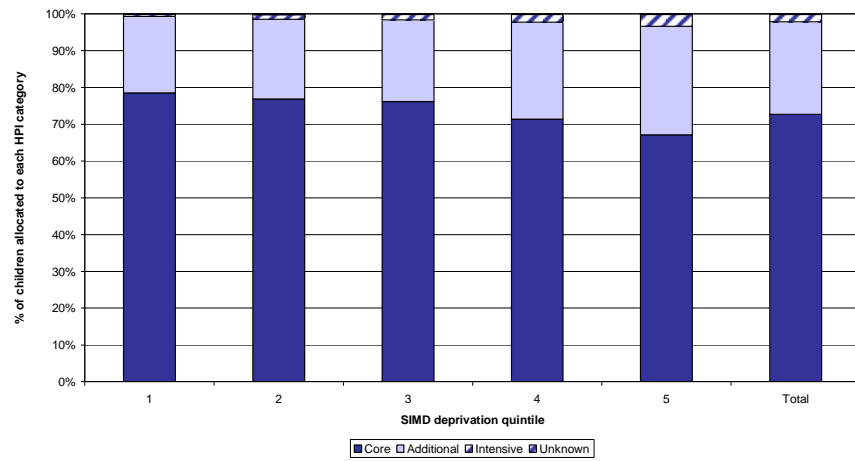
Forth Valley
(18% - 18%)



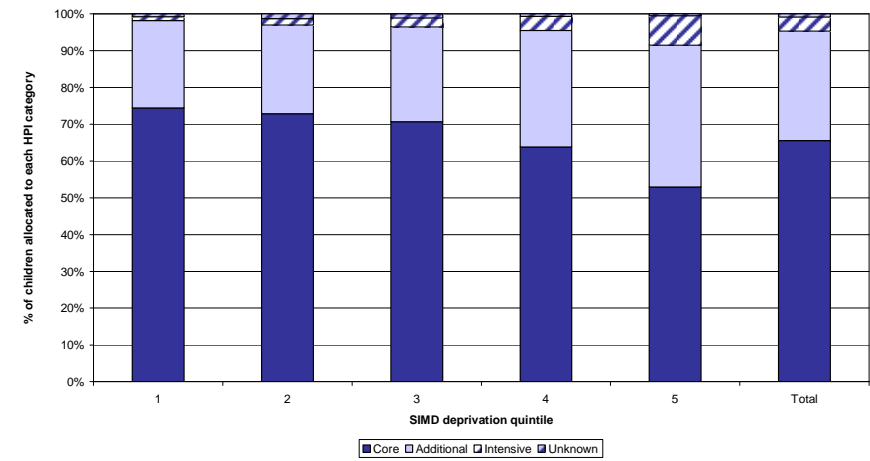
Lothian
(30% - 16%)



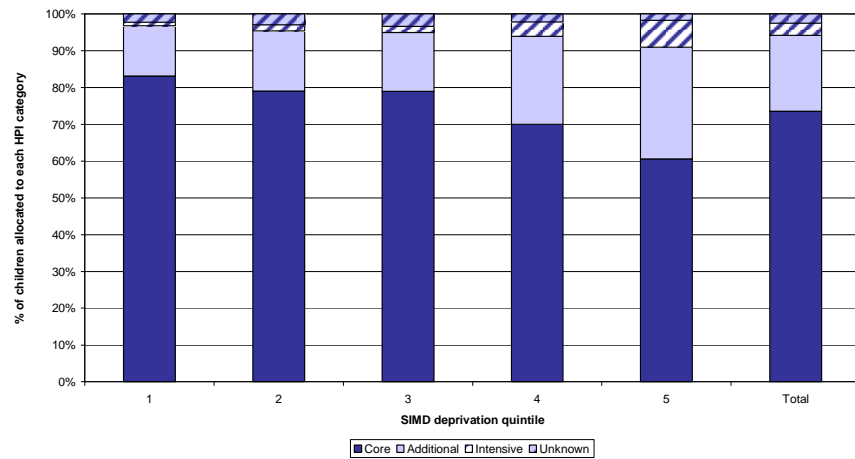
**Lanarkshire
(10% - 29%)**



**All included NHS Boards
(17% - 27%)**



**Tayside
(14% - 24%)**

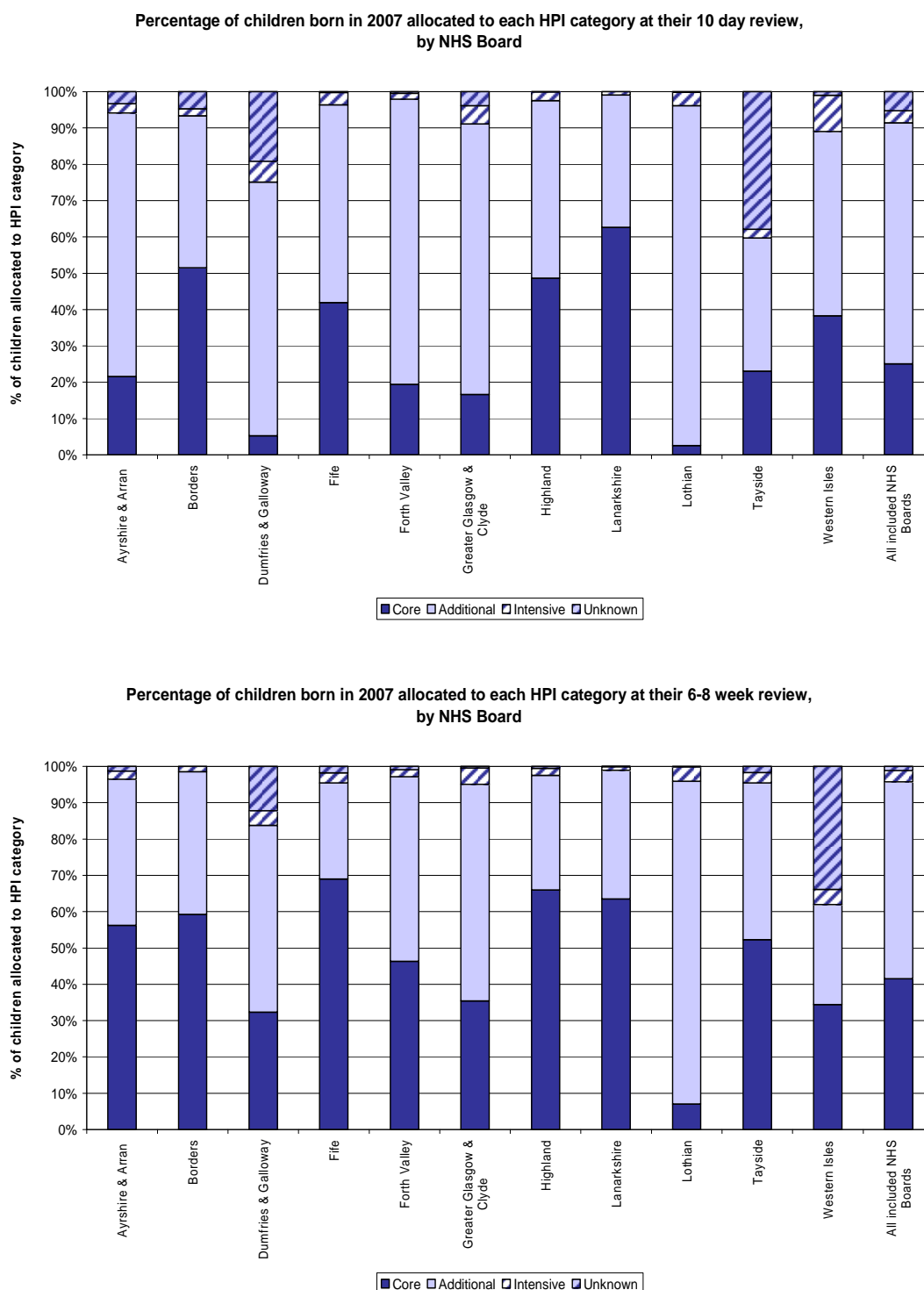


* Information under NHS Board name is % of pre-school children in SIMD 2006 deprivation quintile 1 and quintile 5
Deprivation quintile 1 is the least deprived

Figure 25 shows, just for children born in 2007, the proportion that were allocated to the different HPI categories at their 10 day and 6-8 week reviews. The results show that most Boards tended to assign a large proportion of children attending their 10 day review to an additional or unknown HPI, indicating that the HV was still actively supporting the family and/or assessing the child's needs. By the end of the 6-8 week review, as would be expected from the guidance contained in the CHSP-PS clinical guidelines, almost all children in all Boards (with the exception of Western Isles and to a lesser extent Dumfries & Galloway) had been assigned to an informative (i.e. not unknown) HPI. The proportion of children allocated to a core HPI had increased from the 10 day review but was still highly variable between Boards.

The pattern for NHS Lothian is noticeably different than that for any other Board. Even after the 6-8 week review, very few children in Lothian were assigned to a core HPI: almost all had an additional or, less commonly, an intensive HPI. This reflects the opinion of clinical leaders in NHS Lothian that 6-8 weeks was too early to assign a definitive HPI. As noted in Section 4.3.4, Lothian provided its HVs with supplementary local guidance recommending that all families with new babies should be offered two additional face to face contacts between the 6-8 week review and the child reaching six months of age. The local guidance recommended that all newborn children should be allocated an additional (or intensive) HPI, and a final HPI (i.e. including core where appropriate) should not be assigned until the end of the fourth universally offered contact at six months of age.

Figure 25 Percentage of children born in 2007 allocated to each Health Plan Indicator category at their 10 day and 6-8 week reviews, by NHS Board



Based on May 2008 CHSP-PS extract
 For Highland, only children born after May 2007 have been included. This is the date on which Highland implemented the 2005 policy and on which they started using the CHSP-PS system

The information summarised above fuelled discussions about use of the HPI at the Hall 4 network group. Not surprisingly, although many HVs found the HPI a useful tool to help them prioritise their own caseloads, the prevailing view was that the HPI was being used differently in different areas of Scotland, limiting its intended use as an objective marker of children's need for ongoing support that could be used to facilitate communication between areas, for example when families move. These views were reinforced by other work carried out in 2008, namely the survey of NHS Boards by the Scottish Government that focused on implementation of the 2005 policy; the evaluation by NHS Quality Improvement Scotland that also looked at implementation of the 2005 policy; and the work of the Hall 4 network group HPI subgroup that explored options for change in the way the HPI was used across Scotland. Each of these three pieces of work was briefly described in Section 4.3.4.

The work presented in this chapter aims to expand on the work discussed above by using routinely available data to formally explore factors associated with being allocated an additional/intensive HPI and hence being identified as requiring enhanced support from the Child Health Programme. The specific questions addressed are:

- Are children's characteristics that are known or likely to indicate increased need for support from the CHP associated with allocation of a non-core HPI?
- Does the overall level of HV staffing available in different areas influence the likelihood of children being assigned a non-core HPI?
- To what extent is the variation in allocation of HPI between Boards explained by differences in children's characteristics and HV staffing?

7.1. Methods

Factors associated with children being assigned a non-core HPI at their 6-8 week child health review were explored using multiple regression modelling. Three types of potential predictor variables were included in the regression models:

- Individual child/family characteristics known or likely to indicate increased need for CHP support
- An indicator of HV staffing/capacity
- Geographical markers such as NHS Board

A cohort of children for inclusion in the analysis was specified. Children born between July 2007 and June 2008 inclusive (i.e. the same date of birth range as Cohort 4 in the analysis of review coverage presented in Chapter 6) who were registered within SIRS to receive their Child Health Programme in one of the included NHS Boards were identified. The included Boards were slightly different to those included in the coverage analysis as there was no requirement for this cohort to be comparable to earlier cohorts. Eleven of the 15 Boards were therefore included, namely Argyll & Clyde; Ayrshire & Arran; Borders; Dumfries & Galloway; Fife; Forth Valley; Greater Glasgow; Highland; Lanarkshire; Tayside; and Western Isles. NHS Grampian, Orkney, and Shetland were excluded as they had not implemented use of CHSP-PS or the 2005 policy by July 2007. NHS Lothian was excluded as it did not allocate children to a definitive HPI category by the end of the 6-8 week review. The subset of children that had remained registered to receive their CHP within the same NHS Board from birth up to the date of the SIRS extract used (February 2009) was identified in the same way as was done for the coverage analysis. The February 2009 CHSP-PS extract was then used to identify all CHS records relating to the subset of children when they were aged up to 12 weeks. Children with a record of a 6-8 week review were identified. Those allocated an informative HPI (i.e. core, additional or intensive) at their 6-8 week review were included in the final sample.

A framework of individual child or family factors known or likely to be associated with increased need for support from the CHP was developed. Increased need for CHP support can arise for a wide variety of reasons but the keys ones considered here were increased risk of suboptimal early child development and/or increased risk of child maltreatment. Development of the framework was based on a rapid review of a number of strands of relevant evidence, namely:

- Previous studies exploring factors influencing the perceived relative need for HV resources between individuals within a caseload or between areas within a region (Crofts et al. 2000, Steel, Reading & Allen 2001, Cowley, Bidmead 2009, Cowley 2007b, Williams 1997, Horrocks et al. 1998)¹
- Emerging evidence from large scale surveys such as Growing Up in Scotland and the Millennium Cohort Study on factors associated with suboptimal early child development (Bradshaw, Tipping 2010, Bromley 2009, Blanden, Machin 2010, Dearden, Sibiet 2010, Bradshaw 2011, Schoon et al. 2005, Schoon, Cheng & Jones 2010, Hennessy, Green & Spiby 2008b, Hennessy, Green & Spiby 2008a, Kiernan, Mensah 2010, Hobcraft, Kiernan 2010)
- Factors considered in family needs assessment frameworks in use across Scotland such as the Lothian Child Concern model and that developed by the Getting It Right for Every Child programme (Hogg et al. 2009, Hogg et al. 2012, Scottish Government 2008e)
- Eligibility criteria used for enhanced CHP type interventions such as Starting Well, Sure Start, and the Family Nurse Partnership (Glass 1999, Roberts 2000, Ross et al. 2005, Olds et al. 1986, Barnes et al. 2008, Barnes et al. 2012)

Information on some of the potential individual level child/family predictors was available from the children's CHSP-PS records. All CHSP-PS records generated during the first 12 weeks of included children's lives were available for analysis. The different record types from which information could be drawn were those from

¹ Note that some of the references cited have become available after the initial framework was developed but they are included here for completeness.

the 10 day review, the 6-8 week review, and, for some children, the birth details form. The CHSP-PS birth details form is unusual in that it does not refer to a specific review. It provides summary information on the child's delivery and is completed by midwives prior to a baby being discharged from postnatal care. It is passed to HVs to support continuity of care. Birth details forms are only used in some NHS Board areas (see <http://www.isdscotland.org/Health-Topics/Child-Health/Child-Health-Programme/Child-Health-Systems-Programme-Pre-School.asp>).

Information on other potential individual level child/family predictors was available from the children's mothers' hospital delivery records (Scottish Morbidity Record 02, SMR02 records). SMR02 records are routinely returned to ISD from obstetric units across Scotland after a woman is discharged following an episode of care (see <http://www.isdscotland.org/Health-Topics/Maternity-and-Births/Births/Background.asp>). Included children's mothers' SMR02 delivery records were therefore linked to the children's CHSP-PS records and included in the analysis file. ISD routinely maintains a linked maternal and neonatal dataset which holds mothers' SMR02 records together with their children's statutory birth records and other relevant information such as records of children's neonatal care. Children's personal identifiers (first name, second name, sex, date of birth, full home postcode) held on their CHSP-PS records were therefore firstly linked to their statutory birth records using previously developed probability matching algorithms (Kendrick, Clarke 1993, Kendrick 1997). Their mothers' SMR02 records were then found by direct matching based on maternal and neonatal dataset 'link number' and the child's date of birth and sex.

Although the SMR02 is the mother's record, SMR02 records returned after a delivery do contain a range of information on the baby/babies born as well as information on the mother's health and care. Following a multiple birth, i.e. of twins or more, the SMR02 record contains a note of the total number of babies born and detailed information (such as birthweight) on up to three babies. The babies are just referred to as 'baby 1' (i.e. the first born), etc on the SMR02 record: full identifiers

such as babies' names are not included as they may well be unknown by the time the mother is discharged home. This means that when CHSP-PS records relating to a child from a multiple birth are linked to their mother's SMR02 delivery record, it may not be clear which 'baby' the child is and therefore which set of information should be used. To enable multiple births to be retained in the sample, all children from a multiple birth were therefore assigned the information from the relevant SMR02 record relating to 'baby 1'.

Some potential predictor variables were available from both CHSP-PS and SMR02. In these cases, the source with the most complete data was selected as the primary data source. When appropriate, composite variables were created to maximise data completeness, for example gestational age was taken from SMR02 or, if unavailable from SMR02, from the CHSP-PS 10 day review record. Continuous variables were categorised to facilitate analysis and maximise data quality, for example the composite gestational age variable was categorised as very preterm if <32 weeks, preterm if 32-36 weeks, or term if ≥ 37 weeks, with values of <20 or >45 weeks and missing values categorised as unknown.

Including both gestational age and birthweight as separate predictor variables in regression models can lead to collinearity issues as these factors are so highly correlated. To avoid this, a derived variable indicating 'small for gestational age' was created. Gestational age and small for gestational age status (but not birthweight) were then included as predictor variables in the regression models. Determining whether a baby is small for gestational age essentially involves comparing their birthweight to standard birthweight centile charts for babies of the same gestational age, sex, and singleton/multiple status. The standard centile charts used here were previously developed based on babies born in Scotland in 1998-2003 and are held in ISD for analytical purposes (Bonnellie 2006). Small for gestational age babies were defined as those with a birthweight on or below the 5th centile.

Information on some of the potential individual level child/family predictors was not available from CHSP-PS or SMR02 records. These potential predictors were therefore not included in the regression analyses.

In addition to the individual level child/family factors discussed above, it is possible that the workload/capacity of individual HVs may influence how likely they are to assign children to a non-core HPI. HVs with smaller caseloads and/or a lower proportion of ‘vulnerable’ families within their caseloads may feel more able to assign any individual child to a non-core HPI. Although the CHSP-PS clinical guidelines emphasise that the HPI should reflect the needs of the child and not the capacity of services to respond to their needs, in practice it may be difficult for HVs to assign a child to a non-core HPI if they do not feel they will subsequently be able to offer the child enhanced support.

It was not possible to obtain information on the caseload of the HV assigning a child’s HPI at their 6-8 week review hence the total number of whole time equivalent HVs per 1,000 children aged 0-4 years in the Community Health Partnership where the child lived was used as a proxy indicator of HV staffing/capacity. This variable was included as an additional predictor in the regression models. The data on the number of HVs was obtained directly from the 31 Community Health Partnerships within the 11 included NHS Board areas by email survey issued in August 2009. The general managers of the Community Health Partnerships in included Boards were asked to provide information on the *‘in-post whole time equivalent number of qualified Health Visitors/Public Health Nurses (i.e. registered nurses holding the relevant Specialist Practitioner Qualification) who were actively managing a case load of pre-school children’* at that time. After up to two reminders, 29 out of the 31 Community Health Partnerships surveyed had provided the requested information.

National snap shot data on the NHS workforce is periodically submitted from all NHS Boards to ISD via the Scottish Workforce Information Standard System (SWISS) (see <http://www.isdscotland.org/Health-Topics/Workforce/Data-Sources-and-Collections/#SWISS>). SWISS data from September 2008 were used to estimate

the number of HVs working in the two Community Health Partnerships that did not respond to the survey. SWISS data were not used for all areas as some Boards only return data at NHS Board (rather than Community Health Partnership) level. In addition, some Boards do not identify HVs as a specific staff group in their SWISS returns, for example they categorise all HVs and school nurses as public health nurses. It was simply fortuitous that the two Community Health Partnerships that did not respond to the survey were in Boards that did submit informative SWISS data. National Records of Scotland 2007 mid year population estimates provided the denominator data, i.e. the number of children aged 0-4 years living in each Community Health Partnership area.

Finally, the NHS Board in which children were registered to receive their Child Health Programme was also included in the regression models as a relevant geographical marker. Children's Community Health Partnership of residence was also included in the multilevel regression models (see below).

Simple counts and percentages describing the occurrence of the predictor and outcome variables within the sample were calculated using SPSS version 17.0. The relationship between each individual predictor variable and the outcome variable was assessed by cross tabulating each predictor variable with the outcome variable to see the pattern of HPI distribution across all the different categories of the predictor variable, for example children with mothers who smoked, did not smoke, and had unknown smoking status. The only predictor that was included in the models as a continuous variable (HV availability) was categorised to facilitate this (3 categories: <4 , $4-<5$, ≥ 5 HVs per 1,000 children). Odds ratios (with 95% confidence intervals) of being allocated an intensive (rather than core) HPI were then calculated for children in the 'highest' categories of each predictor variable compared to the 'lowest' (for example living in deprivation quintile five compared to quintile one). Odds ratios were recalculated comparing any non-core (i.e. additional or intensive) HPI to a core HPI.

In addition to looking at the whole sample of children, the distribution of HPI across the different categories of the various predictors was also assessed for the sub-samples living in Greater Glasgow and, separately, Lanarkshire. These Boards were chosen as they had the highest and lowest proportion of children respectively assigned to a non-core HPI. Looking at these Boards individually therefore helped to explore whether particular predictors were more or less strongly associated with HPI allocation in these areas or whether the differences in HPI distribution represented more of a 'threshold' effect across all predictors. All cross tabulations and odds ratios were also done in SPSS.

Standard multiple regression was then used to assess the joint influence of all the predictor variables. Backward stepwise logistic regression with significance threshold set at 0.05 was conducted using Intercooled Stata version 8.0. Two regression models were fitted: one comparing children receiving an intensive HPI to those receiving a core HPI, and one comparing children receiving any non-core HPI to those receiving a core HPI.

As the potential predictor variables intrinsically relate to different levels (i.e. individual children or geographical areas), the models were refitted using three level multilevel multiple logistic regression using Statistical Analysis System (SAS) release 9.2. Community Health Partnership and NHS Board were included in the multilevel regression and were taken as levels 2 and 3 respectively. The multilevel approach ensures that predictor variables are assessed at the correct level of variation, for example the HV staffing level variable was assessed at the Community Health Partnership level (Diez-Roux 2000). Whether the multilevel models indicated there was significant residual variation in HPI allocation between Community Health Partnerships and, separately, NHS Boards after all other predictors had been considered was assessed by a likelihood ratio test. This assesses whether adding each of these geographical variables significantly improves the ability of the model to explain the observed variation in HPI allocation.

The ability of the multilevel models to distinguish children likely to be allocated an intensive or non-core (rather than a core) HPI was assessed. The proportion of children assigned to categories of increasing probability of receiving an intensive or non-core HPI (0.0-0.1, >0.1-0.2, etc) was examined along with the proportion within each category that actually received an intensive or non-core HPI. The proportion of children correctly classified by the models (i.e. assigned a probability of receiving an intensive/non-core HPI of >0.5 and actually received an intensive/non-core HPI or vice versa) was also examined. Diane Stockton from ISD provided assistance with the standard multiple regression modelling and Helen Brown from the University of Edinburgh provided assistance with the multilevel modelling.

ISD has had standing approval from the Privacy Advisory Committee (PAC, see <http://www.nhs.uk/privacy/pac/>) since 1997 to link maternal and child health data. This approval is updated periodically. The most recent approvals that cover the period during which the analyses presented in this thesis were undertaken are PAC applications 2011/71, 2009/3, and 2003/30. As I held an honorary then a substantive contract with ISD during the time the analysis presented here was undertaken, and all analysis was done on ISD premises with no identifiable data taken elsewhere, no additional approval from PAC was therefore required for the linkage of CHSP-PS and SMR02 data. NHS ethical approval was not required for this work as it did not involve anyone accessing identifiable patient data that they would not ordinarily have access to as part of their usual role (Department of Health 2011b, National Research Ethics Service 2011).

7.2. Results

The sample of children included in the analysis is shown in Figure 26. The framework of individual child or family factors known or likely to be associated with increased need for support from the CHP is shown in Table 39. The variables included in the regression models along with relevant definitions and data sources are shown in Table 40.

Figure 26 Children included in the analysis of HPI allocation

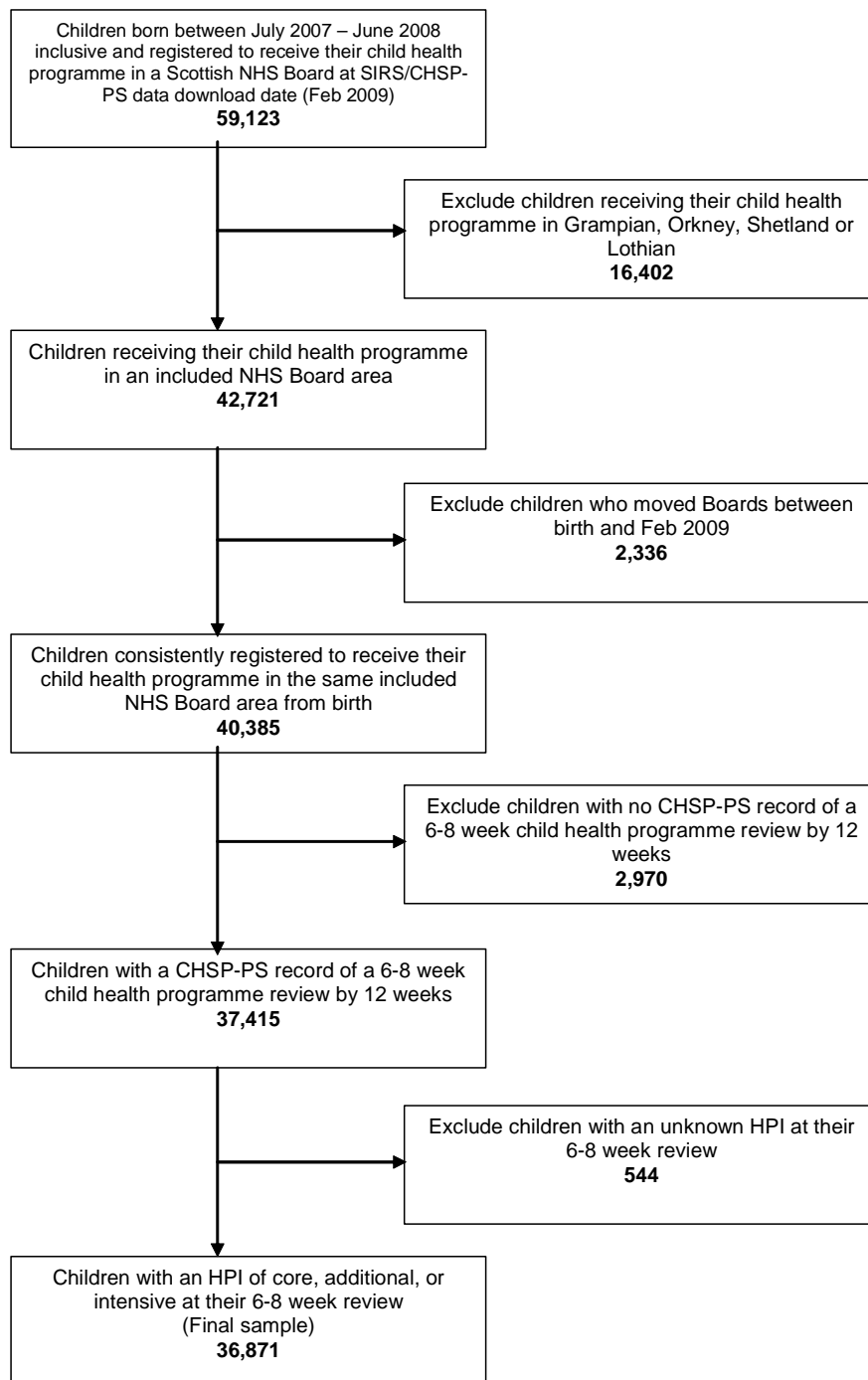


Table 39 Framework of individual child or family factors known or likely to be associated with increased need for Child Health Programme support

Factor		Related variable included in analysis
Family social circumstances		
	Low income / poverty / material deprivation	✓
	Young maternal age	✓
	Mother with low educational attainment	✗
	Single mother	✗
	Workless household	✗
	Intimate partner violence	✗
	Parental criminal involvement	✗
	Homeless family	✗
	Child protection intervention / looked after status for this child or previous children	✗
	Either parent 'looked after' as a child	✗
	Lack of social support / isolation	✓
	Mother from ethnic minority	✓
Parental health		
	Parental smoking	✓
	Parental alcohol misuse	✗
	Parental drug misuse	✓
	Parental mental health	✗
	Parental physical health	✗
Obstetric history and delivery		
	Previous stillbirth or infant death	✓
	First child	✓
	Multiple birth	✓
	Prematurity	✓
	Low birth weight / intrauterine growth restriction	✓
	Operative delivery	✓
Infant health and development		
	Infant sex	✓
	Infant feeding	✓
	Admitted to SCBU/NICU	✓
	Concerns about baby's health	✓
	Concerns about baby's development	✓
	Parent-infant relationship / attachment	✗

SCBU is Special Care Baby Unit; NICU is Neonatal Intensive Care Unit

Table 40 Variables included in the analysis of HPI allocation: definitions and data sources

Variable	Data definition and source
Potential predictors: individual child/family characteristics	
Deprivation	SIMD 2006 deprivation quintile* based on maternal postcode of residence at time of delivery on statutory birth record
Maternal age	At 10 day review from CHSP-PS** or at delivery from SMR02†
Remoteness	Scottish Government 2006/07 urban-rural 8 fold category†† based on maternal postcode of residence at time of delivery on statutory birth record
Maternal ethnicity	From SMR02
Maternal smoking	Maternal smoking status at 10 day review from CHSP-PS
Maternal drug misuse	Maternal drug misuse during this pregnancy from SMR02
Previous stillbirth or neonatal death	From SMR02
First child	Previous live births from SMR02
Multiple birth	Number of babies this delivery from SMR02
Prematurity	Gestation at delivery from SMR02 or CHSP-PS 10 day review
Small for gestational age	Derived from information on gestation, birthweight, sex, and singleton/multiple status from SMR02 and CHSP-PS birth details and 10 day review
Mode of delivery	From SMR02
Infant sex	From any CHSP-PS record
Infant feeding at birth	From CHSP-PS 10 day review
Admitted to SCBU/NICU	From SMR02 or CHSP-PS birth details
Medical/social concerns	Any concern about child's physical health (including congenital anomaly) or social circumstances recorded by HV from CHSP-PS 10 day or 6-8 week review
Developmental concerns	Any concern about child's development recorded by HV from CHSP-PS 6-8 week review
Potential predictors: HV staffing/capacity	
HV availability	Number of whole time equivalent qualified HVs per 1,000 children aged 0-4 years in Community Health Partnership area of residence from special survey and SWISS§
Potential predictors: geographical markers	
Community Health Partnership (Multilevel models only)	CHP of residence based on child's postcode of residence recorded in CHSP-PS as at data download date (February 2009)
NHS Board	NHS Board where child registered to receive Child Health Programme recorded in CHSP-PS as at data download date (February 2009)
Outcome variable	
Health Plan Indicator	Health Plan Indicator from CHSP-PS 6-8 week review

* see (Scottish Executive 2006)

** Definitions and code structures for CHSP-PS variables:<http://www.isdscotland.org/Health-Topics/Child-Health/Child-Health-Programme/Child-Health-Systems-Programme-Pre-School.asp>

† Definitions and code structures for SMR02 variables:
<http://www.datadictionaryadmin.scot.nhs.uk/isddd/9215.html>

†† see (Scottish Government 2008g)

§ see <http://www.isdscotland.org/Health-Topics/Workforce/Data-Sources-and-Collections/#SWISS>

The distribution of the different variables within the study sample is summarised in Table 41. When the CHSP-PS to SMR02 linkage was performed, 55 of the 36,871 children (0.1%) had no birth record identified in the maternal and neonatal dataset, indicating likely failure of the probabilistic linkage algorithms. A further 3,517 (9.6%) had no SMR02 record identified, indicating either that an SMR02 record was missing (e.g. the child was born outwith hospital or the hospital had failed to return an SMR02) or failure of the birth record to SMR02 matching process. Therefore, 3,572 of the 'unknown' cases for variables derived solely from SMR02 are accounted for by these cases. It can be seen that when this is taken into account, data completeness was very high for all variables with the exception of maternal ethnicity and maternal drug misuse during pregnancy.

The sample is slightly more deprived than the general population of children in Scotland as the excluded Boards (Grampian, Orkney, Shetland and Lothian) are relatively affluent. In 2010, around 26% and 16% of all babies born in Scotland were born to mothers living in the most and least deprived quintile areas respectively (Information Services Division 2011a). Despite this, the occurrence of specific factors such as maternal smoking, prematurity, different modes of delivery, etc seen in the sample is very similar to that seen for the Scottish child population as a whole.

The workforce data indicate that the availability of qualified Health Visitors is very variable across Scotland. One Community Health Partnership had an estimated 2.28 whole time equivalent Health Visitors per 1,000 resident children aged 0-4 years whereas another had 7.66. There was no clear pattern evident in staffing availability, for example by size of Community Health Partnership or level of deprivation or rurality. The distribution of HPIs allocated to sample children at the 6-8 week review is similar to that previously indicated by the ISD information updates summarised in the introduction as would be expected (see Figure 25).

Table 41 Distribution of predictor and outcome variables within sample included in the analysis of HPI allocation

Variable	Categories	Number	Percentage
Potential predictors: individual child/family characteristics			
Deprivation	5 (most deprived)	10,627	28.8
	4	8,067	21.9
	3	7,054	19.1
	2	6,135	16.6
	1 (least deprived)	4,896	13.3
	Unknown	92	0.2
Maternal age	12-19 years	2,730	7.4
	20-50 years	33,986	92.2
	Unknown	155	0.4
Remoteness	Very remote	1,248	3.4
	Remote	1,532	4.2
	Accessible	33,999	92.2
	Unknown	92	0.2
Maternal ethnicity	Non-white	268	0.7
	White	2,436	6.6
	Unknown	34,167	92.7
Maternal smoking	Yes	7,243	19.6
	No	28,114	76.2
	Unknown	1,514	4.1
Maternal drug misuse	Yes	292	0.8
	No	9,741	26.4
	Unknown	26,838	72.8
Previous stillbirth or neonatal death	Yes	358	1.0
	No	32,437	88.0
	Unknown	4,076	11.1
First child	Yes	14,943	40.5
	No	18,071	49.0
	Unknown	3,857	10.5
Multiple birth	Yes	1,026	2.8
	No	32,273	87.5
	Unknown	3,572	9.7
Prematurity	Very pre-term (<32 weeks)	300	0.8
	Pre-term (32-36 weeks)	2,154	5.8
	Term (≥37 weeks)	34,356	93.2
	Unknown	61	0.2

Identification of children requiring enhanced Child Health Programme support

Variable	Categories	Number	Percentage
Small for gestational age	Yes	1,407	3.8
	No	31,858	86.4
	Unknown	3,606	9.8
Mode of delivery	Emergency Caesarean	5,119	13.9
	Elective Caesarean	3,729	10.1
	Forceps, Ventouse, breech	1,728	4.7
	Spontaneous vaginal	20,926	56.8
	Unknown	5,369	14.6
Infant sex	Male	18,701	50.7
	Female	18,170	49.3
	Unknown	0	0.0
Infant feeding at birth	Formula only	16,012	43.4
	Any breastfeeding	20,280	55.0
	Unknown	579	1.6
Admitted to SCBU/NICU	≥48 hours	1,503	4.1
	<48 hours	975	2.6
	No	30,992	84.1
	Unknown	3,401	9.2
Medical/social concerns	Yes	9,575	26.0
	No	27,296	74.0
	Unknown	0	0.0
Developmental concerns	Yes	740	2.0
	No	34,559	93.7
	Unknown	1,572	4.3
Potential predictors: HV staffing/capacity			
HV availability*	Minimum 2.28 whole time equivalent HVs per 1,000 children aged 0-4 years		
	Maximum 7.66 whole time equivalent HVs per 1,000 children aged 0-4 years		
	Unknown	200	0.5
Potential predictors: geographical markers			
Community Health Partnership*	Included children lived in a total of 33 Community Health Partnership areas		
	Unknown 185 (0.5%)		
NHS Board	Included children lived in a total of 11 NHS Board areas		
	By definition no unknown		
Outcome variable			
Health Plan Indicator	Core	18,846	51.1
	Additional	16,962	46.0
	Intensive	1,063	2.9
	By definition no unknown		

* The 11 included NHS Board areas contain a total of 31 Community Health Partnerships. 185 children had an unknown Community Health Partnership of residence, for example due to incorrect postcode. A further 15 children lived in two Community Health Partnerships that were outwith an included NHS Board (for example the children lived close to a geographical boundary) and therefore had not been included in the HV workforce survey. A total of 200 children therefore had unknown HV availability

The results of assessing the association between each individual predictor variable and HPI allocation are summarised in Table 42. Every potential predictor showed a significant association with HPI allocation apart from infant sex. For the majority of predictors, the associations were in the expected direction, for example children living in increasingly deprived areas were increasingly likely to be assigned an additional or intensive HPI. The association between remoteness and HPI was in the reverse direction to that expected. It had been hypothesised that children living in very remote areas may have been more in need of enhanced support from the CHP to overcome possible social isolation but in fact these children were less likely than those living in accessible areas to be assigned a non-core HPI. This may indicate that features associated with living in accessible (i.e. mainly urban) areas such as increased material deprivation, greater chance of belonging to an ethnic minority, etc outweigh any effects of geographical isolation in remote areas and/or that there is no simple relationship between geographical and social isolation.

Possible associations between infant feeding method and HPI were difficult to predict. Breastfeeding difficulties in early infancy are a common reason for requiring HV support hence an association between breastfeeding and an additional (but not intensive) HPI may have been expected. In practice, lack of breastfeeding was associated with a higher chance of both an additional or intensive HPI, again probably indicating that associations between lack of breastfeeding and other vulnerability factors outweighed any association between breastfeeding and need for short term HV support. The association between level of HV availability in the Community Health Partnership where a child lived and HPI allocation was complex. Children living in areas with the highest HV availability were most likely to have an additional or intensive HPI but there was no clear trend for children living in areas with lower levels of staffing. There was substantial variation in the pattern of HPI distribution between Community Health Partnerships and NHS Boards as expected.

Assessing the pattern of HPI distribution across the various categories for each of the predictor variables included all the children in the sample for each predictor. By contrast, the number of children included in the odds ratio calculations presented in

Table 42 varied between the different predictor variables depending on how many children were included in the 'highest' and 'lowest' categories of the predictor. Comparing intensive to core HPI allocation also always includes fewer children than comparing non-core to core due to the exclusion of children with an additional HPI.

The association between each predictor and HPI distribution in the sub-samples of children living in Greater Glasgow and, separately, Lanarkshire showed that overall the patterns seen for both Boards were very similar to those seen for the sample as a whole. For every category of every predictor variable (apart from remoteness which is not relevant to these Boards) Lanarkshire showed a higher proportion of children with core HPI and a lower proportion with additional or intensive HPI than Glasgow however. This suggests there is an overall 'threshold' effect for allocating non-core HPIs that varies between Boards rather than idiosyncratic local responses to specific vulnerability factors.

Table 42 Association between each predictor variable and HPI allocation at 6-8 week review

Variable	Categories compared	Odds ratio of intensive cf. core HPI			Odds ratio of non-core cf. core HPI			Comment
		OR	Lower 95% CI	Upper 95% CI	OR	Lower 95% CI	Upper 95% CI	
Deprivation	Deprivation quintile 5 (most deprived) cf. 1 (least deprived)	20.3	13.2	31.1	2.4	2.2	2.5	Increasing deprivation associated with increasing proportion of children assigned non-core HPI across all quintiles
Maternal age	12-19 years cf. 20-50 years	4.6	3.8	5.5	2.7	2.5	2.9	
Remoteness	Very remote cf. accessible	0.7	0.5	0.97	0.5	0.4	0.6	Association contrary to that expected: increasing remoteness associated with decreasing non-core HPI
Maternal ethnicity	Non-white cf. white	1.8	1.04	3.3	1.2	0.9	1.5	Low data completeness for maternal ethnicity. Non-white ethnicity associated with higher intensive but not additional HPI
Maternal smoking	Yes cf. no	7.6	6.7	8.7	1.8	1.7	1.9	
Maternal drug misuse	Yes cf. no	84.2	56.7	125.0	7.2	5.1	10.2	Low data completeness for maternal drug misuse
Previous stillbirth or neonatal death	Yes cf. no	2.4	1.5	3.8	1.3	1.1	1.6	
First child	Yes cf. no	0.9	0.8	0.99	1.7	1.7	1.8	Complex relationship: first children more likely to have additional HPI but less likely to have intensive HPI
Multiple birth	Yes cf. no	2.3	1.6	3.2	2.5	2.2	2.9	
Prematurity	Very pre-term (<32 weeks) cf. term (≥37 weeks)	34.5	21.1	56.2	11.7	7.8	17.5	Increasing prematurity associated with increasing non-core HPI

Variable	Categories compared	Odds ratio of intensive cf. core HPI			Odds ratio of non-core cf. core HPI			Comment
		OR	<i>Lower 95% CI</i>	<i>Upper 95% CI</i>	OR	<i>Lower 95% CI</i>	<i>Upper 95% CI</i>	
Small for gestational age	Yes cf. no	4.0	3.2	4.9	1.7	1.5	1.9	
Mode of delivery	Emergency Caesarean section cf. spontaneous vaginal delivery	1.1	0.9	1.3	1.3	1.3	1.4	Complex relationship: emergency section and instrumental/breech delivery (but not elective section associated with higher additional (but not intensive) HPI
Infant sex	Male cf. female	1.0	0.9	1.1	1.0	0.96	1.04	No significant association with HPI
Infant feeding at birth	Bottle feeding cf. any breastfeeding	2.5	2.2	2.8	1.2	1.2	1.3	
Admitted to SCBU/NICU	Admitted for ≥48 hours cf. not admitted	10.6	8.6	12.9	4.0	3.5	4.5	Increasing length of time in SCBU/NICU associated with increasing non-core HPI
Medical/social concerns	Yes cf. no	5.6	4.9	6.3	3.2	3.0	3.3	
Developmental concerns	Yes cf. no	7.2	5.4	9.4	2.9	2.5	3.4	
HV availability	High (≥5 whole time equivalent HVs / 1,000 children 0-4 years) cf. low (<4)	1.7	1.5	2.1	1.3	1.3	1.4	Complex relationship: children in areas with high HV availability most likely to have additional or intensive HPI but no clear trend across areas with medium and low HV availability
Community Health Partnership	Substantial variation in pattern of HPI distribution between Community Health Partnerships*, for example Inverclyde: 8.6% core; 85.0% additional; 6.4% intensive North Highland: 74.9% core; 24.2% additional; 0.9% intensive							
NHS Board	Substantial variation in pattern of HPI distribution between NHS Boards*, for example Greater Glasgow: 35.7% core; 59.7% additional; 4.6% intensive Lanarkshire: 69.3% core; 30.0% additional; 0.7% intensive							

* As there is no natural ordering of Community Health Partnerships or NHS Boards, odds ratios for the 'highest' and 'lowest' categories were not calculated

The results of the standard and multilevel multiple logistic regression models are summarised in Table 43 (comparison of intensive HPI to core HPI) and Table 44 (comparison of any non-core HPI to core HPI). The results for the standard and multilevel models are very similar for each of the individual child/family characteristics. The odds ratios for HV availability are also very similar between the two sets of models but the confidence intervals generated by the multilevel models are much wider for this predictor. This reflects the fact that the multilevel models correctly dealt with this variable at the Community Health Partnership level rather than the individual child level. The standard and multilevel models sometimes give substantially different odds ratios for the allocation of intensive or non-core HPIs in particular NHS Board areas and again the confidence intervals are much wider from the multilevel models.

Regarding the results from the multilevel models specifically, Table 43 and Table 44 show that a wide range of the individual child/family characteristics remain associated with allocation of an intensive or non-core HPI even when all the other potential predictors are taken into account. Deprivation; young maternal age; maternal smoking; maternal drug misuse; a previous stillbirth or neonatal death; prematurity; being small for gestational age; lack of breastfeeding; admission to SCBU or NICU for longer than 48 hours; and the HV noting medical, social, or developmental concerns about the baby were all independently associated with an increased likelihood of being allocated an intensive (rather than core) HPI at the 6-8 week child health review. Variables with a natural ordering, in particular increasing levels of deprivation and prematurity, showed a dose response relationship with likelihood of being allocated an intensive HPI.

All of these variables except lack of breastfeeding were also associated with an increased likelihood of being allocated any non-core (i.e. additional or intensive) HPI. Being a first child and being one of twins or a higher order birth were also associated with being allocated a non-core HPI, indicating that these factors were particularly associated with being allocated to an additional HPI. Living in a remote area; maternal ethnicity; and mode of delivery had no clear association with HPI in

the multilevel models. Infant sex also had no association with HPI. In general the odds ratios for the significant predictors were much higher in the intensive cf. core (rather than non-core cf. core) model. This would be expected as this model compares two extreme groups.

The multilevel model results suggest that, even when the characteristics of children living in different areas had been taken into account, there was a tendency for children living in areas with higher HV availability to be more likely to be allocated non-core HPIs but this effect was not statistically significant.

Direct comparisons between specific areas in the likelihood of children receiving non-core HPIs were less of a focus in this analysis than in investigating whether significant variation in HPI allocation between areas remained when the characteristics of children living in the areas and the HV resources available locally had been considered. The multilevel models showed that there was significant residual variation between both Community Health Partnerships and NHS Boards in the likelihood of children being allocated to an intensive or any non-core HPI (likelihood ratio test $p < 0.001$ for Community Health Partnership and NHS Board for both models) when all other predictors had been taken into account.

Table 43 Association between all predictor variables and HPI allocation (intensive cf. core HPI) at 6-8 week review: results of standard and multilevel multiple regression models

Variable	Categories compared	Standard logistic regression: intensive cf. core HPI				Multilevel logistic regression: intensive cf. core HPI			
		Odds ratio	Lower 95% CI	Upper 95% CI	p value	Odds ratio	Lower 95% CI	Upper 95% CI	p value
Deprivation	5 (most deprived) cf. 1 (least deprived)	8.9	5.6	14.1	<0.001	7.1	4.5	11.3	<0.001
	4 cf. 1	4.6	2.9	7.4	<0.001	4.1	2.6	6.6	<0.001
	3 cf. 1	3.1	1.9	5.1	<0.001	2.9	1.8	4.7	<0.001
	2 cf. 1	2.3	1.4	3.8	0.001	2.2	1.3	3.6	0.004
Maternal age	12-19 cf. 20-50 years	4.5	3.5	5.7	<0.001	4.4	3.5	5.7	<0.001
Remoteness	Very remote cf. accessible				NS	1.7	0.8	3.3	0.152
	Remote cf. accessible				NS	0.9	0.5	1.4	0.535
Maternal ethnicity	Non-white cf. white				NS	1.9	0.97	3.7	0.062
Maternal smoking	Yes cf. no	4.0	3.4	4.8	<0.001	4.2	3.5	4.9	<0.001
Maternal drug misuse	Yes cf. no	37.9	23.5	61.2	<0.001	34.6	21.4	56.1	<0.001
Previous stillbirth or neonatal death	Yes cf. no	2.4	1.3	4.3	0.004	2.2	1.2	4.1	0.009
First child	Yes cf. no	0.8	0.7	0.97	0.023	0.8	0.7	1.00	0.053
Multiple birth	Yes cf. no				NS	1.9	0.98	3.7	0.057
Prematurity	Very pre-term (<32 weeks) cf. term (≥37 weeks)	8.3	4.1	16.9	<0.001	7.9	3.9	16.1	<0.001
	Pre term (32-36 weeks) cf. term	1.4	1.1	1.9	0.013	1.4	1.1	1.9	0.017

Variable	Categories compared	Standard logistic regression: intensive cf. core HPI				Multilevel logistic regression: intensive cf. core HPI			
		Odds ratio	Lower 95% CI	Upper 95% CI	p value	Odds ratio	Lower 95% CI	Upper 95% CI	p value
Small for gestational age	Yes cf. no	2.0	1.5	2.6	<0.001	2.0	1.5	2.7	<0.001
Mode of delivery	Emergency Caesarean cf. spontaneous vaginal				NS	0.9	0.7	1.1	0.271
	Elective Caesarean cf. spontaneous vaginal				NS	1.0	0.8	1.4	0.779
	Forceps, Ventouse, breech cf. spontaneous vaginal				NS	0.6	0.4	0.98	0.040
Infant sex	Male cf. female				NS	1.0	0.8	1.1	0.606
Infant feeding at birth	Bottle feeding cf. any breastfeeding	1.4	1.2	1.6	<0.001	1.4	1.2	1.6	<0.001
Admitted to SCBU/NICU	Admitted for ≥48 hours cf. not admitted	4.4	3.1	6.2	<0.001	4.3	3.0	6.1	<0.001
	Admitted for <48 hours cf. not admitted	1.5	0.97	2.4	NS	1.4	0.9	2.3	0.136
Medical/social concerns	Yes cf. no	4.8	4.1	5.7	<0.001	4.9	4.1	5.8	<0.001
Developmental concerns	Yes cf. no	3.7	2.6	5.4	<0.001	4.1	2.8	5.9	<0.001
HV availability	per increase of 1 whole time equivalent HV per 1,000 children aged 0-4 years	1.2	1.1	1.3	<0.001	1.2	0.9	1.6	0.128

Variable	Categories compared	Standard logistic regression: intensive cf. core HPI				Multilevel logistic regression: intensive cf. core HPI			
		Odds ratio	Lower 95% CI	Upper 95% CI	p value	Odds ratio	Lower 95% CI	Upper 95% CI	p value
Community Health Partnership		N/a				Individual comparisons not shown due to large number of categories Likelihood ratio test p<0.001			
NHS Board	Argyll & Clyde cf. Greater Glasgow	0.7	0.6	0.9	0.007	1.4	0.8	2.6	0.224
	Ayrshire & Arran cf. GG	0.3	0.2	0.4	<0.001	0.5	0.2	1.2	0.126
	Borders cf. GG	0.2	0.1	0.3	<0.001	0.4	0.1	1.2	0.099
	Dumfries & Galloway cf. GG	1.0	0.6	1.6	NS	0.9	0.3	2.7	0.794
	Fife cf. GG	0.2	0.2	0.3	<0.001	0.4	0.2	0.9	0.032
	Forth Valley cf. GG	0.4	0.3	0.6	<0.001	0.6	0.2	1.4	0.222
	Highland cf. GG	0.2	0.1	0.3	<0.001	0.2	0.1	0.6	0.003
	Lanarkshire cf. GG	0.05	0.04	0.08	<0.001	0.2	0.1	0.3	<0.001
	Tayside cf. GG	0.3	0.2	0.4	<0.001	0.5	0.2	1.2	0.105
	Western Isles cf. GG	1.6	0.7	3.7	NS	0.8	0.2	2.7	0.673
	All Boards	N/a				Likelihood ratio test p<0.001			

NS: not significant

Total of 19,803 children included in models (all except those with unknown HV availability)

Children with unknown HV availability could not be included as no 'unknown' category could be created for this continuous variable

Note Stata does not return an odds ratio for predictors if no categories show a significant association with the outcome variable

SAS returns an odds ratio for all predictors regardless of whether they show a significant association with the outcome variable

Table 44 Association between all predictor variables and HPI allocation (non-core cf. core HPI) at 6-8 week review: results of standard and multilevel multiple regression models

Variable	Categories compared	Standard logistic regression: non-core cf. core HPI				Multilevel logistic regression: non-core cf. core HPI			
		Odds ratio	Lower 95% CI	Upper 95% CI	p value	Odds ratio	Lower 95% CI	Upper 95% CI	p value
Deprivation	5 (most deprived) cf. 1 (least deprived)	1.9	1.7	2.0	<0.001	1.5	1.4	1.7	<0.001
	4 cf. 1	1.5	1.4	1.6	<0.001	1.3	1.2	1.4	<0.001
	3 cf. 1	1.2	1.1	1.3	<0.001	1.1	0.99	1.2	0.099
	2 cf. 1	1.1	1.00	1.2	NS	1.0	0.9	1.1	0.686
Maternal age	12-19 cf. 20-50 years	2.0	1.9	2.3	<0.001	2.1	1.9	2.3	<0.001
Remoteness	Very remote cf. accessible	0.5	0.4	0.5	<0.001	1.1	0.9	1.3	0.537
	Remote cf. accessible	0.7	0.6	0.8	<0.001	0.8	0.7	0.9	0.002
Maternal ethnicity	Non-white cf. white				NS	0.9	0.7	1.2	0.449
Maternal smoking	Yes cf. no	1.5	1.4	1.6	<0.001	1.5	1.4	1.6	<0.001
Maternal drug misuse	Yes cf. no	5.4	3.7	7.8	<0.001	5.4	3.7	7.8	<0.001
Previous stillbirth or neonatal death	Yes cf. no	1.5	1.2	1.9	<0.001	1.6	1.3	2.0	<0.001
First child	Yes cf. no	1.7	1.6	1.8	<0.001	1.7	1.6	1.8	<0.001
Multiple birth	Yes cf. no	2.0	1.6	2.5	<0.001	2.1	1.7	2.6	<0.001
Prematurity	Very pre-term (<32 weeks) cf. term (≥37 weeks)	3.5	2.3	5.4	<0.001	3.5	2.3	5.5	<0.001
	Pre term (32-36 weeks) cf. term	1.3	1.1	1.4	<0.001	1.3	1.2	1.5	<0.001

Variable	Categories compared	Standard logistic regression: non-core cf. core HPI				Multilevel logistic regression: non-core cf. core HPI			
		Odds ratio	Lower 95% CI	Upper 95% CI	p value	Odds ratio	Lower 95% CI	Upper 95% CI	p value
Small for gestational age	Yes cf. no	1.3	1.1	1.5	<0.001	1.3	1.1	1.5	<0.001
Mode of delivery	Emergency Caesarean cf. spontaneous vaginal	1.1	1.02	1.2	0.017	1.1	1.02	1.2	0.015
	Elective Caesarean cf. spontaneous vaginal	1.0	0.9	1.1	NS	1.0	0.9	1.1	0.748
	Forceps, Ventouse, breech cf. spontaneous vaginal	1.0	0.9	1.2	NS	1.1	0.9	1.2	0.397
Infant sex	Male cf. female				NS	1.0	0.9	1.02	0.318
Infant feeding at birth	Bottle feeding cf. any breastfeeding				NS	1.0	0.97	1.1	0.447
Admitted to SCBU/NICU	Admitted for ≥48 hours cf. not admitted	1.9	1.7	2.3	<0.001	1.9	1.6	2.2	<0.001
	Admitted for <48 hours cf. not admitted	1.2	1.05	1.4	0.010	1.2	1.00	1.3	0.055
Medical/social concerns	Yes cf. no	3.3	3.1	3.5	<0.001	3.5	3.3	3.7	<0.001
Developmental concerns	Yes cf. no	2.0	1.7	2.4	<0.001	2.1	1.8	2.6	<0.001
HV availability	per increase of 1 whole time equivalent HV per 1,000 children aged 0-4 years	1.2	1.2	1.3	<0.001	1.2	0.9	1.5	0.226

Variable	Categories compared	Standard logistic regression: non-core cf. core HPI				Multilevel logistic regression: non-core cf. core HPI			
		Odds ratio	Lower 95% CI	Upper 95% CI	p value	Odds ratio	Lower 95% CI	Upper 95% CI	p value
Community Health Partnership		N/a				Individual comparisons not shown due to large number of categories Likelihood ratio test p<0.001			
NHS Board	Argyll & Clyde cf. Greater Glasgow	0.7	0.7	0.8	<0.001	1.8	1.5	2.3	<0.001
	Ayrshire & Arran cf. GG	0.5	0.4	0.5	<0.001	0.6	0.3	1.3	0.213
	Borders cf. GG	0.3	0.2	0.3	<0.001	0.4	0.2	1.2	0.113
	Dumfries & Galloway cf. GG	0.9	0.8	1.02	NS	0.8	0.3	2.3	0.682
	Fife cf. GG	0.2	0.2	0.2	<0.001	0.4	0.2	0.8	0.012
	Forth Valley cf. GG	0.7	0.6	0.8	<0.001	0.7	0.4	1.5	0.364
	Highland cf. GG	0.3	0.3	0.4	<0.001	0.3	0.1	0.7	0.006
	Lanarkshire cf. GG	0.2	0.2	0.2	<0.001	0.3	0.2	0.3	<0.001
	Tayside cf. GG	0.5	0.4	0.5	<0.001	0.7	0.4	1.4	0.336
	Western Isles cf. GG	0.7	0.5	1.1	NS	0.6	0.2	1.7	0.314
	All included Boards	N/a				Likelihood ratio test p<0.001			

NS: not significant

Total of 36,671 children included in models (all except those with unknown HV availability)

Children with unknown HV availability could not be included as no 'unknown' category could be created for this continuous variable

Note Stata does not return an odds ratio for predictors if no categories show a significant association with the outcome variable

SAS returns an odds ratio for all predictors regardless of whether they show a significant association with the outcome variable

Results exploring how well the multilevel models distinguished children likely to be allocated an intensive or non-core HPI (rather than a core HPI) are shown in Table 45 and Table 46 respectively. The model comparing children with intensive and core HPIs shows reasonably good discrimination. The majority (89%) of children were assigned a very low (≤ 0.1) probability of receiving an intensive HPI. The proportion of children that actually did receive an intensive HPI increased incrementally across the predicted probability categories as would be expected. Sensitivity and positive predictive value were rather low but specificity and negative predictive value were high. The model correctly classified over 95% of children. The model comparing children with non-core and core HPIs performed less well. Children were fairly evenly distributed across the predicted probability categories although the proportion of children that actually did receive a non-core HPI still increased incrementally across the categories. Sensitivity, specificity, and positive and negative predictive values were all rather low at around 70% and the model only correctly classified 72% of children.

Table 45 Ability of the multilevel model to distinguish children likely to be allocated an intensive rather than a core HPI

Predicted probability of being allocated an intensive HPI	Number of children allocated to the HPI specified			Proportion of children included in the model with this level of predicted probability	Proportion of children with this level of predicted probability that were allocated an intensive HPI
	Core	Intensive	All		
0.0-0.1	17,269	283	17,552	0.89	0.016
>0.1-0.2	804	130	934	0.05	0.139
>0.2-0.3	302	108	410	0.02	0.263
>0.3-0.4	148	95	243	0.01	0.391
>0.4-0.5	100	71	171	0.01	0.415
>0.5-0.6	48	56	104	0.01	0.538
>0.6-0.7	39	74	113	0.01	0.655
>0.7-0.8	19	68	87	<0.01	0.782
>0.8-0.9	10	71	81	<0.01	0.877
>0.9-1.0	9	99	108	0.01	0.917
Total	18,748	1,055	19,803	1.00	0.053

		Received intensive HPI		
		Yes	No	Total
Predicted to receive intensive HPI*	Yes	368	125	493
	No	687	18,623	19,310
	Total	1,055	18,748	19,803

Sensitivity	34.9%
Specificity	99.3%
Positive predictive value	74.6%
Negative predictive value	96.4%
Percentage of children correctly classified	95.9%

* Predicted to receive intensive HPI defined as predicted probability >0.5

Table 46 Ability of the multilevel model to distinguish children likely to be allocated a non-core rather than a core HPI

Predicted probability of being allocated a non-core HPI	Number of children allocated to the HPI specified			Proportion of children included in the model with this level of predicted probability	Proportion of children with this level of predicted probability that were allocated a non-core HPI
	Core	Non-core	All		
0.0-0.1	43	5	48	<0.01	0.104
>0.1-0.2	3,671	728	4,399	0.12	0.165
>0.2-0.3	4,648	1,505	6,153	0.17	0.245
>0.3-0.4	3,143	1,638	4,781	0.13	0.343
>0.4-0.5	2,598	1,878	4,476	0.12	0.420
>0.5-0.6	1,944	2,518	4,462	0.12	0.564
>0.6-0.7	1,175	2,600	3,775	0.10	0.689
>0.7-0.8	835	2,744	3,579	0.10	0.767
>0.8-0.9	536	2,602	3,138	0.09	0.829
>0.9-1.0	155	1,705	1,860	0.05	0.917
Total	18,748	17,923	36,671	1.00	0.489

		Received non-core HPI		
		Yes	No	Total
Predicted to receive non-core HPI*	Yes	12,169	4,645	16,814
	No	5,754	14,103	19,857
	Total	17,923	18,748	36,671

Sensitivity	67.9%
Specificity	75.2%
Positive predictive value	72.4%
Negative predictive value	71.0%
Percentage of children correctly classified	71.6%

* Predicted to receive non-core HPI defined as predicted probability >0.5

7.3. Discussion

7.3.1. Summary

The analyses presented in this chapter used standard and multilevel logistic regression modelling to examine the relationships between child/family characteristics; HV staffing/capacity; and geographical area, and children being assessed by their HVs as requiring enhanced support from the Child Health Programme (Wood, Stockton & Brown 2012). The analyses predominantly used routine data derived from children's Child Health Programme records and their mothers' delivery records. These data sources were linked together for the first time in Scotland to enable this. A special survey of Community Health Partnerships was done to provide additional information on HV staffing that was not reliably available from routine data sources.

The results show that almost all the individual child/family level factors that were available for analysis, including those relating to family social circumstances; maternal health; obstetric history; and infant health, were independently associated with being assessed as requiring enhanced CHP support. This suggests that child/family needs assessments undertaken by Health Visitors are complex, with many factors being taken into account. Factors that were not found to be significantly associated with HPI allocated may have been genuinely unimportant (e.g. infant sex, mode of delivery) or a reflection of poor data quality (e.g. maternal ethnicity). Maternal drug misuse was found to be exceptionally strongly associated with allocation of a non-core, particularly an intensive, HPI despite the poor data quality for this variable.

The information obtained through the survey of Community Health Partnerships suggests that the level of Health Visitor staffing available in different areas across Scotland is very variable: more than a three fold difference in whole time equivalent HV numbers per 1,000 pre-school children was found. The modelling results suggest that, even when the characteristics of children living in different areas are

taken into account, there is a tendency for children living in areas with higher HV staffing to be more likely to be allocated to a non-core HPI however this finding was not statistically significant in the multilevel models.

The results show that there are marked differences in the pattern of HPIs allocated to children in different NHS Boards and Community Health Partnerships, and that significant differences remain between areas even when the characteristics of resident children and the HV staffing available locally are taken into account. Differences between Boards seem to reflect fundamentally different thresholds for allocating children to non-core HPIs rather than local differences in response to children with particular types of need such as prematurity or deprivation.

The multilevel model comparing children with intensive and core HPIs performs reasonably well in terms of distinguishing these groups of children. The model comparing children with any non-core and core HPIs performs less well, suggesting that even when all the potential predictors included in the model have been taken into account, a degree of unexplained variation in HPI allocation remains.

7.3.2. Strengths and limitations

The work presented in this chapter builds on the simple descriptive analyses of HPI allocation that were previously undertaken by ISD and seeks to explore in more detail the factors associated with children receiving a non-core HPI. The analysis is based on one cohort of children born in 2007/08. All analyses were re-run on a separate cohort of children born April 2006-July 2006 inclusive and receiving their CHP in Argyll & Clyde; Borders; Fife; Forth Valley; Greater Glasgow; and Dumfries & Galloway (i.e. similar to Cohort 3 included in the analysis of child health review coverage): the results were very similar. In addition, the information presented in the introduction shows that HPI allocation in all of the Boards included in this analysis, with the exception of Dumfries & Galloway and to a lesser extent Highland, has remained very similar from 2007/08 to the present (2012) hence these results are likely to still be relevant.

7.3.2.1. Cohort and predictors included in analysis

The cohort of children included in the analysis lived in 11 of the 15 NHS Boards in Scotland. The Boards that had to be excluded due to lack of informative data (Grampian, Orkney, Shetland, and Lothian) contain around 28% of the Scottish population aged 0-4 years (see <http://www.gro-scotland.gov.uk/statistics/theme/population/estimates/mid-year/2011/index.html>) and together are more rural and more affluent than Scotland as a whole. Only children who had remained resident in an included NHS Board from birth up to the SIRS/CHSP-PS data extract date were included in the analysis to ensure that children had the chance to have all the relevant child health contacts recorded on CHSP-PS. As the period of time that children had to remain in the same Board was relatively short (up to 19 months), only a further 5.5% of children were excluded due to moving Boards. Despite these exclusions, the occurrence of specific child/family factors in the sample (such as maternal smoking, prematurity, different modes of delivery, etc) was very similar to that seen for the Scottish population as a whole.

The aim of the Child Health Programme is broad – to support all children to attain their health and development potential. Reflecting this broad aim, children may need additional professional support through the CHP for a wide variety of reasons – essentially for any potentially modifiable or ameliorable factor that threatens to curtail their health or development. Being able to identify such ‘vulnerable’ children and direct enhanced resources to them at an early stage is fundamental to the notion of increased targeting of CHP support as recommended by HFAC4 and the 2005 policy, and these are the children that could be expected to have a non-core HPI. Such a notion of ‘vulnerability’ can seem rather ill-defined (Appleton 1994a, Appleton 1994b) hence, for practicality, when developing the framework of factors known or likely to be associated with increased need for CHP support, I focused on factors associated with increased risk of suboptimal early child development or child maltreatment. It is recognised that factors associated with these particular adverse outcomes may not encompass all the factors associated with ‘vulnerability’/increased need for CHP support, but they are likely to be a reasonable subset.

The framework was designed to provide a manageable range of potential child/family factors for inclusion in the analysis rather than an exhaustive list. Some potentially important factors are not included in the framework, for example asylum seeker/refugee status or English not the first language in the home. Including an increasing number of potential predictors in the models could be useful up to a point but, unless an additional predictor represents an important new aspect of risk not linked to other predictors already included, eventually further expanding the number of predictors is likely to make marginal difference to the performance of the models.

Probably of more importance than factors not included in the framework are the factors that were included in the framework but were not included in the models due to lack of available data. Factors without available data included several relating to family social circumstances, parental health, and the parent-infant relationship. All of these issues can have very substantial impact on children's health and development and HVs would be expected to take them into account when assessing children's needs (Aldgate, Rose 2009, Department of Health 2000). Routine data sources used for this analysis were restricted to those available within ISD, i.e. health related national datasets. Data on some of the factors relating to family social circumstances may have been available from other agencies such as Local Authority social services, benefits, or criminal justice agencies. Accessing these data and linking them to children's health records would be challenging in terms of governance/permission and technical issues however and was therefore outwith the scope of this analysis (see <https://www.scphrp.ac.uk/node/241> and <https://www.scphrp.ac.uk/node/264>). Data on factors relating to some aspects of parental health would have been available within ISD, for example maternal hospital admissions. Deriving a robust indication of the presence/absence of aspects of parental health particularly relevant to parenting capacity, such as maternal depression, learning disability, severe physical disability, any aspects of paternal health, etc was not possible however hence these issues were not included in the analysis. Robust population based data on parent-infant relationships are not currently available from any source.

The framework focuses on risk factors and does not reflect protective factors that may be very important in bolstering children's resilience and helping them secure good outcomes despite issues such as poverty (Daniel, Wassell 2002, Daniel 2010, Luthar, Cicchetti 2000). This is recognised as a limitation but routine data sources in general provide more information on problems than on positive factors.

7.3.2.2. CHSP-PS and SMR02 data linkage and data quality

The work presented in this chapter involved the first linkage of children's Child Health Programme (CHSP-PS) records to their mothers' delivery (SMR02) records undertaken in Scotland. The linkage required a two stage process: first finding the children's statutory birth records then finding their mothers' SMR02 records. By definition all children should have had a birth record available and the results show that a birth record was indeed found for almost all children (36,816/36,871 99.9%). A number of children then had no SMR02 record found, meaning that overall 90.3% (33,299/36,871) of children had an SMR02 record available.

Not all children would be expected to have an SMR02 record available – for example children born outwith an NHS hospital. In addition, administrative error or capacity issues sometimes mean that obstetric units omit to return some SMR02 records. Currently, there is around a 2% shortfall in the number of SMR02 records returned to ISD compared to the number of births registered in Scotland per year (see <http://www.isdscotland.org/Health-Topics/Maternity-and-Births/Births/Background.asp>). Most of the children in this sample with no SMR02 record available came from three NHS Board areas: NHS Argyll & Clyde, Greater Glasgow, and Tayside. Each of these three Boards was known to be having particular issues with the completeness of their SMR02 returns around the time period relevant to this analysis (Etta Shanks, ISD, personal communication). It is likely therefore, that in the majority of cases, when an SMR02 record could not be found for a child, this was because the relevant record had not been returned from the obstetric unit, not because of an inherent problem with the linkage. In general, the linkage between CHSP-PS and SMR02 greatly expanded the range of potential predictor variables available for inclusion in the models and hence reaffirmed the

potential utility of routine data linkage for research purposes (Lloyd, Hertzman 2009, Stanley et al. 2011).

There is limited information about the quality of data recorded through CHSP-PS as discussed in Chapter 6. By contrast, the quality of data recorded through SMR02 is assured by national data definitions (see <http://www.datadictionaryadmin.scot.nhs.uk/SMR-Datasets/SMR02-Maternity-Inpatient-and-Day-Case/>), validation rules (see <http://www.datadictionaryadmin.scot.nhs.uk/SMR-Datasets/SMR-Validation-Section/>), and periodic formal data quality audits (see <http://www.isdscotland.org/Products-and-Services/Data-Quality/>). The most recent audit of a sample of SMR02 returns from 2008/09 showed good agreement/accuracy rates ($\geq 85\%$) for all the audited variables that were included in this analysis, except maternal drug misuse and maternal ethnicity, when SMR02 returns were compared to contemporaneous clinical notes (Information Services Division 2010). The very poor completeness rates for drug misuse and ethnicity were noted in the data quality audit report. Completion of the maternal drug misuse variable on SMR02 returns has since been made mandatory hence completeness of this variable has improved considerably². Recording of maternal ethnicity remains optional, and data completeness rates consequently poor, limiting the ability to assess the impact of maternal ethnicity on care and outcomes.

Several variables were available from both CHSP-PS and SMR02, for example infant sex, gestation, birthweight, and maternal age. Categorised frequencies from both data sources were cross tabulated to assess the degree of concordance between the two sources. It was found that for all variables, what was recorded in CHSP-PS agreed with what was recorded in SMR02 in $\geq 97\%$ of cases. This suggests that,

² SMR02 records are subject to extensive validation procedures as they are returned from the hospital of origin to ISD. Each individual data item within the SMR02 dataset is classified as mandatory, conditional, or optional. Mandatory items must have a valid code present for the SMR02 record to be accepted by the validation system. Conditional items must be present if a specified condition is present, for example date of operation must be completed if operation code is present. It is recommended but not required that optional items are completed. Maternal drug misuse was added to the SMR02 dataset as an optional item in April 2003. The data item was made mandatory in April 2011 and the SMR02 validation rules changed accordingly.

whilst there will always be some degree of recording error in routine data sources, these sources are likely to be of acceptable quality for the purposes of this analysis.

Using ‘baby 1’ data from SMR02 for all twins or higher order births will inevitably introduce some additional error. There is likely to be a high degree of concordance between all babies from one delivery in at least some of the included variables such as mode of delivery, however, hence tolerating this error was considered preferable to excluding all multiple births.

7.3.2.3. Health Visitor staffing data quality and relationship with HPI allocation

The quality of the HV workforce/staffing data merits discussion. It would have been ideal to include in the models a direct indication of the workload/capacity of the HV conducting each child’s 6-8 week review in order to explore more precisely how this may influence their decision making around HPI allocation but this would be very complex to capture. An indication of the HV’s working pattern (full/part time) would be required along with their contemporaneous caseload. Identifying a ‘caseload’ can be difficult when teams of HVs are responsible for corporate rather than individual caseloads, and/or when HVs are covering for vacancies or colleagues on leave. As many HVs now work in skill mix teams along with staff nurses, nursery nurses, and/or healthcare assistants, an indication of the extent to which the HV was supported by these other staff groups would also ideally be required. As this was unfeasible, an indication of the overall level of HV staffing in the Community Health Partnership area where the children lived was considered a reasonable proxy.

It is disappointing that routine NHS workforce data could not (and still cannot) reliably identify the number of HVs working with pre-school children in Community Health Partnership areas. This partly reflects inherent problems with some Boards’ data submissions (e.g. not providing data at Community Health Partnership level) and partly patchily-implemented previous nursing policy that suggested that HVs should be considered alongside school nurses as generic public health nurses (Scottish Executive 2001, Scottish Executive Health Department 2003). The skill

mix issue also complicates the routine workforce data available from some areas: some areas include staff nurses working alongside HVs as public health nurses whereas others count them as generic community nurses. In either case it is not possible to identify staff nurses working specifically with HVs/pre-school children. Staff public health nurses may also work with school nurses and staff community nurses may also work with any kind of community based nurses including district nurses.

A good response rate was obtained to the survey of Community Health Partnership general managers asking for information on the number of in-post whole time equivalent HVs who were actively working with pre-school children in their area. The survey results suggest that the level of available staffing varies very considerably between areas. Information on vacancies was not requested in the survey. It is therefore possible that some of the variation may be explained by differential vacancy rates between areas. Having just one or two unfilled posts in some of the smaller, more rural areas can make a large difference to the number of staff per 1,000 children. Some of the larger Boards have specialist HVs working with particular client groups, such as mothers with breastfeeding problems, travelling families, or family affected by drug misuse. Community Health Partnerships may have varied in whether they included these kinds of staff in their return.

In the survey, Community Health Partnerships were asked to provide additional information on the number of staff nurses working alongside HVs in skill mix teams. Some areas did provide this information but many noted that the staff nurses did not just work with HVs and some noted they had included nursery nurses in their figures. It was therefore impossible to get a robust indication of the staff nurse support available to HVs specifically and this information was not included in the models. In addition it is recognised that there is a time discrepancy between when included children were undergoing their 6-8 week reviews (2007/08) and the period the HV workforce data for their area of residence relates to (2009).

Results from the 2008 NHS Scotland community nursing census suggest that whilst HVs do often work in skill mix teams, qualified HVs remain the most numerous members of such teams, with smaller numbers of staff nurses and nursery nurses working alongside them (Information Services Division 2008). This suggests it was reasonable to only include information on qualified HV staffing in the models. The census suggested an average caseload size of around 270 children per HV. The 2008 NHS Quality Improvement Scotland evaluation of the implementation of the 2005 policy suggested that full time HVs had a median caseload of 200-300 children (Inwood 2010). These estimates are in good agreement with the results of the survey of Community Health Partnerships that suggested a median number of full time HVs per 1,000 children aged 0-4 years of 4.27 (inter-quartile range 3.77-4.78).

Whilst it is recognised that the HV staffing variable included in the models is a far from perfect indication of the capacity of the HV carrying out a child's 6-8 week review, it is the best proxy that was feasible to obtain. It was included as a continuous variable in the models so as to retain the maximum amount of discrimination between areas (Altman, Royston 2006). If it had been categorised, e.g. as high, medium or low staffing levels, the results may have been different, for example areas with high staffing may have shown a significantly higher proportion of children allocated to non-core HPIs, as was seen in the univariate analysis.

Overall the results for this variable suggest that there is a tendency for children living in areas with higher HV staffing to be more likely to be allocated to a non-core HPI but that the effect is not statistically significant. The direction of any possible relationship between HV staffing and HPI allocation cannot be determined. Given that not all aspects of possible child vulnerability will have been captured in the models, it is possible that areas with more vulnerable children tend to have higher staffing levels and/or that HVs in areas with higher staffing levels feel more able to allocate children to non-core HPIs. In general, the high degree of variability in HV staffing between areas suggested by the survey, the lack of any obvious pattern between reported staffing and the size, deprivation, or rurality of Community Health Partnerships, and the suggestion that children living in areas with higher staffing

levels may be more likely to get a non-core HPI suggest that it would be worth exploring HVs' decision making processes around HPI allocation, and in particular how it is influenced by their perceived capacity to provide ongoing support to children, in more detail. Such qualitative research was beyond the scope of this thesis but other colleagues are doing relevant work (see <http://www.crfr.ac.uk/crfrphdstudents.html> (Caroline King) and <http://researchrepository.napier.ac.uk/view/people/Hogg=3ARhona=3A=3A.html>).

7.3.2.4. Statistical modelling

Two different approaches to modelling factors associated with HPI outcomes have been presented. Standard logistical regression is often used to analyse datasets similar in structure to the one used here, i.e. containing predictor variables that relate both to individuals' characteristics and to the attributes of the areas in which they live/are being treated. Multilevel modelling is theoretically superior however as it allows all variables to be assessed at the appropriate level of variation and hence provides more correct (although wider) confidence intervals for area level variables that can substantially alter the interpretation of results (Diez-Roux 2000, Rice, Leyland 1996, Duncan, Jones & Moon 1998). Multilevel models also allow the overall influence of area level variables to be assessed.

Multilevel models are not a panacea however (Bingenheimer, Raudenbush 2004, Diez-Roux 1998). They are complex to understand and can be hard to run in more widely available statistical software packages. They also do not remove the need for careful thought about what variables should be included in a model, and indeed can complicate this process by requiring the appropriate level for any variable to be considered (Victora et al. 1997). The multilevel modelling presented here was only possible with access to the software and expert help of a statistician colleague.

The categorisation of some of the predictor variables for inclusion in the models, for example maternal age, was somewhat arbitrary. It may have been preferable to include multiple categories of increasing maternal age rather than dichotomising women as young/not young although this may have made results more complex to

interpret. It is acknowledged that the results of both the standard and the multilevel models include a large number of significance level/p values due to the relatively large numbers of predictor variables involved. Almost all predictors found to be associated with HPI allocation at the conventional level of significance ($p < 0.05$) were actually very highly significantly associated ($p < 0.001$) hence any correction for multiple testing would not alter the interpretation of the results.

Other approaches to modelling the factors associated with HPI allocation could have been taken. The outcome variable (HPI) has three ordered categories hence it may have been preferable to fit an ordinal model (Ananth, Kleinbaum 1997). This would have had the advantage of not ‘wasting’ data (for example excluding all children with an additional HPI when comparing core and intensive categories) but the outputs can be difficult to interpret. In the model comparing children with any non-core HPI to those with a core HPI, the outcome of interest is very common: around half of all children receive a non-core HPI at the end of their 6-8 week review. Although it is not incorrect to conduct logistic regression in this situation, the odds ratios that are generated cannot be interpreted as approximations of risk ratios as is often done when the outcome of interest is rare (as in the intensive cf. core model). Alternative modelling approaches that generate risk ratios such as those based on Poisson regression may therefore also have been useful (Martuzzi, Elliott 1998, Barros, Hirakata 2003).

The modelling undertaken for this chapter was simply aiming to explore the relationships between all available predictor factors and HPI allocation. The models were explicitly not aiming to be predictive/prognostic (Moons et al. 2009b, Royston et al. 2009, Altman et al. 2009, Moons et al. 2009a). In other words, they were not designed to be the basis for developing some kind of scoring system that could be used by HVs in the future to predict whether an individual child should be assigned to any particular HPI category. The results of the model checking should therefore just be taken as an indication of how well the models discriminated between children in this sample allocated to different HPI categories rather than as an indication of whether the models could be used to predict the ‘appropriate’ HPI for future

children. It is not surprising that the intensive cf. core model performed better than the non-core cf. core model as it compared two extreme groups and excluded the intermediate category of children allocated an additional HPI.

Given the variation in Health Visitor staffing across Scotland, and its apparent lack of correlation with local populations' characteristics, it is of interest to consider whether the models presented in this chapter may be used to inform HV workforce allocation decisions. For example, could the relative prevalence of predictors found to be associated with non-core HPI allocation (percentage of children living in the most deprived areas, of babies born premature, of mothers who smoke, etc) be used to plan how available HV resources should be distributed across areas to be best in line with local populations' need for their services? Such an approach would be similar to that being advocated by the PREview project in England (see Section 7.3.3.4 below) however there are key differences that would caution against using the models presented here for such a purpose.

As discussed previously, although the models as currently constituted are relatively complex with many predictors included, many potentially important factors that increase children's need for CHP support were not included due to lack of available data. Similarly, no protective factors were included. The models, particularly that comparing non-core to core HPI, perform only modestly well, indicating that they by no means explain all the observed variation in HPI allocation. It is unclear whether the models could be simplified without reducing their performance further. Finally, although the HPI is a good indication of HVs' assessments of children's need for CHP support, as discussed below, the relationship between the HPI category that children are assigned to and their outcomes is currently unexplored.

7.3.2.5. Relationship between HPI allocation, subsequent support, and children's outcomes

The final key limitation of the work presented here is that by definition the models only looked at factors associated with the HPI category that children were allocated to at the end of their 6-8 week review. 'Vulnerability' is a fluid state (Appleton

1994a): children's circumstances change over time and many will have their assessed level of need changed after this point (Wright et al. 2009). No routine information is available on the support actually given to the children allocated to the different HPI categories or on relevant outcomes such as their development at school entry. As discussed in Chapter 8, there are no reliable national data on the totality of HV contacts with children outwith the context of the universally offered child health reviews. Furthermore, there are no national data on other key services that the Child Health Programme may facilitate children's/families' early access to, such as enhanced early education or parenting support. As discussed in Section 5.3, population based data on critical outcomes such as the quality of parent-child interactions, the home learning environment, and early child development are also currently lacking. The proposed 24-30 month child health review will provide new data on children's development at that stage and this may provide an opportunity in the future to explore the early outcomes of infants assigned to different HPI categories (Scottish Government 2012b).

7.3.3. Previous relevant work

To my knowledge, no other country uses a tool such as the HPI to explicitly stratify all children in early infancy into different categories of need for ongoing support from the CHP. Consequently, I am not aware of any previous whole population studies that have looked at factors associated with children being explicitly identified as in need of enhanced CHP support. In particular, there are no previous studies available on the characteristics of children that are currently receiving enhanced/targeted support from the Child Health Programmes within the UK. There are some strands of literature that do provide relevant context for this analysis, however, including:

- Previous special studies that have involved HVs categorising children according to perceived need for ongoing support, in particular the Starting Well project in Glasgow

- A range of literature on the factors that HVs say they take into account when assessing children's needs and on how they approach the needs assessment process.
- A small number of previous studies looking at the HV staffing available in local areas and the extent to which it matches the presumed needs of the population.
- The PREview project funded by the Department of Health in England which has produced resources designed to support the targeting of Health Visitor resources at the area and the individual child/family level

7.3.3.1. Starting Well

Starting Well was one of four demonstration projects funded by the Scottish Government in 1999 that collectively aimed to secure significant health improvement and reduction in health inequalities in particular areas (Scottish Office 1999).

Starting Well focused on the early years and involved delivery of an enhanced health visiting service (Ross et al. 2005, NHS Health Scotland 2004a). The first phase ran from 2000 to 2005 in two areas of Glasgow with high levels of deprivation, a high proportion of families from ethnic minorities, and a combined total population of around 60,000. Instead of receiving the usual Child Health Surveillance programme, all families with new babies in the project areas received an enhanced support service from teams of HVs supported by nursery nurses and para-professionals (trained lay members of the local communities). A core visiting schedule was developed that offered a total of 34 contacts (mainly home visits) with families from the antenatal period up to their child's third birthday. Additional tools, such as infant feeding resources and Triple P parenting support materials, were also provided to HVs to enable evidence based support for parents with particular issues.

HVs were expected to complete a specially developed Family Health Plan for every family within the project. This facilitated recording of needs assessments and of all contacts provided. Despite the availability of the core visiting schedule, HVs were encouraged to tailor the amount of support provided to particular families according to their perceived needs. HVs were asked to complete their initial assessment of

child/family needs by the time a child was eight weeks of age. As well as recording the detail of assessment findings, they were asked to allocate all children to an overall Family Needs Scale (FNS) category and record this in the Family Health Plan. FNS category 1 indicated lower than average needs and hence a requirement for fewer than the 34 recommended contacts. FNS categories 2 and 3 indicated average and above average needs respectively. HVs could subsequently change the FNS at any point if families' needs changed.

Starting Well has been subject to a range of internal and external evaluations (Mackenzie et al. 2004, Shute, Judge 2005, McIntosh et al. 2007, Mackenzie 2006, Mackenzie 2008). One aspect of the internal evaluation focused on how HVs used the Family Needs Scale and how that translated into the support provided to different children and their outcomes. The work was led by the Paediatric Epidemiology and Community Health Unit within the University of Glasgow (see <http://www.gla.ac.uk/schools/medicine/medicine/childhealth/researchinterests/paediatricpedemiologyandcommunityhealth/>) and I was involved as a collaborator (see Section 4.3.6) (Wright et al. 2009).

The Family Needs Scale study involved 1,202 families that had one child during the Starting Well project and were followed up for at least 12 months. The study found that only just over half of all children (686/1,202, 57%) had been allocated to one of the FNS need categories by the recommended age of eight weeks: many children were allocated after this point. Furthermore, only a third of children who received a high need rating (FNS 3) at some point over their first year had been identified as high need by eight weeks of age (99/302, 33%).

On average, children initially allocated to FNS 3 received substantially more visits over their first year than those initially allocated to FNS 1 or 2, suggesting that the support offered to families was influenced by the initial assessment of needs to some extent. Children initially allocated to the high need category only accounted for 32% (71/224) of those that received a high number of visits (defined as in the top 20th percentile of contacts) and 35% (51/144) of those referred to social work over the

course of their first year, however, whereas those allocated to the high need category at any point over their first year accounted for 61% (137/224) and 72% (103/144) of these groups respectively. Overall, these results suggest that it can take considerably longer than eight weeks for a HV to feel able to allocate a child to a category of need for ongoing support, and that children's needs change over time, with many infants being identified as high need after the immediate postnatal period.

Reliable information was available for the sample members on a relatively small range of potential vulnerability factors and multivariate modelling was undertaken to assess which were associated with being allocated to FNS 3. Living in a workless household, being one of a multiple birth, the mother having an abnormal Edinburgh Postnatal Depression score, and the parents having previous involvement with criminal justice or having been 'looked after' as a child were all found to be associated, suggesting that these are among the factors that HVs took into account when deciding if a child required enhanced support. Breastfeeding, maternal ethnicity, deprivation, prematurity, and young maternal age were not found to be independently associated with being allocated to FNS 3. This probably reflects the much smaller sample size involved in the Starting Well study than the analysis presented here, and consequently much reduced statistical power. In addition, deprivation was probably not a good predictor in the Starting Well sample as by definition, the vast majority lived in areas of high deprivation.

The similarities between the FNS and the HPI are obvious, although it is important to note the different service contexts the two categorisation systems have been used in. In Starting Well, HVs knew they would be offering a high number of contacts to families (much higher than is offered through post-2005 usual CHS) hence would have multiple opportunities to assess and re-assess children's needs. They may therefore have felt under less pressure to assign children to a needs category by eight weeks and/or under less pressure to assign children to a higher category early on to 'justify' ongoing contact with the family. Overall the results of the Starting Well evaluation do serve as a reminder that children's needs inevitable change over time and that assessing and responding to their needs should be an ongoing process.

Allocation of the HPI at the 6-8 week review should therefore only be taken as an early indication of children's needs, not a fixed attribute that will be unchangeable over time. The factors found to be associated with being assessed as high need in the Starting Well study to some extent echo those found in this analysis, although the range of factors identified was narrower reflecting availability of information on fewer potential predictors, the smaller sample size, and the particular local populations included.

The aspect of the Starting Well evaluation that looked at how children were allocated to FNS categories has been important in terms of influencing subsequent policy developments. As discussed in Sections 4.3.5 and 4.3.6, the Scottish Government has responded to the evaluation by recommending that a child's first HPI should be allocated at any point from the antenatal period up to six months of age, rather than requiring all children to be allocated by or at their 6-8 week review (Scottish Government 2011b). The other recent policy development relating to the HPI, namely that HVs should move to a two (core and additional only) rather than three category system reflects a political decision to bring the HPI more into line with the language used by the Getting It Right for Every Child programme (i.e. children are 'in need' at any particular time or not) rather than arising out of empirical evidence. The Starting Well study and the analysis presented here suggest that HVs can make meaningful use of three categories of need albeit that consistency of use between areas can be problematic. There is no particular reason to assume that moving to a two category HPI will solve the issues of inconsistent use between areas without any associated attempt to provide greater guidance on/definitions around which types of children should be allocated to the different categories.

One other previous study was found in the literature that involved explicit categorisation of young children into levels of need for ongoing HV support (Crofts et al. 2000). As part of a time limited project in Sheffield in 1996/97, HVs explicitly assigned all pre-school children on their caseloads to low, medium, or high priority status, with low priority indicating that the child required core/universally offered contacts only. Overall, 74% of children were considered low priority, 12% medium,

6% high, and 8% were uncategorised. Overall, children considered high and medium priority received almost five and three and a half times as many contacts per child respectively as those considered low priority, suggesting that HVs did focus their efforts on the children perceived as being most in need. Despite this, just over half of all contacts were with low priority children due to the much larger numbers in this group.

7.3.3.2. Health Visitors' assessment of children's needs within routine practice

As touched on in the Methods section of this Chapter, there is a range of literature on the factors that HVs consider important in determining child/family vulnerability and need for ongoing enhanced CHP support, and this was drawn on when developing the framework of potential predictors that guided the modelling analysis. In general the literature around HV perceptions of vulnerability factors stresses the complexity of the concept of vulnerability. HVs identify a very wide range of factors as potentially important in influencing children's need for support (Horrocks et al. 1998). For example, in one qualitative study by Williams (Williams 1997), a small sample of HVs identified more than 50 potential vulnerability factors that related to:

- Lack of support
- Socio-economic factors
- Maternal factors such as age, health
- Parenting skills
- Paternal factors such as engagement with child care
- Access to/engagement with services
- Child factors such as health status
- Child protection concerns e.g. previous children on child protection register.

The literature also emphasises the fluid/changing nature of children's vulnerability, the fact that vulnerability exists across a spectrum rather than as an 'either/or' phenomenon, and the importance of considering protective factors alongside risks to get a rounded picture of children's needs. The importance of HV factors, such as tolerance of/aversion to risk, professional experience, and perceived capacity to

provide support, in influencing decisions around children's vulnerability is also noted, providing a rationale for considering HV staffing/capacity within the modelling presented here (Appleton 1994a, Appleton 1995, Appleton 1996).

Not surprisingly given the perceived complex nature of children's vulnerability, HV researchers have also written extensively on the complexity of the needs assessment process itself. In general, this literature focuses on the importance of open and trusting relationships between HVs and families and of assessments based on informed professional judgement, and a general rejection of simplistic checklists/vulnerability scoring systems being used as the sole basis for assessing needs. Rigid needs assessment checklists have been identified as not just unhelpful but potentially harmful as they undermine HV-family communication and relationships, and fail to identify as vulnerable some children about whom HVs have significant concerns and vice versa (Elkan et al. 2000, Cowley, Houston 2003, Mitcheson, Cowley 2003, Appleton 1997).

HVs also sometimes express concerns that being obliged to use structured needs assessment checklists may reflect managerial control and organisational efficiency goals (i.e. justification of withdrawing services from those 'shown' to be not vulnerable) more than a genuine desire to improve services for the most disadvantaged (Cowley, Houston 2004, Appleton et al. 2004, Cowley, Mitcheson & Houston 2004). HVs can also express concerns about being expected to ask about needs that they then do not have the capacity to address (Selbie 2009). Despite this general rejection of overly rigid and protocol-ised needs assessment process, HVs do recognise that professional judgements are supported by extensive knowledge and experience and can find general frameworks that guide the assessment process, and recording of the results, helpful in terms of making decisions more transparent and defensible (Aldgate, Rose 2009, Sanders 2006). HFAC4 also specifically recommends against the use of a 'check list' approach to needs assessment (Hall, Elliman 2003, pp362-3).

In general, this literature strongly cautions against the unthinking development of checklists/scorecards for child/family vulnerability and their implementation as the key mechanism through which HVs are instructed to assess children's needs. As previously stated, the modelling presented here was simply aiming to explore the relationships between all available predictor factors and HPI allocation. There should be no assumption that the factors found to be associated with HPI allocation could or should be used to develop a vulnerability checklist for use with future children. Apart from the more subtle problems with this approach outlined above, as previously noted the factors found to be significantly associated with HPI allocation in the models do not represent an exhaustive list of all possible vulnerability factors, not least due to the exclusion of many important social factors due to lack of data.

7.3.3.3. Geographical variation in Health Visitor staffing

The results of the Community Health Partnership survey undertaken for this analysis suggest very wide variation in HV staffing levels across Scotland, with no correlation evident between staffing levels and area characteristics such as rurality or deprivation. One previous study compared the expected and actual distribution of HVs across GP practices and Primary Care Groups in Norfolk, England in around 2000 (Steel, Reading & Allen 2001). The expected distribution was based on the total available staffing level and the relative distribution between practices of four key indicators of population need for HV support, namely number of children aged 0-4 years; childhood elective hospital admission rate; low birthweight rate; and overall premature (<65 years) mortality rate. These indicators were chosen after a local consensus process as they were available from routine data (and were therefore not influenced by reporting bias), were reasonably common, and were felt to have face validity as indicators of need for HV support. The study found that the number of whole time equivalent HVs per 10,000 practice population ranged from zero to over seven, although the practices at the extremes had particular reasons for their staffing profile and most practices had between one and three HVs per 10,000 population. If it is assumed that around 5-6% of the population is aged 0-4 years, this would mean that most practices had from around two to around five HVs per 1,000 children aged 0-4 years. This is similar to the staffing levels suggested by the

Community Health Partnership survey (median of 4.27 HVs per 1,000 children).

The three fold level of variability between 'typical' practices in HV staffing is also similar to the level of variability found between Community Health Partnerships.

The Norfolk study found very little correlation between actual staffing levels and those that would be expected if HVs were distributed according to the population needs formula used. It was estimated that redistributing the available staffing in line with population needs would involve around half of all practices gaining or losing at least half of their existing staffing complement. The authors acknowledge a number of weaknesses in their study, for example lack of consideration of rurality, and also note that the method can only be used to consider the relative distribution of available staff, not the absolute staffing level that would be required to secure particular outcomes.

A previous study in Sheffield explored the variation in workload between different HVs working across the city (Crofts et al. 2000). It found that the caseload size per whole time equivalent HV varied widely, from around 150 children to just over 600. Again, this is reasonably consistent with the findings of the Community Health Partnership survey and other recent work looking at HV workload in Scotland. The study then modelled the extent to which staffing would need to change to reflect the different level of deprivation of the caseloads served: it found that around 40% of caseloads would need to gain or lose at least 20% of a whole time equivalent HV (i.e. one working day per week) to ensure a more deprivation-sensitive distribution of HV resources.

These studies are both now somewhat dated, and neither was undertaken in Scotland, but their results are congruent with the findings of the Community Health Partnership survey and in general they support the perception that the distribution of HV staffing is more determined by historical accident than current needs of local populations. There is evidence from HVs across the UK that they have increased the amount of targeted contacts offered to vulnerable families as the number of universally offered CHS contacts has been reduced (Condon 2008, Condon 2011),

but there is no published information to my knowledge on whether/to what extent different areas have attempted to redistribute existing HV staffing to be more in line with population needs since the publication of HFAC4 or, in Scotland, the 2005 policy. It would be of interest to explore this further with NHS Boards and Community Health Partnerships. Anecdotally, HVs can perceive staffing redistribution projects as inherently threatening: this is unsurprising as they can involve uprooting existing staff from communities that they have served for a long time. Nevertheless, HFAC4 is clear that directing enhanced HV support towards the most in need is required both at the area level and at the individual level if improved equity of children's outcomes is to be achieved (Hall, Elliman 2003, pp358-366).

7.3.3.4. The PREview study

A number of previous studies have offered ways of profiling the need for HV support in local communities as a way of guiding staff/resource allocation (Pollock et al. 2002, Cowley, Bidmead 2009, Cowley 2007b, Cowley 2007a). Most recently, the Department of Health in England has commissioned the Child and Maternal Health Observatory to develop a range of resources designed to support targeting of Healthy Child Programme resources (the English equivalent of the Child Health Programme) at both the area and the individual level as part of the PREview project (see <http://www.chimat.org.uk/resource/view.aspx?QN=PREVIEW>).

To support targeting at the area level, PREview first undertook a series of literature reviews and new analyses of data from the Millennium Cohort Study to explore factors associated with poor child outcomes (specifically poor physical health, behavioural problems, and poor cognitive development) at age five years (Hennessy, Green & Spiby 2008b, Hennessy, Green & Spiby 2008a, Kiernan, Mensah 2010, Hobcraft, Kiernan 2010). The best possible predictive models for these outcomes were then developed using the MCS data, with predictors being constrained to those likely to have routine data available at local level. The models were then validated in other longitudinal datasets, notably that from the Avon Longitudinal Study of Parents and Children (see <http://www.bristol.ac.uk/alspac/>).

NHS staff responsible for commissioning Healthy Child Programme services for their district can input local data into the models using tools provided by the Child and Maternal Health Observatory to produce maps of the relative risk of the different poor child outcomes at age five across small area units such as wards (Child and Maternal Health Observatory 2011a, Child and Maternal Health Observatory 2011b). The models require linked individual level data on all babies born in the district over a specified period (and their mothers). It is possible to run the models using different subsets of all possible predictors depending on what data are available locally. The full list of potential predictors that can be included in the models comprises:

- Deprivation
- Maternal age
- Maternal smoking
- First child
- Multiple birth
- Birthweight
- Child's sex
- Infant feeding
- Maternal pre-pregnancy body mass index
- Gestation at mother's first antenatal contact
- Parental marital status
- Parental employment
- Maternal qualifications.

All of these predictors that were included in the analysis reported in this chapter were found to be significantly associated with HPI allocation with the exception of child's sex, again confirming that HVs in Scotland do seem to be identifying children with known vulnerability factors as being in need of enhanced CHP support.

PREview then suggests that the mapped outcomes can be used as the basis for local discussions around allocation/distribution of relevant resources such as Health Visitor teams and wider early years services such as those offered through Sure Start. PREview makes it clear that the predictive factors included in the models are not all possible factors that could be associated with poor child outcomes (for example there

were too few children with drug misusing parents in the Millennium Cohort Study for this factor to be included) and that not all associated factors should be considered causal. Nevertheless, the models are argued to give a reasonably good indication of the likely pattern of children's outcomes across districts if effective interventions are not provided in 'doses' commensurate with children's needs.

The PREview population models require a great deal of individual level data and it is not yet clear how many areas are using the tools to support local resource allocation discussions. It is also not clear whether the PREview models give any different/better information than much simpler approaches such as just mapping the Foundation Stage Profile results of children of school entry age, although this approach would to some extent lose the idea of prediction and supporting the earliest possible intervention that is central to PREview.

PREview also tries to support targeting of HV support at the individual child/family level by providing a series of resources for practitioners (Child and Maternal Health Observatory 2011c). These include evidence summaries of all factors evident from early life that have been shown in the Millennium Cohort Study to be associated with poor child outcomes at age five (i.e. many more factors than are included in the models described above). These are designed to be aide-mémoires to help HVs structure their thinking about vulnerability and protective factors early in children's lives. They are explicitly not meant to be used to be used as checklists to label individual children/families or to replace professional judgement when assessing children's needs. Although an equivalent to the HPI is not used in England, PREview does encourage HVs to consider, after assessing infants' needs, whether they require:

- The universal Healthy Child Programme contacts/services only to meet 'usual or routine needs',
- 'Universal plus' services to meet 'short term additional needs', or
- 'Universal partnership plus' services to meet 'more intensive, perhaps ongoing needs'.

It is notable that England is therefore moving towards a somewhat less explicit categorisation of young children according to assessed need for ongoing CHP support just when Scotland is moving away from the three category HPI to a two category system. How PREview encourages the reassessment of children's needs and responsiveness to changes in their circumstances that may have significant impact on their need for HV support over time is not clear.

PREview is also aiming to engage parents in thinking about how they can influence their children's outcomes from an early age and 'conversation starter' resources are therefore also provided. These facilitate open ended discussions between HVs and parents about their aspirations for their children and factors in their lives/communities that are helping or hindering them from attaining them and are designed to promote an assets based approach and bolstering of parents' self efficacy (Sigerson, Gruer 2011). To date, no equivalent of the PREview resources are available in Scotland.

7.3.4. Wider comments and conclusions

This chapter has explored associations between child/family characteristics, HV staffing/capacity, and geographical area and the allocation of children to different HPI categories at their 6-8 week child health reviews. The findings show that many of the child/family characteristics studied are associated with HPI allocation, suggesting that HV assessments of infants' needs are complex, and take into account many factors known to be associated with increased risk of poor outcomes and hence increased need for HV support.

The level of HV staffing available in different areas across Scotland appears to be very variable and is not obviously related to differential levels of deprivation or rurality/remoteness. There is a suggestion that children living in areas with higher levels of HV staffing may be more likely to receive a non-core HPI but this association is not statistically significant and requires further investigation.

Even when the characteristics of children and the level of HV staffing available locally have been taken into account, there is significant residual variation between Community Health Partnerships and NHS Boards in the proportion of children allocated to non-core HPIs, confirming the early impression of the Hall 4 network group that the HPI is used differently in different areas. This between area variation seems to reflect a general 'threshold' effect rather than differential weight being given to particular vulnerability factors in different areas. The variation probably reflects the limited national guidance provided on the HPI when it was first introduced. It substantially limits the intended utility of the HPI as a tool to facilitate communication about children's need for ongoing CHP support when they move between areas.

This analysis by definition only modelled the allocation of young infants to different categories of need for ongoing CHP support. Other studies suggest that children's needs change substantially over time and hence that needs assessment should be an ongoing process. This analysis cannot comment on the amount of care subsequently provided to children allocated to different HPI categories or on their eventual outcomes. Other research suggests that HVs do actively direct their time towards children they have identified as being the most vulnerable but the degree to which this is currently occurring in Scotland is unknown.

The models inevitably do not explain all variability in HPI allocation, not least because they omitted several potentially important social vulnerability factors due to lack of data. These models should not be used to construct vulnerability checklists used to assign future children to different levels of need for CHP support.

The recent policy decision to widen the period within which the first definitive HPI can be assigned to a child seems reasonable given what is known from the literature on child vulnerability and HV needs assessment processes. This decision raises practical issues however, for example, how will an HPI assigned at six months be recorded on the CHSP-PS system given the current lack of a recommended child health review at that age? The currently recommended move from a three to a two

Identification of children requiring enhanced Child Health Programme support category HPI system is unsupported by evidence, inconsistent with evolving practice elsewhere in the UK, and unlikely by itself to resolve the issue of lack of consistency in use of the HPI between areas.

The next chapter goes on to consider how the reduction in child health reviews offered in Scotland since 2005 has influenced children's overall receipt of preventive health care.

Chapter 8 Preventive child health care provided to pre-school children by General Practitioners

The previous two chapters have considered how the post-2005 changes to the Child Health Surveillance system have influenced the coverage of the remaining child health reviews, and which children are being identified as requiring more than the reduced core programme of reviews and other contacts. This chapter explores the impact of the changes to the review schedule on the totality of preventive health care provided to pre-school children. The changes to the child health review schedule were implemented very abruptly in all NHS Board areas. Children were offered the 'old' programmes of reviews right up to the date on which the 2005 policy was implemented in that area, then offered the 'new' programme from that date onwards. The impact of this abrupt change on the totality of preventive care provided to young children was difficult to predict at the time the 2005 policy was implemented.

The old programme of reviews was long established hence Health Visitors and General Practitioners (GPs) were very familiar with it. Although it is likely that professionals held a range of views on the effectiveness of the various different reviews, there were undoubtedly some concerns around the time the 2005 policy was implemented about the scale of the reduction in universally offered reviews (Scottish Executive 2005). If HVs were concerned about the lack of proactive contact with children after early infancy, they may have offered ad hoc reviews to parents more readily after implementation of the 2005 policy than before and/or encouraged them more strongly to request a review if they had any concerns about their children. Similarly, GPs may have been more ready to proactively assess children's health and development and incorporate health promotion advice within their consultations with young children after the changes were implemented.

Although the 2005 changes to the CHS system were not widely publicised to parents, it is likely that at least some parents were well aware of the reduction in the number of reviews being offered. Some parents with children who spanned the transition

point (i.e. were born but had not yet entered school before the 2005 policy was implemented) will have been given materials outlining the old programme of reviews when their children were born then not been offered some of the ‘promised’ reviews. Parents with older children may also have noticed a difference in the care offered to their younger children. Finally, parents generally form social networks with other parents with children at a similar age and stage, and parents may have noticed that other children only very slightly older than their own were offered reviews that their children were not if they reached a critical age point just after the implementation date. After implementation, parents may therefore also have proactively sought additional care from their HV or GP to reassure them that their child was progressing well, or for advice on parenting and health related topics that they would otherwise have sought through the universal child health reviews.

Initially, I had hoped to explore how the totality of both HV and GP provided preventive care of pre-school children changed after implementation of the 2005 policy. Two potential sources of complete data on all HV-child contacts were explored: CHSP-PS and the Practice Team Information (PTI) system. As discussed in Section 4.3.1, CHSP-PS allows HVs to record the delivery of all universally offered child health reviews. The system also allows HVs to record to delivery of additional contacts provided at the request of the HV (‘recall reviews’) or the parent (‘unscheduled reviews’) (see <http://www.isdscotland.org/Health-Topics/Child-Health/Child-Health-Programme/Child-Health-Systems-Programme-Pre-School.asp>).

Recall reviews are usually formal follow up contacts offered after provision of a universally offered review or other contact if the HV wants to reassess a particular issue or monitor the impact of some advice or intervention that has been provided. For example, if a HV was unsure whether a child attending an old 22-24 month review was showing appropriate speech and language development, they may have offered the parents some advice on language enrichment then offered a follow up appointment in three months’ time to reassess the child’s development and decide whether referral to speech and language therapy was required. They could record the

decision to offer a follow up appointment on the CHSP-PS 22-24 month review form then, when the data on the form were input in the local child health department, the CHSP-PS system would automatically generate an appointment for the child at the appropriate time. Because of how the system works, not all HV-instigated additional (i.e. non universal child health review) contacts with children are managed as formal CHSP-PS recall reviews however. If a HV is seeing a family on a very frequent basis, for example due to severe maternal depression, they are unlikely to use CHSP-PS to schedule (and hence to record) these contacts due to the delay inherent in the paper-based CHSP-PS system.

Unscheduled review forms can be used to record HV-child contacts that have been requested by the family rather than scheduled by the HV using the CHSP-PS system. Again, however, not all parent-initiated contacts are recorded as unscheduled reviews. In general, HVs are likely to use an unscheduled form to record a contact if a significant new concern was raised that required action such as a follow up recall review, a referral, a change to the child's HPI, etc. HVs are unlikely to use an unscheduled form to record that a parent attended a drop in 'baby clinic' if no concerns were raised. Such a contact would probably just be recorded in the child's locally held HV notes and possibly the parent held child health record. The CHSP-PS guidelines suggest that HVs should also use an unscheduled rather than a review specific form to record the delivery of a recommended review to a child that is outwith the specified age range (for example if a child is given their 6-8 week review at age 13 weeks) but in practice, HVs often use review specific forms in such instances.

In addition to these usual uses, some NHS Boards used recall and unscheduled review forms in particular ways around the time the 2005 policy was being implemented (Claire Nolan, ISD, personal communication). As noted in Section 4.3.4, NHS Lothian offered (and continues to offer) all newborn children two further reviews between the 6-8 week review and the child attaining six months of age, with all of these reviews being scheduled and recorded in CHSP-PS using recall forms. Not surprisingly, therefore Lothian has seen a large increase in the number of recall

reviews offered to infants since 2005. Furthermore, Lothian, and probably other Boards to some extent, have used a mixture of recall and unscheduled forms to record review and possible updating of children's HPI status prior to starting school, leading to a large 'spike' of recall and unscheduled reviews recorded for four year old children every summertime. These figures are somewhat misleading as most of these 'reviews' are desk based reviews of children's notes that do not involve any contact with the child or their family.

It can be seen from the above, that it is not possible to use CHSP-PS to obtain an accurate picture of the totality of contacts between HVs and pre-school children, or to assess how the balance between universally offered reviews and other forms of contact has changed since implementation of the 2005 policy.

The Practice Team Information system is Scotland's main national primary care information system. Under the PTI system, a sample of GP practices from across Scotland return data on all face to face contacts between healthcare staff and the practices' patients (see <http://www.isdscotland.org/Health-Topics/General-Practice/PTI-Statistics/What-is-PTI.asp>). Initially (1990- March 2003 when PTI was known as the Continuous Morbidity Recording scheme) only contacts between the practices' GPs and patients were recorded. From April 2003 onwards, contacts with a wider range of staff groups have been included. From April 2003 to the present, patient contacts with practice-employed practice nurses have been consistently recorded. From April 2003 to at least March 2006, practices also consistently recorded patient contacts with practice-attached HVs and district nurses. For HVs, these PTI returns were separate from, and additional to, any CHSP-PS returns. From April 2006 onwards, many practices were finding it increasingly difficult to continue returning data on HV and district nurse contacts, for example because community nurses were working across geographical patches rather than specifically with patients from one practice, and including contacts with these staff groups in PTI returns became optional. Most practices stopped returning these data shortly thereafter.

Given the variable date on which practices stopped returning HV contact data and the variable date on which Boards implemented the 2005 policy, the PTI database was explored to see if any practices continued to return data on HV contacts after the date on which the 2005 policy was implemented in their area but none did. PTI data therefore cannot be used to examine the totality of contacts between HVs and pre-school children after implementation of the 2005 policy in any practices.

The total number of HV contacts with pre-school children recorded through CHSP-PS and PTI before implementation of the 2005 policy were compared to estimate the proportion of all contacts that were recorded through CHSP-PS. All contacts occurring between April 2003 and March 2004 with children aged 0-4 years who were registered with 32 GP practices during that time were included. The 32 practices were those within the PTI scheme that consistently returned HV contact data over the time period studied and were also in an NHS Board area that used the CHSP-PS system at that time. Around 13,000 contacts were recorded through CHSP-PS (including all universally offered, recall, and unscheduled reviews) compared to around 44,000 through PTI (including all face to face contacts). This suggests that at that time CHSP-PS recorded around 30% of all face to face contacts between HVs and pre-school children. As universal child health reviews are reliably recorded through CHSP-PS but other, additional, contacts are not, this percentage is likely to have declined since 2005. This confirms that CHSP-PS is not suitable for assessing trends in the totality of HV-provided care.

Given the difficulties inherent in looking at the impact of the 2005 policy on the totality of care provided by HVs, I focused the rest of this analysis on preventive health care provided by GPs to pre-school children. Although not primarily responsible for delivery of child health reviews, GPs provide an important component of the overall system of preventive health care for young children (Royal College of General Practitioners 1982, Harnden, Sheikh 2002). In many practices they contribute to the delivery of at least some of the child health reviews (see below). It is common for practice nurses to have lead responsibility for provision of routine childhood vaccinations but again, in some practices, GPs continue to provide

at least some vaccinations (West Dunbartonshire Community Health Partnership 2007). HVs often refer children they suspect of having a medical or developmental problem to a GP for more detailed clinical assessment. GPs can then directly provide medical care to these children and/or refer them for more specialist input as required. As GPs frequently see families with young children, they also play an important role in provision of opportunistic preventive care and health promotion or parenting advice during consultations, and in bringing particular children/families needing additional support to the attention of HV colleagues (Wilson, Mullin 2010).

The professionals that have contributed to providing universal child health reviews are recorded on the relevant CHSP-PS review forms. To estimate how commonly GPs were/are involved in delivery of reviews, the proportion of all reviews that were recorded on CHSP-PS as being delivered by a HV and/or a GP before (2004/05) and after (2007/08) implementation of the 2005 policy was examined. The results are summarised in Table 47 and show that, when the old programme of child health reviews was offered, GPs often contributed to (and were sometimes the sole provider of) the 6-8 week and 8-9 month reviews and to a lesser extent the 39-42 month reviews. They were rarely involved in the 22-24 month reviews. HVs were/are almost always solely responsible for provision of the 10 day and pre-school reviews hence GP input into these reviews was not recorded on CHSP-PS. GP input into the 24 month selective review offered after 2005 is also not recorded on CHSP-PS. The CHSP-PS data suggest that GP input into the 6-8 week review has remained at a similar level after implementation of the new reduced programme of child health reviews.

Table 47 The proportion of universally offered child health reviews recorded on CHSP-PS as being delivered by a HV and/or a GP

Review	Total number of reviews	% delivered by HV	% delivered by GP
Before implementation of 2005 policy (April 2004 – March 2005)			
10 day	Almost always delivered by HV alone hence GP involvement not recorded on CHSP-PS		
6-8 week	43,346	79	87
8-9 month	40,975	82	84
22-24 month	38,318	99	2
39-42 month	36,153	85	67
48-54 month	Almost always delivered by HV alone hence GP involvement not recorded on CHSP-PS		
After implementation of 2005 policy (April 2007 – March 2008)			
10 day	Almost always delivered by HV alone hence GP involvement not recorded on CHSP-PS		
6-8 week	45,940	85	85

Reviews delivered in NHS Argyll & Clyde, Ayrshire & Arran, Borders, Dumfries & Galloway, Fife, Forth Valley, Greater Glasgow, Lanarkshire, Lothian, and Tayside were included as these Boards had the relevant data available. CHSP-PS also allows 'community paediatrician' to be recorded as delivering reviews but this was very uncommon for all reviews.

Following the 2005 changes to the universally offered child health reviews, GP provision of certain reviews (in particular those previously provided at 8-9 and 39-42 months) was likely to cease. Due to the complex relationships between provision of universal reviews, parents' health seeking behaviour, and HV and GP practice, the impact of the changes to the review schedule on GPs' wider provision of preventive care to young children was more difficult to predict however.

The analysis presented in this chapter therefore uses PTI data to explore the following questions:

- How did GP provision of universally offered child health reviews change before and after implementation of the 2005 policy?
- How did GP provision of other preventive care to pre-school children change before and after implementation of the 2005 policy?
- What proportion of all GP consultations with pre-school children involve child health reviews or other preventive care, and how did this change before and after implementation of the 2005 policy?

8.1. Methods

GP consultation data were obtained from the Practice Team Information (PTI) system. Participation in the PTI system is voluntary, and practices are free to join and leave at any time. At any one time, around 60 practices, serving around 5% of the Scottish population, contribute to the scheme. Data are captured on all face to face contacts between GPs (including locums and doctors in training) and the practices' patients. The data items collected include patient demographics and Read codes for one or more aspects (symptom, sign, diagnosis, or scheduled care event) of the consultation.

For this analysis, the 30 practices that submitted complete GP consultation data from 1 April 2003 to 31 March 2010 and were in an NHS Board area that implemented the 2005 policy on a specified date prior to mid 2007 were included. Consultations for each practice occurring during the 2½ years (10 sequential quarters) before and after the implementation date were included in the analysis.

Lists of Read codes were drawn up to identify consultations involving delivery of universally offered child health reviews or other aspects of preventive care (see Table 48 and Appendix 4). The code lists were specified after:

- Reviewing relevant Read code groupings that had previously been developed by ISD to support analysis of primary care data, for example the code grouping relating to 'child health care' (see <http://www.isdscotland.org/Health-Topics/General-Practice/PTI-Statistics/Grouping-clinical-codes.asp>).
- Supplementary manual searching of Read code version 2 (Scottish) browser.
- Conducting a survey of practices (see below).
- Review by relevant colleagues. The final code lists were reviewed for completeness and accuracy by a Consultant in Public Health Medicine with expertise in health information and maternal and child health (Dr Jim Chalmers), and a specialist clinical coder (Murray Bell), both of whom worked in ISD.

Table 48 Categories of GP consultations included in the analysis

Broad category	Subcategory
Child health reviews	6-8 week
	8-9 month
	22-24 month
	39-42 month
	Other pre-school child health reviews
Other preventive care consultations	Postnatal care (including examination of newborn)
	Immunisation (all universally offered pre-school vaccinations)
	Medical and developmental assessment (e.g. examination of hips or heart or any aspect of development)
	Health promotion advice and parenting support (e.g. provision of advice on child safety or behaviour or parental support)
	Assessment and advice relating to child nutrition and growth (e.g. advice on breastfeeding or weaning or child growth monitoring)
	Child protection (e.g. child 'at risk' or neglected/abused)
Other consultations	Any other reason
Total	All consultations

The survey of practices was undertaken to confirm that all relevant codes relating to provision of child health reviews were included in the Read code lists. The largest included practice from each NHS Board area was sent an email survey in February 2011. Eight out of ten practices responded after two reminders. The survey asked about GP contribution to specific child health reviews before and after implementation of the revised child health review programme, and which Read codes were assigned to the relevant consultations as appropriate.

The codes indicating child health reviews were divided into subcategories indicating each of the specific reviews offered prior to implementation of the 2005 policy that GPs were potentially involved in and an additional subcategory of 'other pre-school child health reviews' (see Table 48). This last subcategory included a variety of codes indicating reviews at 10 days, 48-52 months, and any other specified (pre-school) ages at which universal reviews were not usually offered. It also included other codes for child health reviews that did not specify an age such as ZV202 'Routine child health check'. Practices had indicated through the survey that these codes were sometimes used for the universally offered child health reviews but it was not possible to assign consultations with these codes to any specific review subcategory.

The subcategories of 'other preventive care' were chosen to represent a broad spectrum of the types of preventive care that could be provided by GPs to young children. All 'other preventive care' consultations, and those that were not also coded as a child health review (i.e. those that represented additional consultations), were identified separately. For relevant subcategories of 'other preventive care' (postnatal care; health promotion advice and parenting support; and assessment and advice relating to child nutrition and growth), consultations with women aged 15-49 were also examined, as when a consultation for preventive child health care is attended by a mother and her child, the consultation may be assigned to the mother rather than the child. Abbreviated Read code lists were used when identifying relevant consultations with women to ensure as far as possible that only relevant consultations were picked up: all codes lists are provided in Appendix 4.

Practice population figures at the end of September for every year studied were used to give approximate list sizes for the preceding April to the subsequent March. Consultation rates per 1,000 children aged 0-4 years (or women aged 15-49 years where appropriate) were then calculated for each practice individually and all practices combined for 10 sequential quarters pre- and post-implementation of the 2005 policy using Excel 2003. Segmented linear regression was done using SPSS version 19 to assess whether the consultation rates for all practices combined changed significantly when the 2005 policy was implemented (Wagner et al. 2002, Perrin 2009, UCLA Academic Technology Services). Both the intercept and the slope of the fitted consultation rates were allowed to change at the point of implementation. The ten quarters prior to implementation were compared to the ten quarters after implementation: no lag periods/delayed effects were assumed. Anthea Springbett, statistician based at ISD, provided advice and assistance with the regression.

Analysis for this study was conducted within ISD and no patient identifiable data were involved. PTI practices are informed by ISD that the data they submit will be used in anonymised form for routine NHS publications and research purposes, and practices are made aware of research outputs based on PTI data. ISD's Caldicott Guardian confirmed that the analysis for this study was within normal ISD practice and no additional permissions were required. No ethical approval was required.

8.2. Results

The 30 included practices had a combined list size of 200,852 on 1 April 2010, including 11,214 children aged 0-4 years. Practices were drawn from 10 of the 15 NHS Board areas across Scotland and were of a range of sizes. The date on which the practices' Boards implemented the 2005 policy varied from 1 October 2005 to 1 May 2007 (see Table 49).

The age, deprivation, and urban/rural profile of the included practices' populations is compared to that of all PTI practices and all practices in Scotland in Table 50. The age profile of included practices is very similar to that of all PTI practices and all Scottish practices. The included practices are somewhat more deprived than all PTI practices and all Scottish practices. The proportion of the included practices' populations that live in rural (categories 5 and 6) and remote (categories 4 and 6) areas is similar to that of all PTI practices and all Scottish practices but the included practices' populations (and those of all PTI practices) tend to live more commonly in 'other' urban areas rather than the largest cities, and in remote small towns rather than remote rural areas.

Table 49 Details of the 30 PTI practices included in the analysis: list size, NHS Board area, and date of implementation of the 2005 policy

Practice	List size*		NHS Board area	Date of implementation of 2005 policy
	Aged 0-4 years	All ages		
1	300	4,700	Tayside	1 January 2007
2	300	6,100	Tayside	1 January 2007
3**	800	14,000	Dumfries & Galloway	1 April 2006
4	400	7,600	Dumfries & Galloway	1 April 2006
5	1,000	18,700	Fife	1 April 2006
6	700	9,600	Fife	1 April 2006
7	700	12,500	Forth Valley	1 April 2006
8	300	5,400	Forth Valley	1 April 2006
9	500	8,800	Forth Valley	1 April 2006
10	500	8,500	Forth Valley	1 April 2006
11	600	9,800	Greater Glasgow	1 April 2006
12	100	4,200	Greater Glasgow	1 April 2006
13	100	2,500	Greater Glasgow	1 April 2006
14	200	3,400	Greater Glasgow	1 April 2006
15	100	3,400	Highland	1 May 2007
16	100	2,300	Highland	1 May 2007
17	500	11,100	Highland	1 May 2007
18	300	3,900	Lanarkshire	1 December 2006
19	300	4,200	Lanarkshire	1 December 2006
20	200	4,900	Lothian	1 October 2005
21	200	3,600	Lothian	1 October 2005
22	400	5,900	Lothian	1 October 2005
23 [†]	500	8,500	Lothian	1 October 2005
24	200	3,100	Ayrshire & Arran	1 October 2006
25	200	4,400	Ayrshire & Arran	1 October 2006
26	300	5,100	Ayrshire & Arran	1 October 2006
27	700	13,100	Ayrshire & Arran	1 October 2006
28	100	3,300	Argyll & Clyde	1 February 2006
29	200	3,400	Argyll & Clyde	1 February 2006
30	300	5,100	Argyll & Clyde	1 February 2006
Total	11,214	200,852		

* figures for individual practices rounded to nearest 100

** This is actually two smaller practices but is counted as one within the PTI system. Practice 4 was therefore included in the survey as the largest single practice within D&G

[†] This practice had been dissolved between the end of the study period (March 2010) and the survey (February 2011). Practice 22 was therefore included in the survey as the largest available practice in Lothian

Table 50 Age, deprivation and urban/rural profile of the 30 included practices' populations, all PTI practices, and all Scottish practices, 30 September 2009

	30 included PTI practices		All PTI practices		All Scottish practices	
	Number	%	Number	%	Number	%
Age profile (years)						
0-14	33,937	17	57,041	17	864,450	16
15-39	63,785	32	109,365	32	1,843,752	34
40-64	71,249	36	119,719	35	1,900,985	35
65+	31,382	16	53,007	16	870,867	16
Total	200,353	100	339,132	100	5,480,054	100
Deprivation profile (SIMD 2008 deprivation quintiles)						
1 (least deprived)	27,929	14	69,962	21	1,070,670	20
2	37,387	19	63,741	19	1,082,294	20
3	43,163	22	66,776	20	1,084,434	20
4	46,157	23	70,991	21	1,104,755	20
5 (most deprived)	45,717	23	67,662	20	1,137,899	21
Missing	0	0	0	0	2	0
Total	200,353	100	339,132	100	5,480,054	100

	30 included PTI practices		All PTI practices		All Scottish practices	
	Number	%	Number	%	Number	%
Urban/rural profile (Scottish Government 2009/10 6 fold urban/rural classification)						
1 Large urban	30,342	15	68,795	20	2,149,195	39
2 Other urban	103,770	52	154,847	46	1,631,112	30
3 Accessible small town	18,549	9	29,100	9	475,799	9
4 Remote small town	11,981	6	21,459	6	196,519	4
5 Accessible rural	28,087	14	48,558	14	634,686	12
6 Remote rural	6,032	3	13,923	4	339,361	6
Missing	1,592	1	2,450	1	53,382	1
Total	200,353	100	339,132	100	5,480,054	100

Missing deprivation and urban/rural status are due to non-mapping postcodes

Key findings from the survey of practices about GP involvement in and recording/coding of child health reviews are provided in Table 51. The pattern of GP involvement in the various reviews is similar to that suggested by the CHSP-PS data presented in the introduction. Before the implementation of the 2005 policy, GPs in the surveyed practices always contributed to 6-8 week child health reviews, and this has continued after implementation of the 2005 policy in all but one practice. Contribution to the 8-9 month review was also usual but involvement in the 39-42 month and, particularly, the 22-24 month reviews was less common.

Most practices indicated that they used Read codes that identified the relevant age-specific child health review when recording these contacts with children, although some used relatively non-specific (or in one instance incorrect) codes that would have resulted in the consultation being categorised as an 'other pre-school child health review' in this analysis. As well as some variation between practices in the codes used, one practice also indicated that they used a range of possible codes for each age-specific review. The surveys were generally completed by one GP from each practice so there may well have been more between-GP variation within the practices that was not captured by the survey.

Table 51 Results of practice survey enquiring about GP involvement in provision of child health reviews before and after implementation of the 2005 policy, and the Read codes assigned to the relevant consultations

Practice	Before implementation of 2005 policy								After implementation of 2005 policy		Comments
	6-8 week		8-9 month		22-24 month		39-42 month		6-8 week		
	GP*	Codes	GP*	Codes	GP*	Codes	GP*	Codes	GP*	Codes	
2	✓	9N..	✓	9N..	✓	9N..	✓	9N..	✓	9N..	Practice indicated 'some 9N..' codes used for all reviews. 9NOY and 9NOS were included as 'other pre-school child health reviews' codes so these consultations may have been picked up there
4	✓	64D	✓	64E	✓	64F	✓	64H	Intermittent. 'Duty doctor' just asked for advice by HV as required		22-24 month review picked up as 'other' review as code indicates 18 month not 2 year review. Otherwise 'before' consultations picked up as the correct reviews. 'After' 6-8 week reviews may not be recorded as a GP consultation at all.
5											No response
7	✓	64D, ZV202, ZV708, 64	✓	64E, ZV202, 64	✘		✘		✓	64D, ZV202, ZV708, 64	Picked up as either the correct reviews or as 'other' reviews
11	✓	64D	✓	64E	✘		✘		✓	64D	Picked up as the correct reviews
17											No formal response. Practice manager indicated GPs have minimal involvement in child health reviews

Practice	Before implementation of 2005 policy								After implementation of 2005 policy		Comments
	6-8 week		8-9 month		22-24 month		39-42 month		6-8 week		
	GP*	Codes	GP*	Codes	GP*	Codes	GP*	Codes	GP*	Codes	
19	✓	64D	✓	64E	✘		✓	64Y	✓	64D	Picked up as the correct reviews
22	✓	64D	✓	64E	✘		✓	64H	✓	64D	Picked up as the correct reviews
27	✓	64D	✘		✘		✘		✓	64D, 9NOY	Picked up as either the correct review or, after 2005 policy implemented, as 'other' review
30	✓	64D	✓	64E	✓	64W	✓	64Y	✓	64D	Picked up as the correct reviews

* Did the practice GPs directly provide the relevant child health review, either alone or in conjunction with HVs?

GP consultations for child health reviews before and after implementation of the 2005 policy are shown in Table 52 and Figure 27. The results of the segmented linear regression relating to child health reviews are provided in Table 53. Prior to implementation of the 2005 policy, the commonest child health review recorded as being provided (at least in part) by GPs was the 6-8 week review. GP provision of the 8-9 month review was slightly less common, with provision of the 39-42 month review less common still. Very few GP consultations were coded as 22-24 month reviews. Consultations coded as 'other' child health reviews were reasonably common: the rate for this consultation type was between that for the 39-42 and 8-9 month reviews.

Figure 27 shows that GP provision of 6-8 week reviews did not change after implementation of the 2005 policy. By contrast, there was a sudden, almost complete fall in the provision of all other child health reviews provided at specified ages (8-9, 22-24, and 39-42 months) immediately after implementation. There were almost no GP consultations coded as 22-24 month reviews after implementation despite the availability of the selective two year review during this period which should have been identified by the codes used. Consultations for 'other' child health reviews dropped slightly after implementation before increasing back to near previous levels. The results of the segmented linear regression confirm these findings. The fitted consultation rate for 6-8 week reviews shows no change at the point of implementation of the 2005 policy whereas the rates for 8-9, 22-24, and 39-42 month reviews show a highly significant fall to close to zero.

Overall, the results for the age specific reviews are as would have been expected from what was known about the 2005 policy and how it was implemented and about GP involvement in the various child health reviews. Results for 'other' child health reviews are more difficult to interpret. This category is likely to include some universally offered reviews, including 6-8 week reviews, as well as non-standard reviews offered by GPs in some practices, either routinely or on request from parents or colleagues such as HVs for particular children.

Table 52 GP consultations with children aged 0-4 years for child health reviews, all 30 practices combined, by quarter before and after implementation of the 2005 policy, numbers and quarterly rates per 1,000 children aged 0-4 years

	Quarter relative to implementation of 2005 policy																			
	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10
Number of consultations with children aged 0-4 years																				
6-8 week	209	264	275	277	307	307	264	257	254	276	273	298	283	270	287	298	287	284	249	320
8-9 month	192	241	233	231	230	261	251	252	255	240	43	1	2	0	0	1	0	0	0	0
22-24 month	5	4	9	20	6	11	12	9	5	12	1	0	0	0	1	0	0	0	0	0
39-42 month review	104	137	135	141	105	103	96	95	84	96	23	0	0	0	0	0	0	0	0	1
Other pre-school child health reviews	163	115	145	197	160	177	150	157	175	157	106	76	100	103	79	117	122	140	155	153
All child health reviews	671	759	794	864	807	859	772	770	773	780	446	375	385	367	362	411	400	417	396	468
Quarterly consultation rate per 1,000 children aged 0-4 years																				
6-8 week	20.0	25.3	26.1	26.3	28.8	28.8	24.6	23.9	23.9	26.0	25.2	27.5	26.0	24.8	25.9	26.8	25.8	25.5	22.1	28.3
8-9 month	18.4	23.1	22.2	21.9	21.6	24.5	23.4	23.4	24.0	22.6	4.0	0.1	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0
22-24 month	0.5	0.4	0.9	1.9	0.6	1.0	1.1	0.8	0.5	1.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
39-42 month review	10.0	13.1	12.8	13.4	9.8	9.7	8.9	8.8	7.9	9.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Other pre-school child health reviews	15.6	11.0	13.8	18.7	15.0	16.6	14.0	14.6	16.5	14.8	9.8	7.0	9.2	9.5	7.1	10.5	11.0	12.6	13.8	13.5
All child health reviews	64.3	72.7	75.5	82.1	75.7	80.6	71.9	71.6	72.8	73.4	41.2	34.6	35.3	33.7	32.7	37.0	35.9	37.5	35.1	41.3

Figure 27 GP consultations with children aged 0-4 years for child health reviews, all 30 practices combined, by quarter before and after implementation of the 2005 policy, quarterly rates per 1,000 children aged 0-4 years

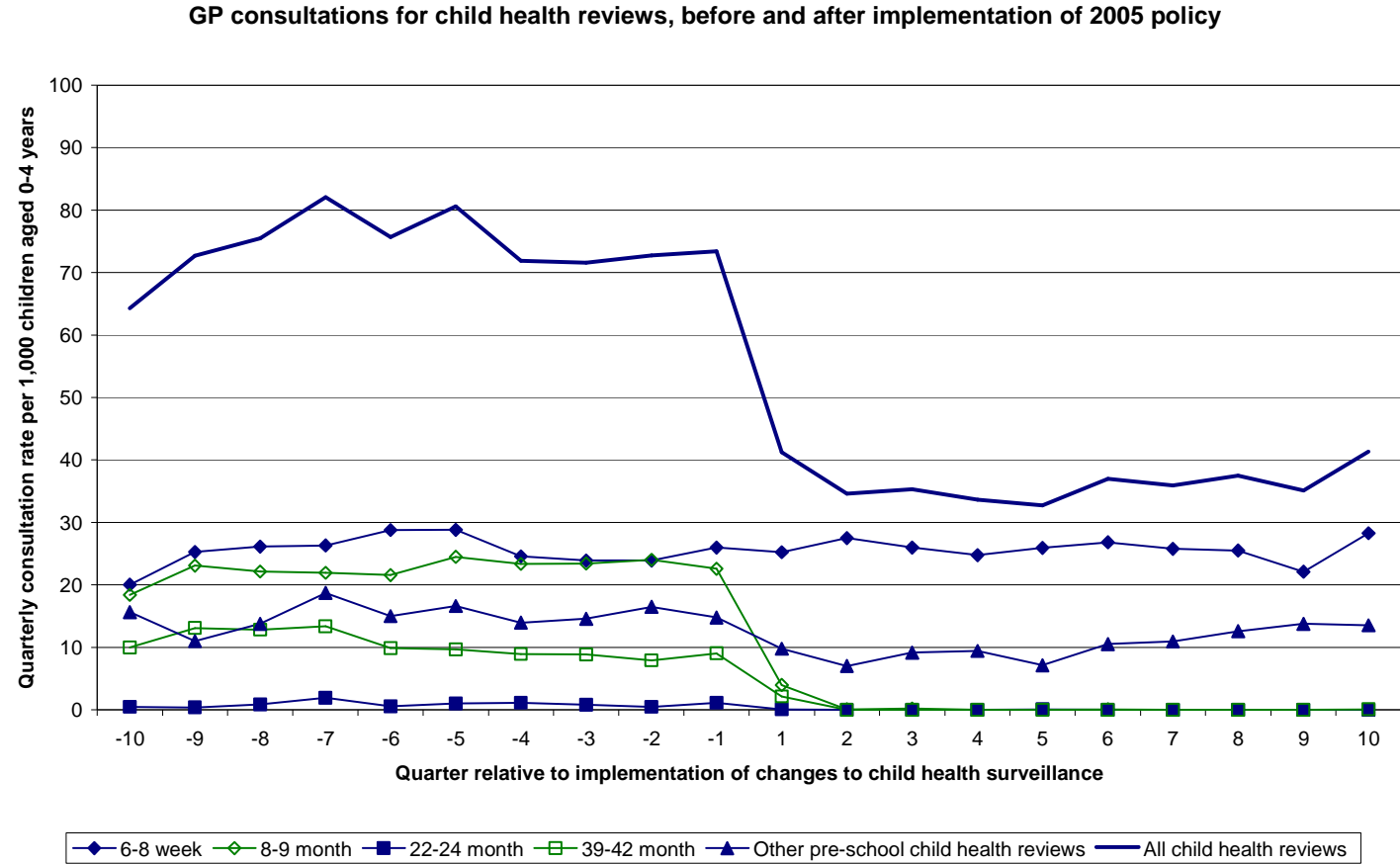


Table 53 GP consultations with children aged 0-4 years for child health reviews, all 30 practices combined: results of segmented linear regression

Parameter	Unit / interpretation	Child health reviews					
		6-8 week	8-9 month	22-24 month	39-42 month	Other pre-school child health reviews	All child health reviews
Fitted consultation rate just before implementation of 2005 policy	Quarterly consultation rate per 1,000 children aged 0-4 years	26.1	24.1	1.0	8.2	15.7	75.1
Change in fitted consultation rate at implementation		0.0	-22.4	-1.0	-7.4	-8.8	-39.5
Significant change in fitted consultation rate at implementation?	p value	0.987	<0.001	0.006	<0.001	<0.001	<0.001
Slope of fitted consultation rate over period before implementation	Incremental change in quarterly consultation rate per 1,000 children aged 0-4 years per quarter	0.17	0.35	0.03	-0.48	0.13	0.23
Difference in slope before and after implementation		-0.22	-0.58	-0.03	0.36	0.51	-0.07
Significant change in slope before and after implementation?	p value	0.540	0.010	0.540	0.054	0.093	0.923

GP consultations with children aged 0-4 years for other preventive care before and after implementation of the 2005 policy are shown in Table 54 and Figure 28. GP consultations with women aged 15-49 years for selected subcategories of other preventive care are shown in Table 56 and Figure 29. Relevant segmented linear regression results are shown in Table 55 and Table 57 respectively.

Across the study period there were consistently few GP consultations with young children recorded as being for the various types of other preventive care, with the exception of the immunisation subcategory. Most consultations that were coded to a subcategory of other preventive care were not also coded as a child health review. Trends were therefore very similar whether all other preventive care consultations, or only additional consultations not also coded as a child health review, were examined.

Consultations for immunisation steadily declined over the first part of the study period then sharply increased around six months after implementation of the 2005 policy. More detailed examination of the rates for the individual practices showed that this overall trend was driven by two practices with declining rates early in the period of study and two different practices with sharply increasing rates over the latter part of the study. The overall rate therefore seems to reflect ad hoc changes in these practices that are unrelated to implementation of the 2005 policy rather than any widespread or direct effect of the child health review changes. GP consultations coded as being for child protection reasons were consistently noticeably uncommon across the period of study.

The regression results confirm there was no significant change in the GP-child consultation rate for postnatal care; medical or developmental assessment; health promotion advice or parenting support; assessment and advice relating to child nutrition and growth; or child protection issues around the time that the 2005 policy was implemented. The regression results for consultations relating to immunisations are of questionable validity as the rates do not show a linear trend with time over the before and after periods. As the substantial majority of all 'other preventive care'

Preventive child health care provided to pre-school children by General Practitioners consultations were immunisation contacts, the regression results for all 'other preventive care' consultations are similarly problematic.

There were many more consultations for postnatal care; health promotion advice or parenting support; and assessment and advice relating to child nutrition and growth with women aged 15-49 years than with children aged 0-4 years. Despite the use of abbreviated code lists, it is difficult to tell the extent to which consultations with women would have been primarily focused on the health of young children. For example, it is unclear who would be the primary recipient of 'postnatal care' or 'breastfeeding support'. Some consultations may have been with women with older children ('parental support'), or even no children ('family counselling').

Nevertheless, no significant change in the GP-woman consultation rate for postnatal care; health promotion advice or parenting support; or assessment and advice relating to child nutrition and growth was seen around the time that the 2005 policy was implemented. This reinforces the finding from the GP-child consultation rates.

Table 54 GP consultations with children aged 0-4 years for other preventive care, all 30 practices combined, by quarter before and after implementation of the 2005 policy, numbers and quarterly rates per 1,000 children aged 0-4 years
(a) All consultations for other preventive care (whether also coded as a child health review or not)

	Quarter relative to implementation of 2005 policy																			
	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10
Number of consultations with children aged 0-4 years																				
Postnatal care	10	23	19	12	8	6	12	3	13	4	5	3	1	3	2	3	2	3	1	3
Immunisation	178	207	210	143	158	135	103	95	74	105	81	70	247	305	258	319	239	257	238	264
Medical/developmental assessment	10	16	17	17	18	13	14	11	12	21	8	10	22	33	28	52	29	44	34	43
Health advice/parenting support	9	15	10	10	18	12	9	15	18	19	19	21	27	36	43	29	24	29	38	24
Child nutrition and growth	9	4	16	46	37	51	31	48	46	48	26	22	18	25	13	19	11	16	9	19
Child protection	5	2	1	2	5	4	1	0	3	2	1	2	1	2	0	0	0	3	1	0
All other preventive care	221	267	272	227	241	217	169	170	162	195	137	123	302	395	330	408	294	340	306	342
Quarterly consultation rate per 1,000 children aged 0-4 years																				
Postnatal care	1.0	2.2	1.8	1.1	0.8	0.6	1.1	0.3	1.2	0.4	0.5	0.3	0.1	0.3	0.2	0.3	0.2	0.3	0.1	0.3
Immunisation	17.1	19.8	20.0	13.6	14.8	12.7	9.6	8.8	7.0	9.9	7.5	6.5	22.7	28.0	23.3	28.7	21.5	23.1	21.1	23.3
Medical/developmental assessment	1.0	1.5	1.6	1.6	1.7	1.2	1.3	1.0	1.1	2.0	0.7	0.9	2.0	3.0	2.5	4.7	2.6	4.0	3.0	3.8
Health advice/parenting support	0.9	1.4	1.0	0.9	1.7	1.1	0.8	1.4	1.7	1.8	1.8	1.9	2.5	3.3	3.9	2.6	2.2	2.6	3.4	2.1
Child nutrition and growth	0.9	0.4	1.5	4.4	3.5	4.8	2.9	4.5	4.3	4.5	2.4	2.0	1.7	2.3	1.2	1.7	1.0	1.4	0.8	1.7
Child protection	0.5	0.2	0.1	0.2	0.5	0.4	0.1	0.0	0.3	0.2	0.1	0.2	0.1	0.2	0.0	0.0	0.0	0.3	0.1	0.0
All other preventive care	21.2	25.6	25.9	21.6	22.6	20.4	15.7	15.8	15.3	18.3	12.7	11.4	27.7	36.2	29.8	36.7	26.4	30.6	27.2	30.2

Note that the number of consultations for each of the subcategories do not necessarily sum to the total for all types of other preventive care as consultations coded to more than one subcategory have only been counted once in the total

(b) Additional consultations for other preventive care only (i.e. not also coded as a child health review)

	Quarter relative to implementation of 2005 policy																			
	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10
Number of consultations with children aged 0-4 years																				
Postnatal care	10	23	19	12	8	6	12	3	13	4	5	3	1	3	2	3	2	3	1	3
Immunisation	153	202	196	132	123	120	91	86	63	94	77	65	230	295	247	298	220	246	225	254
Medical/developmental assessment	10	14	17	17	15	13	14	10	11	21	8	10	11	20	17	24	11	26	14	14
Health advice/parenting support	9	15	10	10	18	10	9	15	18	18	19	20	27	36	43	29	23	28	38	24
Child nutrition and growth	9	4	8	9	11	11	7	9	14	16	11	11	7	12	6	16	10	12	7	12
Child protection	4	2	1	0	3	4	1	0	3	2	1	2	1	2	0	0	0	3	1	0
All other preventive care	195	260	250	180	178	162	134	123	121	154	119	107	270	363	305	363	261	312	281	301
Quarterly consultation rate per 1,000 children aged 0-4 years																				
Postnatal care	1.0	2.2	1.8	1.1	0.8	0.6	1.1	0.3	1.2	0.4	0.5	0.3	0.1	0.3	0.2	0.3	0.2	0.3	0.1	0.3
Immunisation	14.7	19.3	18.6	12.5	11.5	11.3	8.5	8.0	5.9	8.8	7.1	6.0	21.1	27.1	22.3	26.8	19.8	22.1	20.0	22.4
Medical/developmental assessment	1.0	1.3	1.6	1.6	1.4	1.2	1.3	0.9	1.0	2.0	0.7	0.9	1.0	1.8	1.5	2.2	1.0	2.3	1.2	1.2
Health advice/parenting support	0.9	1.4	1.0	0.9	1.7	0.9	0.8	1.4	1.7	1.7	1.8	1.8	2.5	3.3	3.9	2.6	2.1	2.5	3.4	2.1
Child nutrition and growth	0.9	0.4	0.8	0.9	1.0	1.0	0.7	0.8	1.3	1.5	1.0	1.0	0.6	1.1	0.5	1.4	0.9	1.1	0.6	1.1
Child protection	0.4	0.2	0.1	0.0	0.3	0.4	0.1	0.0	0.3	0.2	0.1	0.2	0.1	0.2	0.0	0.0	0.0	0.3	0.1	0.0
All other preventive care	18.7	24.9	23.8	17.1	16.7	15.2	12.5	11.4	11.4	14.5	11.0	9.9	24.8	33.3	27.6	32.7	23.4	28.0	24.9	26.6

Note that the number of consultations for each of the subcategories do not necessarily sum to the total for all types of other preventive care as consultations coded to more than one subcategory have only been counted once in the total

Figure 28 Additional (non child health review) GP consultations with children aged 0-4 years for other preventive care, all 30 practices combined, by quarter before and after implementation of the 2005 policy, quarterly rates per 1,000 children aged 0-4 years

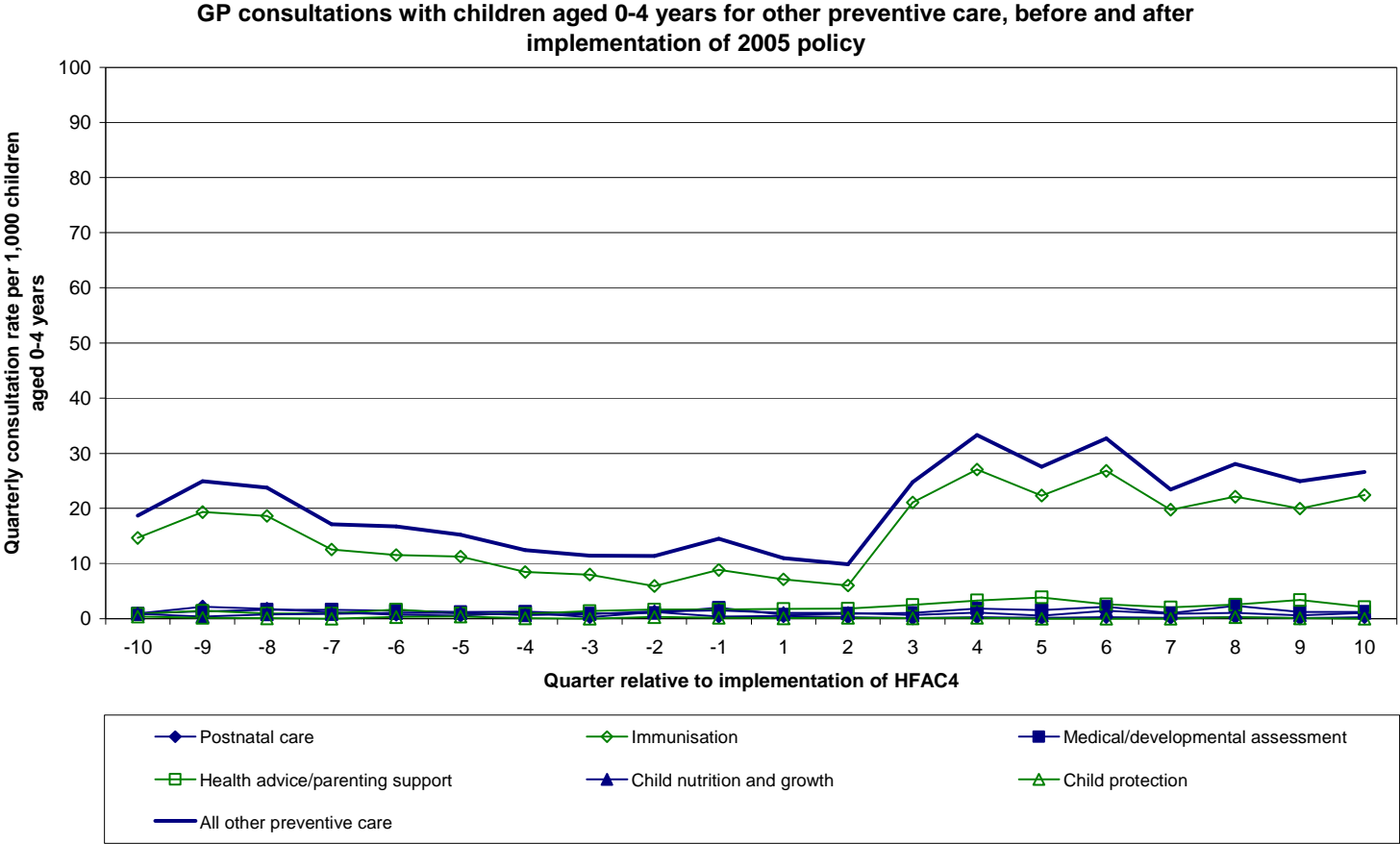


Table 55 GP consultations with children aged 0-4 years for other preventive care, all 30 practices combined: results of segmented linear regression

Parameter	Unit / interpretation	Other preventive care						
		Postnatal care	<i>Immunisation</i>	Medical/ developmental assessment	Health advice/ parenting support	Child nutrition and growth	Child protection	<i>All other preventive care</i>
Fitted consultation rate just before implementation of 2005 policy	Quarterly consultation rate per 1,000 children aged 0-4 years	0.5	6.1	1.4	1.5	1.3	0.2	10.9
Change in fitted consultation rate at implementation		-0.2	5.9	-0.4	0.8	-0.3	0.0	5.4
Significant change in fitted consultation rate at implementation?	p value	0.596	0.191	0.355	0.159	0.211	0.823	0.283
Slope of fitted consultation rate over period before implementation	Incremental change in quarterly consultation rate per 1,000 children aged 0-4 years per quarter	-0.12	-1.29	0.02	0.06	0.07	-0.01	-1.27
Difference in slope before and after implementation		0.11	2.64	0.05	-0.01	-0.07	0.00	2.71
Significant change in slope before and after implementation?	p value	0.084	0.003	0.452	0.933	0.101	0.986	0.005

Results for immunisation and all other preventive care consultations are in italics as consultations for these reasons did not show a clear linear trend over time or a change at implementation of the 2005 policy hence the results are of questionable validity

Table 56 GP consultations with women aged 15-49 years for selected subcategories of other preventive care, all 30 practices combined, by quarter before and after implementation of the 2005 policy, numbers and quarterly rates per 1,000 women aged 15-49 years

	Quarter relative to implementation of 2005 policy																			
	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10
Number of consultations with women aged 15-49 years																				
Postnatal care	505	542	536	542	534	494	471	419	410	409	384	399	398	407	433	433	420	442	399	464
Health advice/parenting support	134	133	113	126	125	95	109	126	142	111	103	102	157	165	117	138	139	170	143	123
Child nutrition and growth	94	113	105	134	131	82	114	114	90	139	145	117	156	163	149	155	174	156	156	196
Quarterly consultation rate per 1,000 women aged 15-49 years																				
Postnatal care	10.9	11.6	11.5	11.6	11.3	10.4	9.9	8.8	8.8	8.7	8.1	8.4	8.4	8.6	9.1	9.1	8.9	9.3	8.4	9.8
Health advice/parenting support	2.9	2.9	2.4	2.7	2.6	2.0	2.3	2.6	3.0	2.4	2.2	2.2	3.3	3.5	2.5	2.9	2.9	3.6	3.0	2.6
Child nutrition and growth	2.0	2.4	2.2	2.9	2.8	1.7	2.4	2.4	1.9	3.0	3.1	2.5	3.3	3.4	3.1	3.3	3.7	3.3	3.3	4.1

Figure 29 GP consultations with women aged 15-49 years for selected subcategories of other preventive care, all 30 practices combined, by quarter before and after implementation of the 2005 policy, quarterly rates per 1,000 women aged 15-49 years

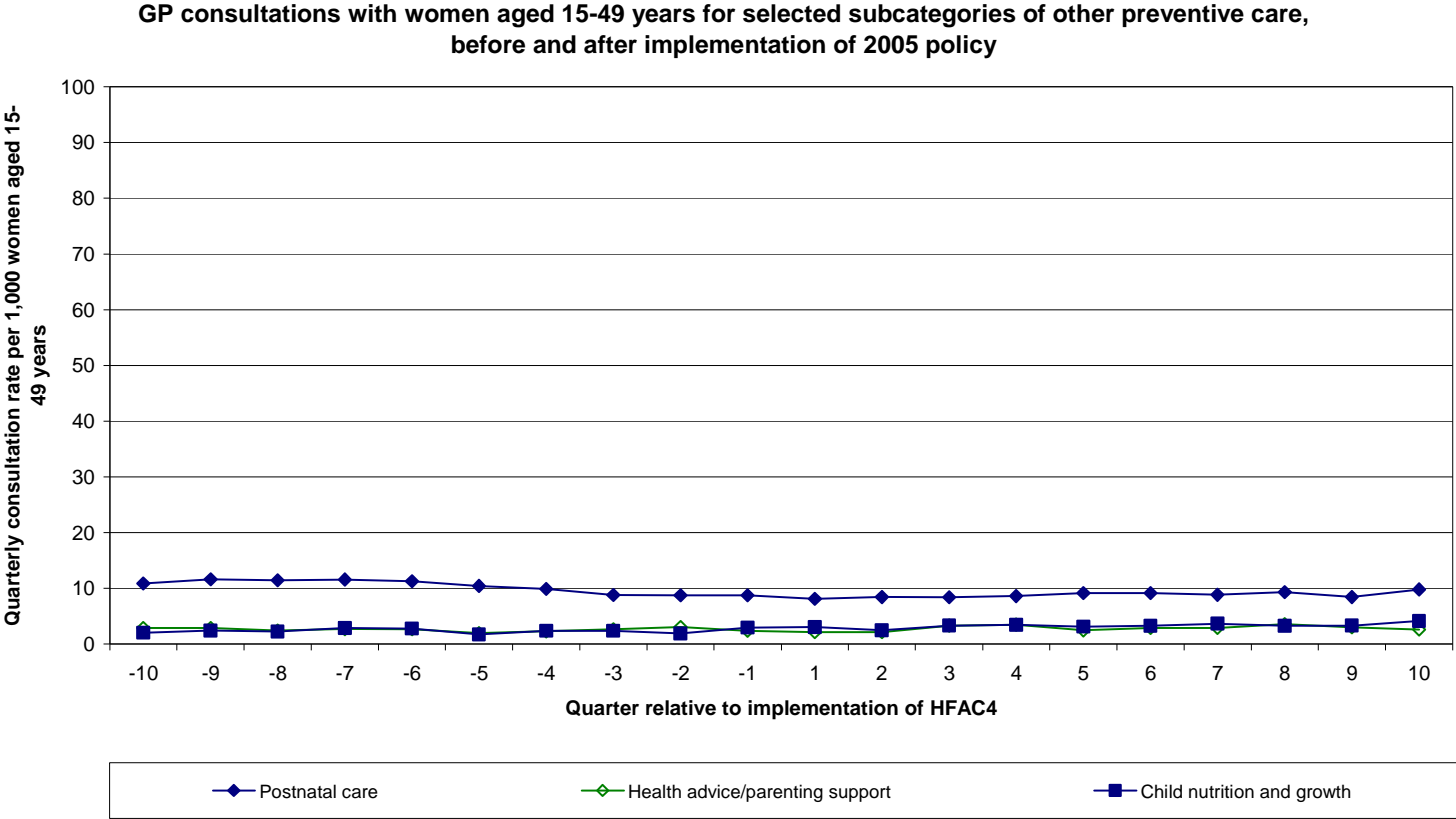


Table 57 GP consultations with women aged 15-49 years for selected subcategories of other preventive care, all 30 practices combined: results of segmented linear regression

Parameter	Unit / interpretation	Other preventive care		
		Postnatal care	Health advice/ parenting support	Child nutrition and growth
Fitted consultation rate just before implementation of 2005 policy	Quarterly consultation rate per 1,000 women aged 15-49 years	8.8	2.5	2.5
Change in fitted consultation rate at implementation		-0.6	0.1	0.3
Significant change in fitted consultation rate at implementation?	p value	0.209	0.870	0.380
Slope of fitted consultation rate over period before implementation	Incremental change in quarterly consultation rate per 1,000 women aged 15-49 years per quarter	-0.35	-0.02	0.02
Difference in slope before and after implementation		0.48	0.08	0.08
Significant change in slope before and after implementation?	p value	<0.001	0.219	0.208

The proportion of all GP consultations with children aged 0-4 years accounted for by child health reviews and additional consultations involving other preventive care before and after implementation of the 2005 policy is shown in Table 58 and Figure 30: related segmented regression results are shown in Table 59. The GP consultation rate with pre-school children for other, non-preventive care reasons, and the overall consultation rate were relatively constant over the period of study, with some periodicity evident which probably reflects seasonal trends in GP attendance (McConnachie et al. 2004). The seasonality effect is unlikely to have affected the regression results for these consultation types as there are numerous data points before and after the change point.

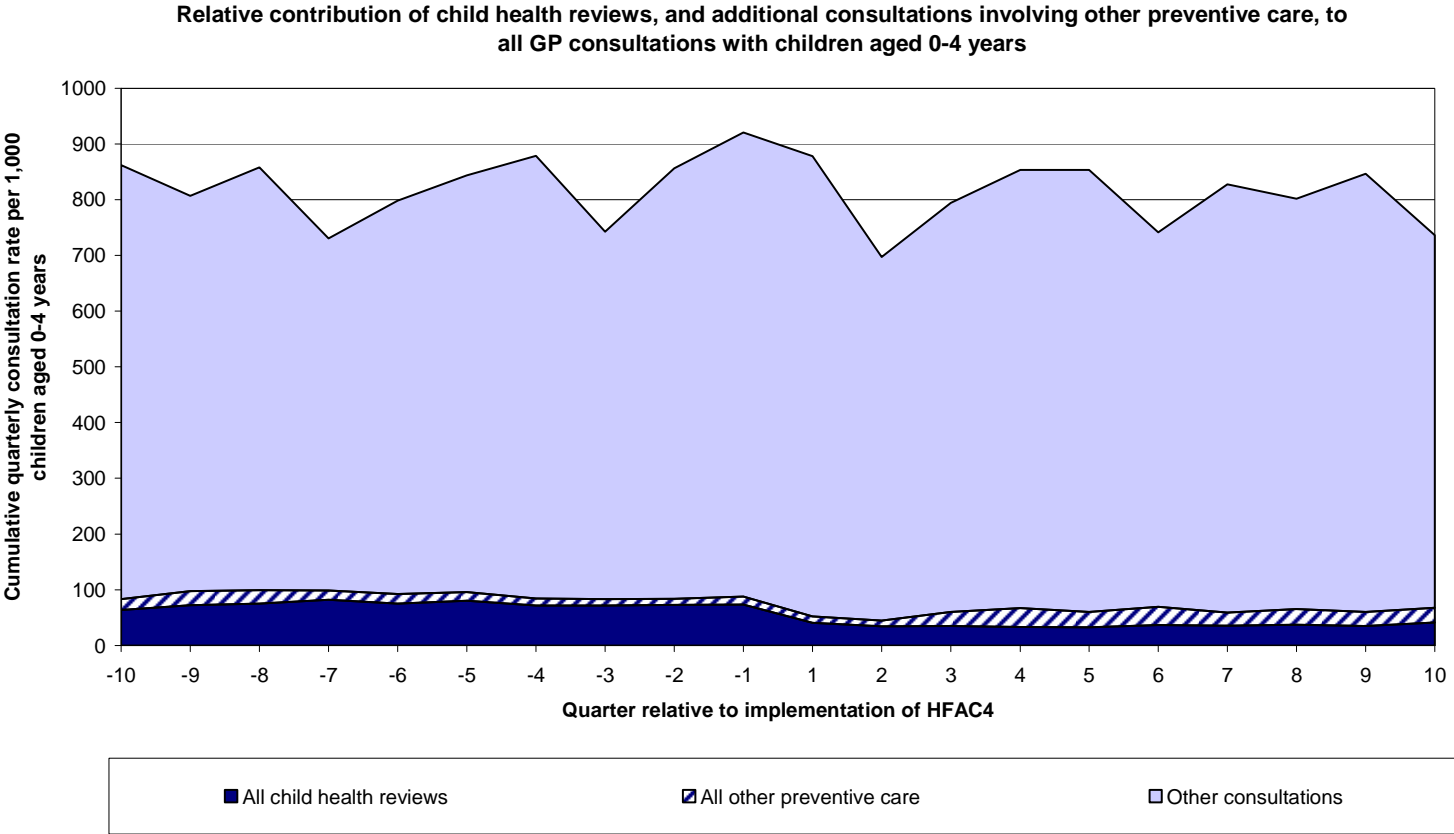
Child health reviews and, in particular, additional consultations coded as other types of preventive care, form a small proportion of all GP consultations with children aged 0-4 years. In the 2½ years before and after implementation of the 2005 policy, all preventive consultations combined accounted for around 10.9% (9,606 / 87,938) and 7.6% (6,709 / 88,698) respectively of all consultations with this age group, with the decline due to reductions in GP provision of child health reviews.

Table 58 All GP consultations with children aged 0-4 years by type of consultation, all 30 practices combined, by quarter before and after implementation of the 2005 policy, numbers and quarterly rates per 1,000 children aged 0-4 years

	Quarter relative to implementation of 2005 policy																			
	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10
Number of consultations with children aged 0-4 years																				
All child health reviews	671	759	794	864	807	859	772	770	773	780	446	375	385	367	362	411	400	417	396	468
All other preventive care	195	260	250	180	178	162	134	123	121	154	119	107	270	363	305	363	261	312	281	301
Other consultations	8128	7404	7981	6648	7525	7969	8528	7094	8200	8855	8935	7069	8003	8574	8778	7462	8550	8189	8860	7569
All consultations	8994	8423	9025	7692	8510	8990	9434	7987	9094	9789	9500	7551	8658	9304	9445	8236	9211	8918	9537	8338
Quarterly consultation rate per 1,000 children aged 0-4 years																				
All child health reviews	64.3	72.7	75.5	82.1	75.7	80.6	71.9	71.6	72.8	73.4	41.2	34.6	35.3	33.7	32.7	37.0	35.9	37.5	35.1	41.3
All other preventive care	18.7	24.9	23.8	17.1	16.7	15.2	12.5	11.4	11.4	14.5	11.0	9.9	24.8	33.3	27.6	32.7	23.4	28.0	24.9	26.6
Other consultations	779.1	709.2	758.8	631.4	705.9	747.9	794.0	659.7	772.1	833.2	825.8	652.6	734.5	786.8	793.5	671.5	768.1	735.9	786.3	668.7
All consultations	862.1	806.8	858.1	730.6	798.3	843.7	878.3	742.7	856.3	921.1	878.1	697.1	794.6	853.8	853.8	741.2	827.5	801.4	846.4	736.7

All other preventive care consultations are those not also coded as a child health review

Figure 30 Relative contribution of child health reviews and additional consultations involving other preventive care to all GP consultations with children aged 0-4 years, all 30 practices combined, by quarter before and after implementation of the 2005 policy, rates per 1,000 children aged 0-4 years



All other preventive care consultations are those not also coded as a child health review

Table 59 All GP consultations with children aged 0-4 years, all 30 practices combined: results of segmented linear regression

Parameter	Unit / interpretation	Consultation type			
		All child health reviews	<i>All other preventive care</i>	Other consultations	All consultations
Fitted consultation rate just before implementation of 2005 policy	Quarterly consultation rate per 1,000 children aged 0-4 years	75.1	<i>10.9</i>	765.4	851.3
Change in fitted consultation rate at implementation		-39.5	<i>5.4</i>	-1.3	-35.5
Significant change in fitted consultation rate at implementation?	p value	<0.001	<i>0.283</i>	0.981	0.539
Slope of fitted consultation rate over period before implementation	Incremental change in quarterly consultation rate per 1,000 children aged 0-4 years per quarter	0.23	<i>-1.27</i>	5.83	4.79
Difference in slope before and after implementation		-0.07	<i>2.71</i>	-9.76	-7.12
Significant change in slope before and after implementation?	p value	0.923	<i>0.005</i>	0.335	0.476

Results for all other preventive care consultations are in italics as consultations for these reasons did not show a clear linear trend over time or a change at implementation of the 2005 policy hence the results are of questionable validity

Routinely available information on the quality of the PTI data submitted by the included practices over the study period is provided in Table 60 for background. The approach to assessing PTI data quality is rather complex and has changed over time (see <http://www.isdscotland.org/Health-Topics/General-Practice/PTI-Statistics/How-is-the-information-collected.asp>). In the 2004-2006 and 2008-2010 quality assurance cycles, the completeness of recording of all face to face patient contacts with GPs and practice nurses was assessed by comparing the number of consultations for a particular week returned via PTI to the number recorded on the practices' information system. Completeness rates of over 100% in the latter cycle were due to some newer practice information systems returning telephone consultations to PTI as 'face to face' contacts. In the 2004-2006 cycle, the accuracy of consultation coding was assessed by PTI staff manually checking all morbidity Read codes assigned to GP consultations for a particular week against the locally held clinical notes. As practices increasingly moved over to full electronic patient records, with PTI returns being a direct extract of these, this approach became less relevant. During the 2008-2010 cycle, accuracy of recording was therefore assessed by determining how well a practice's PTI returns reflected aspects of the PTI coding guidelines, for example every GP contact to have a valid morbidity code included and every practice nurse contact to have a valid activity code included.

Table 60 shows that completeness is high (>90%) for the substantial majority of practices at both time points (37/45, 82%). The accuracy of recording the underlying morbidity that necessitated GP consultations was also reasonably high (>80%) for the majority of practices during 2004-2006 (14/15). The meaning of the 'accuracy' figures for 2008-2010 is less clear. Again, the majority of practices (6/8) received a reasonably high score (>80%), but few practices were assessed during this assurance cycle and 'accuracy' only actually reflects completeness of coding and its face validity rather than any detailed comparison against a gold standard.

Table 60 Routinely available information on the quality of PTI data submitted by included practices

Practice	2004-2006 quality assurance cycle		2008-2010 quality assurance cycle	
	% completeness (GPs and PNs)	% accuracy of morbidity coding (GPs only)	% completeness (GPs and PNs)	% congruence with PTI coding guidance (GPs and PNs)
1	99	100	98	53
2	90	97	100	86
3	-	-	86	-
4	-	-	102	-
5	96	95	97	-
6	-	-	93	-
7	99	85	93	91
8	-	-	92	-
9	-	-	102	-
10	94	88	89	89
11	98	88	100	-
12	95	92	98	-
13	-	-	71	-
14	98	94	96	-
15	86	66	56	66
16	99	86	100	94
17	99	97	99	-
18	-	-	103	94
19	-	-	97	-
20	-	-	89	-
21	100	85	71	-
22	-	-	100	-
23	98	91	97	-
24	-	-	94	-
25	-	-	100	-
26	-	-	91	-
27	-	-	96	-
28	-	-	74	88
29	101	89	95	-
30	94	81	96	-

The PTI quality assurance process has changed over time – see text for description
 Not all practices are included in each cycle of data quality assurance

8.3. Discussion

8.3.1. Summary

This chapter reports an analysis of routinely available GP consultation (PTI) data that explores GP provision of child health reviews and other preventive care within the context of all consultations with pre-school children (Wood, Wilson 2012). Periods before and after implementation of the 2005 CHP policy that changed the number of child health reviews offered to children are examined.

The findings show that, prior to implementation of the 2005 policy, GPs made a substantial contribution to the provision of child health reviews, particularly those offered at 6-8 weeks, 8-9 months, and, to a lesser extent, 39-42 months of age. Following implementation, GPs have continued their involvement in the 6-8 week review but provision of the other reviews has essentially ceased. This finding is broadly in line with what was known about how the 2005 policy was implemented and with information on GP involvement in review provision that is available from the CHSP-PS system.

Since implementation of the 2005 policy, the PTI data suggest that GPs have had minimal involvement in provision of the selective 24 month review. CHSP-PS cannot provide any corroborating information on this as the system does not record GP involvement in this review. As shown in Chapter 6, however, CHSP-PS data show that HVs have provided this selective review to around 25% of children. Lack of GP input into the 24 month review is perhaps not surprising as GPs historically had little involvement with the universally offered 22-24 month review, but it does suggest that since 2005 GPs have had minimal input into proactively assessing children's development after early infancy. The extent to which GPs will be involved in provision of the forthcoming universal 24-30 month review is yet to be seen.

Despite extensive code lists, relatively few additional (non-child health review) GP consultations with pre-school children for other aspects of preventive care, apart from immunisation, were identified. Consultations coded as involving child maltreatment or child protection processes were noticeably rare, particularly in light of evidence that unhelpful parenting, neglect, and abuse are common and have serious implications for children's outcomes (Gilbert et al. 2012, Gilbert et al. 2009, Daniel, Burgess & Scott 2012). Changes over time in the number of GP consultations involving childhood immunisations appear to reflect occasional changes in GP provision of routine immunisations in individual practices rather than any direct effect of the changes to the programme of child health reviews on GP involvement in this aspect of children's care. Implementation of the 2005 policy therefore appears to have had no impact on GP provision of consultations including these wider aspects of preventive child health care. In particular, there is no evidence that withdrawal of 'routine' child health reviews has led to an increase in the number of non-child health review consultations for pre-school children that are focused on preventive care.

Overall, child health reviews and other consultations focusing on aspects of preventive care account for a low proportion of all GP consultations with young children. This proportion has decreased from around 11% to around 8% since implementation of the 2005 policy, with the decline being due to the cessation of previously provided child health reviews.

8.3.2. Strengths and limitations

8.3.2.1. Sample included in the analysis

This analysis used PTI data from 30 practices from across 10 NHS Board areas that together served over 11,000 children aged 0-4 years. The populations served by the practices were similar to that of Scotland as a whole in terms of age structure and broad urban/rural/remote status although inner city and very remote rural areas were relatively underrepresented. The populations served by the 30 practices were slightly more deprived than the general population. Children from deprived areas are less

likely to receive their child health reviews (see Chapter 6) hence the results may slightly underestimate the proportion of all GP consultations with young children that are focused on preventive care within Scotland as a whole, but any such effect is likely to be small. Calculating consultation rates standardised for deprivation may have been useful in terms of providing 'all-Scotland' estimated rates but this would have required considerable additional work, including PTI data re-extraction, as I was only provided with overall monthly counts of consultations for each reason and practice, rather than individual level data including deprivation status, in order to minimise privacy/confidentiality issues. Standardisation may also have been of questionable validity due to the very small number of consultations for some reasons in the whole sample, let alone in specific deprivation groups.

The 30 practices included in this analysis represent around half the number that contribute to the PTI system at any one time. This restriction was necessary to ensure that only practices with complete data available for the whole period of study were included. A relatively long period of 2½ years before and after implementation of the 2005 policy was examined for each practice. This allowed the background stability of consultation rates to be assessed, and increased the confidence with which any changes occurring around the time the 2005 policy was implemented could be attributed to the policy.

8.3.2.2. Consultation types included in the analysis and data quality

Care was taken to consider both child health reviews and a wide range of other preventive care that GPs may be involved in providing to young children. The Read code lists drawn up to identify the various types of care were extensive and robustly developed. The PTI system is long established and subject to ongoing data quality assurance (see <http://www.isdscotland.org/Health-Topics/General-Practice/PTI-Statistics/How-is-the-information-collected.asp>) however the likelihood that the data examined would capture the types of preventive care being considered warrants discussion.

The information available on the quality of PTI data from the survey of practices and routine data quality assurance cycles suggest that in general GP consultations with young children, including GP provided child health reviews, are very likely to be captured as GP consultations through the PTI system. PTI practices are asked to code all the clinical findings/activity relevant to each consultation as precisely as possible using as many Read codes as necessary and all codes were included in the analysis. Three main questions therefore arise: would GPs intend to record/code delivery of the types of preventive care included in the analysis and, if so, would the correct codes have been used, and were these codes included in the code lists used for this analysis.

The way in which Read codes are assigned to consultations has changed over time. Early in the period of study it is likely that at least some practices operated a system in which GPs maintained paper based clinical notes during consultations then either the GP or specialist administrative staff subsequently assigned Read codes to the consultations based on what was recorded in the notes. Over time, almost all practices have become 'paperless', i.e. they maintain only electronic patient notes. Under this system, all relevant details, including Read codes, are entered by the GP directly into a patient's electronic record within the practice information system during or immediately after a consultation. Despite these changes over time in how Read codes are assigned to consultations, it is likely that GPs have consistently recorded in patient notes whatever is considered necessary for safe and effective care hence not all aspects of consultations will necessarily be recorded. It is likely that some opportunistic health promotion advice will not be recorded/coded and therefore will not have been picked up in this analysis. By contrast, if preventive care, such as provision of infant feeding advice, undertaking a developmental assessment, discussion of parenting difficulties, etc is the major focus of a consultation, this is likely to be recorded. Delivery of specific interventions, in this analysis particularly immunisations, is likely to be recorded as an essential part of adequate record keeping.

The results of the practice survey suggest that consultations that entail delivery of child health reviews are likely to be recorded as such, and the codes used are usually correct, although sometimes use of non-age specific codes mean that identifying the number of particular age specific reviews can be problematic. Information available through PTI data quality assurance processes suggests that Read codes used to record the morbidity that necessitated a GP consultation are correct reasonably often in most practices, although by no means perfect, however these data cannot inform how often delivery of the various other types of preventive care is correctly recorded/coded.

There were particularly few consultations identified as being for child protection reasons in this analysis. A recent study has reported on the recording of child maltreatment concerns within general practice (Woodman et al. 2012a). This study developed a comprehensive list of Read codes that may indicate child maltreatment based on Read browser searching, existing guidance from the Royal College of General Practitioners (Royal College of General Practitioners 2011), and advice from specialist GPs. The proportion of children registered with 11 purposively chosen practices with particular expertise in child protection or clinical coding and, separately, with 442 practices that routinely contribute data to The Health Improvement Network (THIN) that had received the various putative codes was then assessed. Despite the very extensive code lists, the proportion of children who had received the codes was much lower than would be expected based on known social work referral rates, which are themselves a substantial underestimation of the total number of children experiencing maltreatment. A high degree of variability between practices in use of the different codes was noted, with many GPs from the 11 practices indicating reluctance to use specific codes for this particular problem due to legal and confidentiality concerns. A further study by the same authors has suggested that recording of child maltreatment concerns within GP records has improved over recent years, although by no means to levels that reflect the prevalence of maltreatment in the child population (Woodman et al. 2012b).

To improve the completeness and consistency of recording of child maltreatment concerns within GP records, the authors of the above studies have recommended

that, whenever child maltreatment is suspected, a child's record should be flagged with Read code 13. If 'child is cause for concern' with more specific codes then used to indicate the nature of the concern and child protection procedures that are ongoing (Woodman et al. 2012a). This advice is reflected in coding advice recently issued to Scottish GPs through the Scottish Clinical Information Management in Practice (SCIMP) programme (see <http://www.scimp.scot.nhs.uk/clinical-coding/child-protection-codes-v1-0-june-2012>). The 'child is cause for concern' code was included in the Read code lists developed for this analysis, but clearly the more recent coding advice was not available to GPs during the time period covered by this study. On balance it seems that the Read codes used in this analysis to capture GP involvement in detection and management of child maltreatment were broadly reasonable but that much of this GP activity goes uncoded and hence was not detected.

Overall, it is reasonable to assume that the PTI data used provide an adequate reflection of trends in GP-provided child health reviews and of additional consultations that had provision of the other types of preventive care (apart from child protection) as a major focus. The abrupt changes seen around the time the 2005 policy was implemented in consultations recorded as entailing delivery of the various age specific reviews are congruent with what would have been expected, increasing confidence in the findings. Similarly, the complete absence of any abrupt change in additional consultations involving other preventive care, and also examining consultations with women of childbearing age, increases confidence in the findings relating to other preventive care (Mark, Henry & Julnes 2000). I am unaware of any Scotland-wide issues that may have influenced GP provision of preventive child health care around the time the 2005 policy was implemented. The 2003 GP contract was implemented in April 2004 hence was in force for the majority of the time period studied.

8.3.2.3. Wider limitations

As this analysis focused on overall consultation rates for various reasons, no comment can be made on whether the characteristics of children receiving the

consultations changed over time. No change in the overall consultation rate for a particular reason may mask sub-changes such as a shift towards fewer patients consulting more often and/or towards more patients from deprived areas (and commensurately fewer from affluent areas) consulting for the reason of interest. As one of the key goals of the 2005 policy was to focus CHP support more intently on children most in need, these possible sub-changes are of interest and would merit further investigation. This would require individual level data rather than the aggregate counts of consultations that were used for this analysis.

A significant limitation of this analysis is that it can only comment on how GP delivery of preventive care to young children changed after implementation of the 2005 policy. Preventive health care provided by GPs is only one element of the complex system of services that aims to protect and promote young children's health and development. As discussed in the introduction, it would have been preferable to also examine how the 2005 policy influenced the overall amount, nature, and distribution of preventive care provided to young children by Health Visitors but this was not possible using routinely available data. Some local areas are starting to use electronic HV case record systems which may in time make more detailed analysis of HV activity, and hence a more complete assessment of the preventive care provided to young children, feasible.

It would also be of interest to explore whether or how changes in the preventive care provided to young children by HVs and GPs since 2005 have influenced provision of other follow on services. Exploring patterns of key services such as speech and language therapy referrals, community paediatrics developmental assessments, parenting support programme attendances, etc would help to assess whether the changes to the CHP have succeeded in enhancing early delivery of evidence based interventions to children at greatest risk without compromising other goals such as prompt detection of particular developmental problems.

The ultimate goal of the 2005 policy was to secure more positive and equitable health and developmental outcomes for children. The analysis presented in this

chapter did not examine children's outcomes. As discussed previously, routine data to assess key outcomes, in particular those relating to family functioning and child development, are currently largely lacking, but a wider assessment of the impact of the changes to the Child Health Programme on children's outcomes would be very valuable. It may be possible to use PTI data to examine trends in the number and age profile of children suspected of or identified as having particular developmental problems, for example delay in language development, although direct referrals from HVs to relevant professionals such as speech and language therapists that bypass GPs may make the data hard to interpret.

8.3.3. Previous relevant work

8.3.3.1. Previous estimates of GP consultation rates among young children

The analysis presented in this chapter suggests an overall GP consultation rate for children aged 0-4 years during the period 2003 to 2009 of around 800 per 1,000 population per quarter, or around 3.2 per child per year. As would be expected, this is very similar to the estimated all Scotland GP consultation rates based on PTI data that are routinely published by ISD. The most recent publication estimated the overall GP consultation rates for children aged 0-4 years as 3.3 per year for boys and 3.1 for girls, with no trend in overall consultation rates for this age group evident over the period 2003/04 to 2010/11 (Information Services Division 2011b).

The NHS Information Centre has published estimated primary care consultation rates for the population of England (Hippisley-Cox, Vinogradova 2009). In 2008/09 the mean GP consultation rate per child aged 0-4 years was estimated as 4.7 per year for boys and 4.3 for girls. These figures are based on data extracted from 496 practices and submitted to the QResearch database hosted by the University of Nottingham (see <http://www.qresearch.org/SitePages/Home.aspx>) and include telephone as well as face to face contacts which may in part explain why the rates are higher than the PTI rates.

Estimated consultation rates based on data held in the General Practice Research Database (GPRD) (Walley, Mantgani 1997) have also been published. An analysis of data extracted from 226 General Practices from across the UK estimated that in 1998, the overall consultation rate per child aged 0-4 years was 6.1 per year for boys and 5.8 for girls, with no evidence of a trend over the period 1992 to 1998 (Rowlands, Moser 2002). This study included consultations with GPs and nurses and also included telephone as well as face to face consultations. Again, these methodological differences are likely to at least partly explain the higher rates found in this study but other reasons such as a decline in consultation rates between the time periods studied, lower consultation rates in Scotland compared to England, or systematic differences in data quality cannot be ruled out (Hollowell 1997).

As all automated GP data extraction databases such as PTI, QResearch, and the GPRD (now Clinical Practice Research Datalink, see <http://www.cprd.com/intro.asp>) collect data from volunteer practices, results are sensitive to how closely representative of all practices the contributing practices are (Majeed 2004). In general, all the studies reported here show a similar age/sex pattern in overall GP consultation rates, i.e. highest consultation rates in young children and older adults, and consultation rates higher in females than males in all age groups except young children, and this consistency increases confidence in their reliability.

Only one previous study that attempted to quantify the proportion of GP consultations with young children that were for preventive care could be found in the published literature (Saxena, Majeed & Jones 1999). This study was based on the fourth national survey of morbidity in general practice. The survey was conducted between September 1991 and August 1992 and involved extraction of consultation data from 60 volunteer practices from across England and Wales supplemented by interviews of all registered patients to obtain additional socio-demographic details (McCormick, Fleming & Charlton 1995). The study found that the overall mean GP consultation rate (in person and by telephone) was 6.1 per year for children aged 0-4 years and around 2.4 for children aged 5-15 years. Consultation rates for illness and home visits were higher for children (0-15 years combined) in the more deprived

groups. Consultations for preventive care accounted for 11% of all consultations with children aged 0-15 years and, in contrast to consultations for illness and home visits, showed a non-significant inverse trend with deprivation. Consultations for preventive care were defined as those involving ‘immunisations, screening, and surveillance’: further details were not provided. This study is based on an earlier time period than the analysis presented in this chapter. In addition it involved a wider age range of children, and probably a narrower definition of ‘preventive care’. Despite these differences, the estimated proportion of GP consultations that were focused on preventive care was similar to that found for the pre-2005 policy period in my analysis.

There are a number of UK quantitative studies (many now rather dated) looking at factors associated with higher than average GP consultation rates in early childhood (McConnachie et al. 2004, Carr-Hill, Rice & Roland 1996, Fleming, Charlton 1998, Leach 1993). Exact findings vary between studies but factors such as deprivation, ethnicity, proximity to a practice, method of infant feeding, maternal age, family composition, and maternal mental health have all been found to influence consultation rates. Other qualitative studies have explored in more detail the factors that trigger mothers to take their children to a GP when they are unwell (Osman, Dunt 1995, Hewison, Wyke 1990). Regarding accessing preventive care from GPs, a number of studies have explored parental decision making around bringing their children for immunisations (Sturm, Mays & Zimet 2005, Smith, Yarwood & Salisbury 2007, Samad et al. 2006, Smailbegovic, Laing & Bedford 2003, Bond et al. 1998), but there is little or no information in the literature on how parents view wider aspects of preventive child health care provided by GPs, or on what may influence them to access such preventive care from GPs.

8.3.3.2. GP involvement in preventive child health care

As discussed in Section 4.1, in the UK, delivery of preventive child health care was historically quite separate from delivery of general primary care to children. The ‘tripartite’ system of child health care, with, broadly speaking, GPs providing therapeutic primary care for children with minor or common illnesses from practices,

Preventive child health care provided to pre-school children by General Practitioners consultant paediatricians providing specialist therapeutic care for children with more serious or rare conditions from hospitals, and Health Visitors and community child health doctors providing preventive care from child health clinics persisted well after the formation of the NHS. Over time, many commentators and organisations, including the Royal College of General Practitioners, have argued that the distinction between preventive and therapeutic primary care for children was unhelpful and that preventive care should be integrated within general practice, but such integration was slow to come about (Court 1976a, Butler 1989a, Royal College of General Practitioners 1982, Harnden, Sheikh 2002).

The 1990 GP contract was instrumental in encouraging GPs to work with practice-attached HVs to deliver Child Health Surveillance to all registered children and to place greater emphasis on delivery of other aspects of preventive child health care such as immunisation (Secretaries of State for Health, Wales, Northern Ireland, and Scotland 1989, Department of Health and Social Security 1990a). By contrast, the most recent 2003 GP contract has been repeatedly criticised for providing relatively weak incentives for GPs to focus on child health care in general and preventive child health care in particular (Wood 2009, Marks et al. 2011, Lewis, Lenehan 2012, Gill et al. 2012). Furthermore, the recently dominant model of HVs being attached to practices is being changed or challenged in a number of areas, with many HVs going back to working from community clinics and serving all children living in defined geographical areas rather than those registered with particular general practices. Within Scotland, this is currently being seen mainly in Highland (see http://highlandlife.net/planning_for_integration), but it is also common across England as increasing numbers of HVs work from Sure Start centres rather than practices (Eisenstadt 2011, Department of Health 2011a). The impact of this re-separation of GP and HV services on GP engagement with preventive child health care is unknown.

It is known that historically many GPs have had limited or no formal training in paediatrics and child health issues before becoming independent practitioners, and hence have relied on ‘on the job learning’, although training requirements may

increase in the future (Kennedy 2010, Lewis, Lenehan 2012, Royal College of General Practitioners 2010). Studies have noted a degree of ambivalence amongst at least some GPs around their role in delivering preventive health care in general and preventive child health care in particular. A King's Fund review of GP involvement in health promotion activity for patients of all ages in England (based on literature review and interviews with practice staff) found that GPs often perceive they lack the skills required to deliver health promotion/primary prevention advice, feel that addressing these issues with patients may undermine their relationship with them, and/or feel that health promotion activity is best delegated to nursing colleagues (Peckham, Hann & Boyce 2011). Other barriers to GPs delivering preventive care that were identified included perceived lack of time (Yarnall et al. 2003) and inadequate remuneration through mechanisms such as the Quality and Outcomes Framework. How confident clinicians feel in delivering health promotion/primary prevention advice, and how confident they are in its effectiveness, has been shown to influence the amount of preventive care they deliver (Laws et al. 2008).

A recent study examined primary care professionals' knowledge and attitudes relating to infant feeding and primary prevention of childhood obesity through a survey and interviews with staff. It showed that GPs were less confident about being involved in such care than HVs, and were less frequently consulted for such issues, although GPs were more knowledgeable about the health risks associated with obesity (Redsell et al. 2011). Many of the GPs interviewed also expressed the view that such care was part of the HV's role and outwith their remit. GPs also expressed concerns that raising issues around infant feeding may damage their relationship with mothers if it did not fit with the mothers' priorities and views. No published studies were found that explored how GP views on their involvement in preventive child health care have changed over time.

8.3.4. Wider comments and conclusions

The analysis presented in this chapter has shown that GP provision of child health reviews declined substantially after implementation of the 2005 policy as would have

been expected. Since 2005, GPs have had minimal involvement in the selective child health reviews provided by HVs to vulnerable toddlers. Additional GP consultations with pre-school children that are focused on/recorded as involving delivery of other kinds of preventive care are relatively uncommon, and the 2005 policy has had no discernable impact on overall provision of these consultations. Consultations focused on preventive care form a small proportion of all GP consultations with pre-school children.

In general, primary care consultation data are hard to analyse. It is difficult to produce systematic lists of all possible Read codes that may be used to indicate particular issues, and coding practice can be highly variable between GPs and practices. Analyses are based on data submitted to particular schemes such as PTI by volunteer practices that can join and leave the schemes at will making longitudinal analysis difficult, and participating practices may not be representative of 'typical' practices. GP involvement in detection and management of child maltreatment is particularly difficult to assess through routine data. ISD is currently working with the Scottish Government to develop a national primary care data extraction service that may allow analysis of data from a much higher proportion of Scottish practices (Duncan Buchanan, ISD, personal communication). In addition, work continues through the SCIMP programme to encourage consistent Read coding of particular issues, including child maltreatment, across practices (see <http://www.scimp.scot.nhs.uk/>).

Although the Royal College of General Practitioners strongly supports GP involvement in preventive child health care, the wider literature suggests that at least some GPs are ambivalent about delivering preventive child health care and lack confidence in providing such care. The current GP contract provides limited financial incentives to GPs to engage in provision of preventive child health care.

This analysis cannot comment on how implementation of the 2005 policy has affected the totality of HV care or early intervention services provided to pre-school children, or young children's outcomes. Additional research to assess GP and

Preventive child health care provided to pre-school children by General Practitioners

parental views on effective delivery of preventive child health care within primary care would be beneficial, as would a more comprehensive assessment of how the whole system of preventive care and early intervention services for young children has changed over time, and the impact this has had on children's outcomes.

The next, final, chapter provides overall conclusions from the thesis as a whole.

Chapter 9 Conclusions and recommendations

Each chapter has provided a detailed discussion of the strengths and limitations of the work presented and the conclusions that can be drawn. This final chapter provides an overview of conclusions from the thesis as a whole, a discussion of their wider implications for policy and practice, and suggested recommendations for future research.

This thesis aimed to explore the changes to the Child Health Programme, and in particular to the Child Health Surveillance offered to pre-school children, that occurred in Scotland from 2005 onwards, and to examine the impact of these on the preventive health care provided to pre-school children. It sought to address the following objectives:

- To describe the development of professional guidance on the Child Health Programme (CHP) and how this has been adopted into Scottish policy.
- To compare the CHP provided in Scotland to that offered in other high income countries.
- To examine the impact of the changes to CHS on the coverage of universally offered child health reviews.
- To explore, following the changes to CHS, which factors are associated with children being identified as in need of enhanced CHP support.
- To assess the impact of the changes to CHS on the totality of preventive care provided to pre-school children by Health Visitors (HVs) and General Practitioners (GPs).

All the objectives have been achieved with one exception: it has not been possible to assess the impact of the changes to CHS on the totality of Health Visitor-provided care due to limitations in routinely available data.

9.1. Summary of conclusions

Early child development matters (Chapter 3). Suboptimal development is common and is an important (probabilistic) determinant of poor long term physical and mental health, academic achievement, and social well-being. Early child development is itself influenced by a wide range of factors, including children's genetic endowment, the parenting they receive, the environments they grow up in, and the network of services available to them and their parents. The Child Health Programme matters because it is the only service focused on protecting and promoting children's health and development that is provided to all young children and their families.

The CHP is a complex service comprising many elements (Chapter 4). The quality of the evidence supporting the different elements varies from current and robust to outdated and questionable. Developing authoritative guidance on the content and delivery of the programme as a whole is therefore a considerable challenge. In the UK, evolving guidance based on the available evidence and professional opinion/consensus has been provided through the Health for All Children (HFAC) reports. Tracing the path of the most recent HFAC4 guidance into the Scottish Government's 2005 CHP policy and then into practice in Scotland demonstrates the complexities that can accompany policy development and implementation. Implementation of the 2005 policy resulted in a very marked reduction in the number of universal child health reviews offered to pre-school children in Scotland, the scale of which was not intended by either HFAC4 or the Scottish policy.

Most if not all high income countries provide some form of Child Health Programme. All the countries studied for this thesis provide the same core elements as the Scottish programme, namely specified screening tests; childhood immunisations; and a series of child health reviews providing growth and development assessment, health promotion advice, and parenting support (Chapter 5). Underneath this superficial similarity lies considerable variation in the content and delivery of different countries' programmes. The current Scottish CHP provides a relatively limited service compared to other (non-UK) countries: in particular

Scotland provides a relatively low number of universal child health reviews. Inter-country differences in the care offered through the CHP are likely to reflect differential interpretation of the available evidence in settings with different values and cultures more than differential population needs.

Wider aspects of countries' health systems influence how successfully the recommended CHP is delivered, for example the proportion of children that actually receive the recommended care. The CHP delivered to children interacts with a wide range of other potential determinants of child health to result in substantial variation in indicators of overall child health between high-income countries.

Within Scotland, implementation of the 2005 policy was associated with a considerable reduction in the number of universal child health reviews offered to children as noted above. Reducing universally offered care was intended to enable HVs to more actively target additional care and support to children most in need. This in turn was intended to increase the positive impact of the CHP on children's outcomes and on reducing social inequalities in outcomes.

Given this context, it is of interest to consider whether the remaining reviews have reached children from across the social spectrum (Chapter 6). Routinely available data suggest that, pre-2005, coverage of universally offered reviews fell from near complete (99%) at 10 days of age to around 86% at 39-42 months. Recorded coverage was higher for children from the least compared to the most deprived areas for each review. The discrepancy increased for reviews provided at older ages, so that by the 39-42 month review there was almost a 15% difference in recorded coverage for children living in the least and most deprived areas (92% and 78% respectively). Implementation of the 2005 policy has not been accompanied by any change in the recorded coverage of the remaining universally offered child health reviews, or in the level of inequality in coverage. Recorded coverage of the 10 day review remains very high at around 99% (99.2% cf. 98.7% in least and most deprived areas respectively). Recorded coverage of the 6-8 week review remains somewhat lower at around 94% (97% cf. 93%).

The data quality audit undertaken for this thesis suggests that these figures may somewhat underestimate the actual levels of coverage achieved due to data completeness issues. The audit does however confirm the association between missing recommended child health reviews and markers of vulnerability, and suggests that lack of parental engagement is an important (but not the only) reason underlying children not receiving their reviews.

Post-2005, given the lack of subsequent universally offered child health reviews, it is also of interest to explore which children are being identified at their 6-8 week review as being in need of enhanced ongoing support to help them achieve their health and development potential. The analysis of Health Plan Indicator (HPI) allocation (Chapter 7) shows that many factors known to be associated with increased risk of poor child outcomes (including those relating to family social circumstances, maternal health, obstetric history, and infant health) are independently associated with receiving a non-core HPI. This suggests that HVs take a wide range of known vulnerability factors into account when assessing children's need for ongoing support.

The survey of Health Visitor staffing levels undertaken for the HPI analysis suggests that staffing levels are very variable across Scotland, and are not related to population/area characteristics such as deprivation or rurality. There is a suggestion that children living in areas with higher HV staffing levels may be more likely to be identified as requiring enhanced ongoing support but this association is not statistically significant. Significant differences in HPI allocation between Community Health Partnerships and NHS Boards are evident, even when the characteristics of children and the level of HV staffing available locally have been taken into account. This geographical variation in the threshold for allocating children to a non-core HPI category limits the intended use of the HPI as a tool to communicate children's need for ongoing support when they move between areas.

The impact of the changes to the child health review schedule on the amount, type, and distribution of care provided to pre-school children by HVs was not examined as

part of this thesis due to lack of relevant routine data. Changes over time in the preventive child health care provided by GPs were assessed using routinely available consultation data. Prior to implementation of the 2005 policy, GPs made a substantial contribution to the provision of universal child health reviews, particularly those offered at 6-8 weeks, 8-9 months, and 39-42 months. Following implementation, GPs have continued their involvement in the 6-8 week review but, as would be expected, provision of other reviews has essentially ceased. Despite careful methodology, relatively few GP consultations with pre-school children for other aspects of preventive care were identified. Furthermore, implementation of the 2005 policy had no discernable impact on provision of these additional preventive care consultations. Overall, child health reviews and other preventive care consultations accounted for around 11% and 8% of all GP consultations with pre-school children before and after implementation of the 2005 policy respectively.

9.2. Implications for policy and practice

Existing scientific knowledge, and hence the evidence base on which to build policy and practice decisions, is invariably complex, contested, and incomplete: ‘*a never ending network of conditionalities and contingencies*’ (Pawson, Wong & Owen 2011, p542). Nevertheless, such uncertainty does not excuse inaction: there is an obligation to make the best use of existing knowledge in policy and practice decisions, whilst at the same time recognising its partial nature and seeking to address that through further research. As Bradford Hill has noted:

‘All scientific work is incomplete - whether it be observational or experimental. All scientific work is liable to be upset or modified by advancing knowledge. That does not confer upon us a freedom to ignore the knowledge we already have, or to postpone the action that it appears to demand at a given time.’
(Bradford Hill 1965, p300).

The twin issues of ongoing uncertainty paired with the need for best possible policy decisions in the here and now apply to the Child Health Programme as much as any other topic. Mindful of this, this section considers the work presented in this thesis alongside other existing knowledge and personal impressions of the policy making process formed during the six years of working on this thesis, and suggests implications for policy and practice.

Current understandings of early child development have profound implications for health and wider social policy. These have been emphasised internationally by the World Health Organisation’s Commission on the Social Determinants of Health (http://www.who.int/social_determinants/en/), Harvard University’s Centre on the Developing Child (<http://developingchild.harvard.edu/>), and University College London’s Institute of Health Equity (<http://www.instituteofhealthequity.org/>). Within Scotland, they have been reflected most obviously in the Early Years Framework, Early Years Taskforce, and Early Years Collaborative but also underpin development of policy on the Child Health Programme (see Section 4.4).

Policy on the CHP will continue to develop over time. Researchers should take care to ensure that relevant research findings are heard and understood by

policy colleagues to ensure, as far as possible, that policy developments reflect the evolving evidence base. As noted in Section 4.3.5, there have already been considerable changes to Scottish CHP policy since the first comprehensive policy on the programme was published in 2005. Amongst other things, the policy update issued in 2011 has signalled the reintroduction of a universal child health review for children aged 24-30 months, a relaxation of the time frame within which HVs are expected to complete their initial assessments of children's need for ongoing CHP support, and a move from a three to a two category classification of children's need for ongoing support. Taken together these changes illustrate the mix of factors that influence policy development, including professional opinion, a desire for policy congruence, and research evidence. In order to ensure that research evidence remains in the mix, researchers should take the time to build relationships with policy colleagues and communicate research findings to them in appropriate and accessible ways. Researchers should not however expect a simple process of their findings being directly incorporated into policy developments to a timescale of their choosing.

As far as possible, policy makers should seek to anticipate and avoid unintended policy consequences. The story of the 2005 Scottish CHP policy serves as a reminder of the potential for discrepancy between policy intention and the reality of implementation. Seeking the opinions of those responsible for implementing proposed policies, and of the recipients of proposed services, as part of the policy making process should help to avoid unexpected implementation problems. Again, however, there can be no assumption that the opinions provided will automatically influence policy. The consultation responses received after publication of the draft 2005 policy clearly indicated considerable professional concern that the proposals would result in an excessive reduction in the number of universally offered child health reviews but these views did not result in any substantive change to the final version of the published policy.

Policy makers should demonstrate a more sustained commitment to monitoring the implementation and impact of their policies. The Hall 4 network group

established by the Scottish Government to oversee the implementation of the 2005 policy served as a useful forum for professional debate but it did not undertake systematic monitoring of the implementation of the 2005 policy or of its impact on the care received by children or their outcomes. The group was disbanded in 2009 and there is currently no forum responsible for monitoring and evaluating subsequent policy developments or discussing how CHP policy may need to change to reflect advancing knowledge.

International comparisons provide a useful broader context for aspects of Scottish policy and arguably should be used more widely to inform policy development. Scottish policy making can be a rather insular process. Policy makers are more commonly concerned with how proposed policy developments sit with other elements of existing Scottish policy than with how they compare to policy on similar issues in other countries. The international comparison analysis presented in Chapter 5 should stimulate debate about what the observed variation between different countries' CHPs may mean for Scottish policy.

Achieving high and equitable child health review coverage is challenging but essential if reviews are to contribute fully to improving children's outcomes and child health equity. The analysis of child health review coverage presented in Chapter 6 provides both reassurance and challenges. Coverage of the currently offered reviews is relatively high: almost all children receive their 10 day review and the vast majority also receive their 6-8 week review. Stubborn inequalities in coverage persist however, particularly of the 6-8 week review. Children likely to have the highest need for ongoing support from the CHP are the least likely to receive their review. Technical issues such as robust population-based call-recall systems, appropriate invitations, and attention to the accessibility of services are all likely to be important in promoting high coverage and these should receive consistent attention. More subtle issues around how the reviews are perceived by parents are also likely to be important in building parental engagement and hence contributing to high coverage. Good Health Visitor communication skills, recognising parents' priorities rather than ticking off a list of pre-specified topics

(agenda matching), and genuinely working with parents to support them in finding sustainable solutions to problems rather than imposing professionally defined fixes (assets based approaches) are likely to be important influences on parents' perceptions. Recognition of the importance of these issues has implications for HV training and ongoing professional development.

It is likely that systematic monitoring and reporting of review coverage would also help to promote high coverage and this should be instigated. Monitoring of the coverage of other elements of the Scottish CHP (such as childhood vaccinations and newborn bloodspot screening) is in place but, to date, monitoring of child health review coverage is not. Monitoring should be instigated when the new 24-30 month child health review is introduced from April 2013 as the analysis presented in Chapter 6 suggests that it will be challenging to achieve high coverage of this review. The NHS Information Services Division (ISD) has committed to doing this if resources allow.

Consideration should be given to strengthening the data quality assurance of Scotland's child health information systems. Accurate monitoring of review coverage (and other issues such as the proportion of children found at their reviews to have developmental problems) depends on data quality within the CHSP-PS system. Currently, the national child health information systems are not subject to the level of data quality assurance enjoyed by other national information systems/datasets such as hospital discharge recording. Greater attention should be paid to data definitions, data standards, and periodic data quality audits.

Assessing children's need for ongoing support from the CHP is a complex task and the subtleties involved should be recognised in policy and guidance. The results of the HPI allocation analysis presented in Chapter 7 show that, among the subset of children who attend their 6-8 week review, those with known vulnerability markers are more likely to be identified as being in need of enhanced CHP support. The available vulnerability markers by no means explain all the variability in HPI allocation however, even when level of HV staffing and geographical area is also

taken into account. These findings reinforce the complexities involved in assessing children's need for support and provide further evidence against the unthinking development of vulnerability 'checklists' to guide allocation of resources/support at the individual child level.

Greater attention should be paid at national and local level to ensuring that the distribution of Health Visitor resources better matches population need.

That Health Visitor staffing levels are highly variable between areas, and bear little relation to population need, has been noted repeatedly by authors working in different parts of England. The survey of Community Health Partnerships undertaken for this thesis suggests that this situation also pertains in Scotland. Addressing this issue is necessary to ensuring the CHP as a whole makes the maximum possible contribution to improving child health equity. If the geographical maldistribution of HV is allowed to continue, increased targeting of CHP resources at the individual child level becomes a rather irrelevant 'icing on the cake' issue. In practice it is difficult to actively redistribute existing resources over a short time frame. It may be more acceptable to professionals and local communities to 'level up', i.e. to work towards increasing staffing levels in disadvantaged and relatively understaffed areas over time. This has obvious cost implications but the current HV recruitment programme in England shows that it can be done if the political will is there. There is no sign that such will exists in Scotland at present but academics and professionals should continue to engage with policy makers over this issue. The lack of routine data on the health workforce supporting pre-school children (HVs and other members of skill mix teams) undermines efforts to demonstrate and monitor this issue. Relevant refinement of national workforce data and associated publications would therefore be helpful.

Thresholds for identifying a child as being in need of enhanced ongoing CHP support should be more consistent across Scotland.

The proposed move from a three to a two category HPI classification (core and additional categories only) is unlikely by itself to promote greater consistency. However many categories are used, attention should be paid to providing basic definitions of the different

categories (done within the recently published guidance on the 24-30 month review), providing scenarios suggesting how commonly encountered issues may translate into the HPI category a child is assigned to, providing opportunities for staff from areas with very different thresholds to learn from each other, and routinely publishing information on HPI allocation in different areas,. As noted in Chapter 7, ISD already analyses CHSP-PS data relating to HPI allocation in different areas and feeds this back to NHS Boards. ISD has committed to going further and formally publishing this information from 2013/2014 onwards.

Options for addressing the lack of routine data on the totality of care provided by Health Visitors (or, ideally, Health Visitor-led teams) should be considered.

The current lack of data prevents monitoring changes over time in the care provided by HVs and assessing the outcomes of that care. Implementing a new national data system to capture this information would be costly and complex but is worthy of serious consideration. One feasible model that may provide useful data without imposing undue burden on budgets or staff could be a data extraction service focused on sites that have moved to electronic community nursing records. Data from clinical systems can be very difficult to analyse however so careful attention to data definitions and standards would be required. How such a system would integrate with existing systems such as CHSP-PS would also need thought through. The Scottish Government e-health directorate is currently (January 2013) considering options for updating the national child health information systems: the need for more comprehensive data on Health Visitor care should be considered as part of this process.

The degree to which GPs contribute to preventive child health care should be a focus of enquiry and debate. The findings of the GP consultation analysis presented in Chapter 8 raise broad questions about the engagement of GPs with preventive child health care. These questions are not new and are rooted in the separate histories of primary care and preventive child health care. The decreasing involvement of GPs since 2005 in ‘routine’ child health reviews has implications for their knowledge, skills, and confidence in assessing issues such as child development

and growth, and consequently implications for GP training and continuous professional development. The involvement of GPs in the forthcoming 24-30 month review (either in directly providing the review or responding to requests from HVs afterwards) should be actively monitored to assess the impact that introduction of this review has on GPs' work.

9.3. Recommendations for future research

Many areas of uncertainty relating to the Child Health Programme persist. This final section outlines some suggestions for further research that would help to inform future policy development.

The international comparison analysis presented in Chapter 5 provides an insight into which elements of Scotland's CHP differ markedly from care offered in other settings. For example, with regard to screening, Scotland/the UK offers a particularly limited newborn bloodspot screening programme and, with regard to immunisation, Scotland/the UK is unusual in not offering universal childhood varicella vaccination. These areas of difference suggest areas of research that are likely to be of benefit to future policy development (either through confirming or challenging current decisions). For example, examining the marginal benefits and harms associated with expanding the newborn bloodspot screening programme would be of interest. In April 2012, the Department of Health in England announced a one year trial of extending bloodspot screening to include testing for five inherited metabolic conditions including maple syrup urine disease (<http://mediacentre.dh.gov.uk/2012/04/08/430000-babies-to-be-screened-for-five-extra-rare-conditions-in-newborn-screening-pilot/>). The results of the trial will be considered by the National Screening Committee.

The other major area of difference between Scotland's CHP and that offered in other countries is the number (and to an extent the content) of universally offered child health reviews. The optimal 'package' of child health reviews, in terms of maximum impact on child health outcomes, reduction of inequalities, and overall cost effectiveness, remains unclear. This uncertainty has been tolerated for too long and serious consideration should be given to high quality research to address it.

Child health reviews are a challenging area to research due to their inherent complexity. Reviews have many components and many aims. The optimal package required to achieve early detection of developmental problems may be different to

that required to achieve promotion of child healthy weight or prevention of child maltreatment. To some extent, the very minimal suite of reviews currently offered in Scotland (even when the 24-30 month review is introduced) offers a good starting point from which to assess the marginal benefits and harms of a more comprehensive approach. Different review packages could be formally compared to current practice, perhaps through cluster randomised trials. Much of the existing UK based research on Child Health Surveillance is dated and of poor quality. Care should therefore be taken to ensure that any such trials were of sufficient quality to contribute useful new knowledge. Previously developed approaches to evaluating complex interventions would provide a helpful framework. The different review packages to be trialled should be based on robust theory that is itself informed by the available evidence. Which aspects of the review package to alter between trial arms (for example number, timing, precise content such as method of assessing development) would need careful prioritisation to ensure the most critical policy questions were addressed. The primary outcomes of interest (for example early detection of certain developmental problems) would also need to be robustly specified. Less direct outcomes, for example parents' knowledge of usual developmental trajectories and their satisfaction with the level of support provided by the child health reviews should also be considered.

Other possible avenues of research are suggested by the quantitative analyses reported in Chapter 6 to Chapter 8. The analyses in general show both the possibilities and the limitations of research based on routine data. The findings could usefully be extended by more in depth qualitative work. This could involve exploring parents' perceptions of child health reviews and the factors that influence their engagement with them, and/or Health Visitors' decision making processes relating to child/family needs assessment/HPI allocation and how they are influenced by workload and perceived capacity to address identified needs.

It should perhaps be recognised that coverage, particularly of child health reviews delivered after early infancy, is unlikely to ever be complete. To avoid differential coverage exacerbating inequalities in child health, consideration should be given to

developing alternative models of care for groups that find it particularly difficult to engage with the traditional service model of attending a pre-specified appointment or home visit. Any such novel services, such as group based reviews that offer peer support or opportunistic reviews in non-traditional settings, should be evaluated in an appropriate and proportionate way.

Detailed work with NHS Boards and Health Visitors to understand the processes that sustain the maldistribution of HV resources would be beneficial. Consideration should be given to whether a project similar to PREview (see Section 7.3.3.4) should be undertaken in Scotland to encourage the more appropriate distribution of resources. This could include mapping population need for HV resources (using the indicators developed for PREview) against current HV staffing levels at an appropriate geographical level such as Community Health Partnership as an initial resource for Boards.

Little is known about GP's knowledge, skills, and attitudes towards provision of preventive child health care and this area would benefit from more systematic study. It would also be of interest to explore the impact on GP involvement in preventive child health care of HVs moving back to serving geographical areas from community clinics rather than being practice attached (a change recently implemented in Highland).

With regard to Health Visitor-led care, this thesis has primarily examined provision of universally offered child health reviews and initial assessments of children's need for ongoing support from the Child Health Programme. It would be of interest to explore how initial needs assessments change over time (for example, how frequently children move up or down HPI categories), how the HPI category a child is assigned to relates to the amount and type of care they subsequently receive, and how the care received influences children's outcomes. Conducting such studies would require considerably more data than is currently routinely available, for example data on the totality of HV care, on the provision of other relevant services such as developmental assessments or parenting support services, and on relevant

outcomes such as developmental status at school entry. Unless/until national data sources are developed, special studies at local level would be required to address these questions.

Even when robust evidence exists on the impact of elements of the Child Health Programme on short term goals, evidence of impact on long term outcomes is usually lacking. For example there is good evidence supporting the ability of universal neonatal hearing screening to facilitate earlier detection of congenital hearing loss and earlier provision of hearing aids, but the impact of this on children's long term language development, success at school, and general well-being is unclear. Similarly, there is accumulating evidence that systematic assessment of young children's development can facilitate earlier detection of developmental problems but the impact on eventual outcomes is unknown. Studies assessing impact on long term outcomes are by definition difficult as they involve long time scales but efficient methods such as using linkage to routine health and education records to capture relevant outcomes should be considered. For example, the children involved in the definitive Wessex trial of neonatal hearing screening would now be around school-leaving age hence linkage based follow up could potentially provide very useful information on outcomes such as educational attainment.

In summary, the Child Health Programme makes an important contribution to supporting young children and their families, but it is a complex service and considerable uncertainty about aspects of its content and delivery remain.

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Appendices

Appendix 1 How early care giving and relationships influence early child development: attachment relationships and stress responses

Care giving and attachment

The theory of attachment was initially developed by John Bowlby (Bowlby 1969, Bowlby 1973, Bowlby 1980, Bretherton 1992). The theory essentially suggests that early child development is a complex, bidirectional process; that human infants have a strong biological drive to form attachment relationships with their primary care givers; and that the quality of their attachment relationships are critical in shaping future personality and well-being.

Attachment behaviours are inherent human characteristics and are used by infants and young children to elicit protection and care. These behaviours are evident from very early in life onwards, for example crying, smiling, and moving closer (Cassidy 2008). Under normal circumstances, over the first year of life, children move beyond indiscriminate display of attachment behaviours to the development of specific attachment relationships with their primary caregivers (Marvin, Britnet 2008). By 12 months, normally developing children have a clear hierarchy of attachment figures, with the mother usually being top of the list. If a child feels threatened, for example by a novel situation or person, they seek the proximity of their attachment figure, are able to be reassured by them, and quickly resume normal play/exploratory behaviour. Children thus use their primary attachment figures as their main source of security and the secure base from which they can go forth and learn about the world. Children of this age typically demonstrate substantial distress on being separated from their primary attachment figure which is quickly eased on being reunited.

Although attachment behaviours are inherent characteristics of infants, the development of an attachment relationship requires both infant and care giver, and the quality of care provided is critical (Belsky, Fearon 2008). The normal pattern of

secure attachment described above is contingent on consistent, responsive care giving and is in some ways a learnt response to such care. Responsive care essentially means parents being well attuned to their baby – noticing when they are demonstrating needs and responding reasonably consistently, promptly and appropriately, for example through feeding, changing, playing with, or settling them.

Ainsworth and others have described suboptimal attachment relationship patterns (Ainsworth et al. 1978, Main, Solomon 1986). These are usually described as insecure (anxious/avoidant and anxious/resistant types) and disorganised attachment. Insecure attachment often develops in the face of inconsistent or low emotional warmth parenting. These relationships are still organised forms of attachment and, although suboptimal, can represent logical adaptations that enable children to maximise the care they receive in certain situations. By contrast, disorganised attachment represents the absence of any organised strategy for seeking and securing care giver protection and reassurance. This attachment pattern is often associated with frankly neglectful or abusive care giving or severe unresolved trauma within parents (for example their own experience of previous abuse) (Main, Hesse 1990).

Long term cohort studies, most notably the Minnesota Longitudinal Study of Parents and Children (Sroufe 2005), and other smaller scale studies (Zeanah, Smyke 2008, Main 1983) have confirmed that consistent, responsive care is associated with secure attachment patterns whilst inconsistent, harsh or neglectful care is associated with insecure or disorganised attachment. They have also shown that secure attachment is associated with enhanced social and emotional development, specific behavioural patterns such as ability to deal with new situations, and lower risk of mental health problems such as anxiety or conduct disorder as children grow up.

It is important to note that attachment is not a sole absolute predictor of children's subsequent developmental trajectories. Other characteristics of care giving (usually measured after infancy) such as promoting children's social and learning opportunities and positive approaches to boundary setting and discipline, along with families' wider social circumstances such as experience of poverty, are important in

influencing developmental outcomes (Royal College of Paediatrics and Child Health 2002, Stewart-Brown 2005). Nevertheless, consistent, responsive care giving and secure attachment relationships between children and their primary care givers have come to be seen as critical corner stones of social/emotional and cognitive development (Centre on the Developing Child 2012, Sroufe, Coffino & Carlson 2010, Sroufe et al. 2005). Understanding precisely how attachment relationships fulfil this role is still incomplete, but it has been suggested that they provide children with a blueprint for future social functioning by embedding expectations of self and others and also that the safe base provided by secure attachment promotes exploration and learning. It is also likely that attachment plays an important role in helping infants learn to modulate their stress, as discussed below.

Care giving and coping with stress

In the scientific literature, stress is usually defined as situations in which the demands placed on an individual exceed their capacity to deal with them (Gunnar 2006). Stress may arise from a variety of biological (e.g. overwhelming infection) or psychological (e.g. fear of harm or loss) causes. In the face of stress, the body mounts a stress response which is designed to alter physiological functioning over the short term to promote coping. In essence, the stress response shifts the body away from future orientated functioning (learning, growing) to functioning designed to cope with the immediate situation (vigilance, release of energy stores). If the stress is relatively short lived, the stress response is also short lived and the body quickly returns to normal functioning. The ability to mount an appropriate stress response is thus part of healthy adaptation. If stress is excessive and prolonged, however, it has marked deleterious effects on health and development, and also over time influences how an individual typically responds to stress.

The stress response is mediated by two main physiological systems – the sympathetic nervous system (SNS) and the hypothalamic-pituitary-adrenocortical (HPA) system (Johnson et al. 1992). Broadly speaking, the SNS governs the release of adrenaline from the adrenal medulla and hence triggers a range of physiological responses that

together comprise the immediate 'fight or flight' response to stress. The impact of repeated/prolonged activation of the SNS on child development has been little studied. The HPA system is more complex and it has been the focus of much research. Under the HPA system, in response to stress the hypothalamus (and other areas of the brain) produces corticotrophin-releasing hormone (CRH). CRH acts directly on various regions of the brain and also stimulates the release of adrenocorticotrophic hormone (ACTH) from the anterior pituitary. ACTH in turn stimulates the production of glucocorticoid hormones (mainly cortisol) from the adrenal cortex (Lupien et al. 2009). Cortisol has a very wide range of functions. It has direct effects on the brain and also influences growth, inflammation, and the immune system. Some CRH/ACTH/cortisol is produced all the time and older children and adults show a typical diurnal pattern of high cortisol levels in the morning that gradually decrease through the day. Stress causes sudden peaks in cortisol levels on top of this pattern. Again, under normal circumstances, the elevation in cortisol level reduces CRH secretion via a negative feedback loop and hence an ability to switch off the stress response after an appropriate length of time is built into the system.

The human stress systems develop over gestation and the first years of life (Gunnar 2006). Newborn babies are very reactive to stress. They show behavioural (e.g. crying), fight or flight (e.g. increased heart rate), and increased cortisol reactions to even mild stressors such as physical examinations and they do not show a clear diurnal pattern in basal cortisol levels. This excessive stress reactivity is gradually dampened down over time: by around three months babies no longer mount increased cortisol reactions to mild stressors and by twelve months not even to more significant stressors such as brief separation from their mother (although they may still show behavioural and heart rate responses). By the time toddlers give up their day time naps they also show mature diurnal patterns in basal cortisol.

A range of research has showed that this progressive dampening down is dependent on receipt of consistent, responsive parental care and that it can go markedly awry if early care giving is disrupted. Animal experiments have shown that disruption of

normal maternal care leads to persistently elevated stress reactivity in young rats and primates and impaired social and cognitive development (Liu et al. 1997, Young et al. 1973, Suomi 1997, Sanchez, Ladd & Plotsky 2001). Observational studies in humans (made possible by the development of non-invasive salivary cortisol assays) have confirmed that receipt of consistent, responsive care in early infancy, and development of a secure attachment relationship, are critical in facilitating the maturation/damping down of the stress system as children age. Maternal soothing helps infants to modulate their responses to stress and quickly return to normal functioning (Albers et al. 2008), and children with secure attachment are much less likely to show elevated cortisol responses to mild/moderate stressors than those with insecure attachment (Ahnert et al. 2004). Equally, children who experience very disrupted early care giving (for example due to severe maternal depression, abuse, or institutional care) develop abnormalities in their stress responses which can persist indefinitely (Ashman 2002, Heim 2001, Gunnar et al. 2001). Interesting, even care giving situations that are commonplace in Western societies, such as all day nursery care for toddlers, can also be associated with altered stress response such as loss of the usual diurnal pattern of basal cortisol (Watanabe et al. 2003).

Disrupted early care giving results in such long lasting effects on children because high levels of cortisol experienced early in life influence the long term functioning of the stress system itself. Through complex processes such as epigenetics (modification of gene expression without modification of DNA (Essex et al. 2011)), up/down regulation of specific cortisol receptors subtypes, and direct effects on brain structural development, exposure to high levels of cortisol in early life resets the stress system to a highly reactive state and can influence basal cortisol levels over the long term (Shonkoff, Garner 2012, McEwen 2005, McEwen 1998). Early excessive stress thus sets up a vicious cycle with stress increasing the susceptibility to stress and incrementally reducing growth, impairing social/emotional and cognitive development, and impairing physical health (e.g. depressing the immune system and causing chronic inflammation) over the long term. This vicious cycle has been termed 'toxic' stress to differentiate it from normal stress reactions that are part of health adaptation and development (Shonkoff 2010, Shonkoff, Boyce & McEwen

2009). More generally, the way that early experiences ‘get under your skin’ to directly affect anatomy (brain development) and physiology (stress biology) has been termed ‘biological embedding’ (Hertzman, Wiens 1996).

Some areas of uncertainty remain in relation to the neurobiology of stress. Some key concepts were initially developed using animal models although recent observational work in humans has gone a long way to confirm their applicability to child development. Similarly, many human studies have involved children who have experienced very specific and extreme early care giving situations such as international adoptees leaving some uncertainty as to how more subtle variations in early care giving influence outcomes. Complex interactions between hormonal status and development of specific areas of the brain are also suggested rather than understood in detail.

Appendix 2 How the Child Health Programme is reflected in NHS, local authority, and central government performance monitoring processes

Since 2005, performance monitoring of the NHS in Scotland has been based on Health improvement, Efficiency, Access, and Treatment (HEAT) targets (see <http://www.scotland.gov.uk/About/Performance/scotPerforms/partnerstories/NHSScotlandperformance>). A rolling suite of HEAT targets is agreed each year. The targets then form the basis of the Local Delivery Plans agreed between NHS Boards and the Scottish Government, and NHS Boards' progress against the targets is monitored through an annual review process. HEAT targets relevant to the delivery of, or outcomes from, the CHP that have been agreed since 2005 are shown in Table 61.

Table 61 NHS Scotland HEAT targets agreed since 2005 relevant to the delivery of, or outcomes from, the Child Health Programme

Target directly measuring delivery of (one element of) the CHP
<ul style="list-style-type: none"> Ongoing target of 95% uptake for all childhood vaccinations (complete course of all primary immunisations including one dose of MMR)
Targets measuring outcomes of the CHP (and other services) in pre-school and school aged children
<ul style="list-style-type: none"> Proportion of new-born children exclusively breastfed at 6-8 weeks to increase from 26.6% in 2006/07 to 33.3% in 2010/11
<ul style="list-style-type: none"> 60% of 5 year old children to have no signs of dental disease by 2010
<ul style="list-style-type: none"> Pregnancy rate (per 1,000 population) in 13–15 year olds to reduce by 20% from 8.5 in 1995 to 6.8 by 2010
Targets monitoring access to, or the delivery of, services that the CHP has a role in routing children into, and on which the success of the CHP in improving children's outcomes partially depends
<ul style="list-style-type: none"> 80% of all three to five year old children to be registered with an NHS dentist by 2010/11
<ul style="list-style-type: none"> At least 60% of 3 and 4 year old children in each Scottish Index of Multiple Deprivation quintile to receive at least two applications of fluoride varnish per year by March 2014
<ul style="list-style-type: none"> To achieve 14,910 completed child healthy weight interventions over the three years ending March 2014
<ul style="list-style-type: none"> Deliver faster access to mental health services by delivering 26 weeks referral to treatment for specialist Child and Adolescent Mental Health Services from March 2013, reducing to 18 weeks by December 2014, and 18 weeks referral to treatment for Psychological Therapies from December 2014
Target monitoring the engagement of pregnant women with antenatal services, and linking this to subsequent improvement in children's outcomes that will also be influenced by ongoing engagement with the CHP
<ul style="list-style-type: none"> At least 80% of pregnant women in each SIMD quintile to have booked for antenatal care by the 12th week of gestation by March 2015 so as to ensure improvements in breast feeding rates and other important health behaviours.

Source: (<http://www.scotland.gov.uk/About/scotPerforms/partnerstories/NHSScotlandperformance>).

In 2007, the then new Scottish National Party administration introduced a national performance framework that set out the goals of the Scottish Government and a hierarchical suite of outcome indicators designed to monitor progress towards them (<http://www.scotland.gov.uk/About/scotPerforms>). The framework was subject to minor revisions in 2011 and currently (December 2012) includes one overarching purpose statement, eight high level purpose targets, 16 national outcomes, and 50 national indicators. Only the national indicators are actually defined as specific, measurable targets, but each of them is mapped upwards through the higher levels of the performance framework to show how they contribute to/indicate progress towards the government's stated purpose. Current national indicators most relevant to the CHP and children's well-being more broadly, and how they link up to the government's overarching purpose, are shown in Figure 31.

The 2007 framework was accompanied by a new 'concordat' between central and local government (Scottish Government and COSLA 2007). This gave local authorities the ability to determine local priorities, set their own objectives, and monitor progress towards them using the 50 national indicators and/or approved additional local indicators (<http://www.improvementservice.org.uk/local-outcome-indicators/>). Central government manages this process through agreeing Single Outcome Agreements with each Local Authority and conducting annual reviews. The health service contributes to local authority planning through the community planning process (<http://www.scotland.gov.uk/Topics/Government/PublicServiceReform/community-planning>). There is a complex relationship between the CHP and local authority services: the CHP depends in part on services within the control of local authorities, such as childcare and early education, to achieve its goals, and similarly the CHP contributes to the attainment of some local authority goals such as improved child protection processes.

Figure 31 Scottish Government national performance framework indicators relevant to children's well-being and the CHP



Performance monitoring processes and targets can have a profound impact on practice although they are not exempt from criticism and can have distorting effects (Pencheon 2007, Dancox 2008, Whittaker-Brown, Barker 2005, Flowers, Hall & Pencheon 2005). HEAT targets are well known within the health service and do have considerable impact on local priorities. To date, available HEAT targets relevant to the CHP have promoted an emphasis on immunisation delivery and the interlinked areas of breast feeding, dental health, and promotion of child healthy weight. There has never been a HEAT target focused on early child development. This is likely to at least in part reflect the absence of national data on this issue.

There is no comprehensive monitoring of the Scottish Child Health Programme as a whole although some relevant data are available. For example NHS National Services Division reports on Guthrie bloodspot screening (<http://www.nsd.scot.nhs.uk/services/screening/newbornscreening/index.html>) and neonatal hearing screening (<http://www.nsd.scot.nhs.uk/services/screening/unhearingscreening/index.html>) but not the pre-school vision programme. NHS Information Services Division reports on childhood immunisation coverage (<http://www.isdscotland.org/Health-Topics/Child-Health/Immunisation/>), infant feeding (<http://www.isdscotland.org/Health-Topics/Child-Health/Infant-Feeding/>), child growth (<http://www.isdscotland.org/Health-Topics/Child-Health/Child-Weight-and-Growth/>) and the dental health of school children (<http://www.isdscotland.org/Health-Topics/Dental-Care/National-Dental-Inspection-Programme/>).

Appendix 3 Effectiveness of different elements of the CHP: examples relating to screening, immunisation, physical examination, and provision of health promotion advice

Effectiveness of screening within the CHP: universal neonatal hearing screening

Universal neonatal hearing screening was recommended for the first time by the UK National Screening Committee (NSC) in 2000 (Bamford et al. 2004) and subsequently endorsed in HFAC4. The Scottish Government first indicated universal neonatal hearing screening should be added to the CHP in Scotland in 2001 (Scottish Government 2001a) and it was again recommended in the 2005 guidance (Scottish Executive Health Department 2005b). The NHS Scotland National Services Division is responsible for delivery of the neonatal hearing screening programme (<http://www.nsd.scot.nhs.uk/services/screening/unhearingscreening/index.html>).

The NSC considers the evidence for proposed new screening programmes against a set of criteria (<http://www.screening.nhs.uk/criteria>) based on Wilson and Junger's original framework (Wilson, Jungner 1968). The criteria promote structured consideration of whether there is sufficient evidence indicating that the problem being screened for is an important public health problem with well understood epidemiology; that a suitable screening test is available; that definitive diagnosis is available for those who screen positive; that effective intervention is available for those diagnosed; and that the screening programme as a whole is feasible and does more good than harm.

The NSC recommendation in favour of universal neonatal hearing screening was primarily informed by a comprehensive report published by the NHS Health Technology Assessment (HTA) Programme in 1997 (Davis et al. 1997). The HTA report was based on a systematic literature review and a survey of contemporaneous practice across the UK. Preliminary results from a UK-based large scale randomised

controlled trial (RCT) of universal neonatal hearing screening using otoacoustic emissions were included in the report and were particularly influential on its findings (Wessex Universal Neonatal Hearing Screening Trial Group 1998).

The HTA report found that:

- Congenital permanent childhood hearing loss is relatively common, affecting around 1 in 1,000 children born.
- At that time, late diagnosis and treatment of congenital hearing loss was also common, with only around half of affected children provided with hearing aids by two years of age and three quarters by four years.
- Children with congenital hearing loss are at markedly increased risk of impaired language development and other problems such as educational difficulties and mental health problems.
- Understanding of neural development (e.g. decreasing plasticity as children age) suggests that early intervention should lead to improved outcomes.
- Parents have a strong preference for the earliest possible diagnosis.
- Screening tests of acceptable accuracy are available for use in neonates.
- Implementing universal neonatal hearing screening is likely to be feasible with overall costs being comparable to those incurred by HV distraction testing.

The report did note some areas of uncertainty, for example:

- The epidemiology of progressive and acquired permanent childhood hearing loss (that would not be detected by neonatal screening) is poorly understood.
- Although a number of observational studies suggest that earlier intervention leads to better indicators of language development over the short term, the evidence of impact on long term outcomes is relatively lacking.

The HTA report ultimately recommended universal neonatal hearing screening followed by distraction testing at seven months for those that missed their neonatal screen and, as noted, this informed the subsequent NSC decision to support universal neonatal hearing screening. In general, evidence in favour of screening has

accumulated (Yoshinaga-Itano, Coulter & Thomson 2000, Kennedy et al. 2006, Schroeder et al. 2006) and it continues to be recommended across the UK and elsewhere (<http://www.screening.nhs.uk/hearing-newborn>) (Centre for Community Child Health, Royal Children's Hospital Melbourne 2002).

The lack of evidence that universal neonatal screening positively influences children's long term outcomes still persists, however, and this has been emphasised in other reviews (Thompson et al. 2001, Colgan et al. 2012). Because of this uncertainty, although the American Academy of Pediatrics recommends universal neonatal screening, a minority of states in the US persist in offering selective screening to high risk infant only (see Chapter 5). This demonstrates how finely balanced effectiveness decisions can be: the availability of 'gold standard' RCT evidence does not necessarily translate into easy development of recommendations about whether to incorporate particular interventions into the CHP or not.

Summaries of the evidence underpinning the NSC recommendations relating to other screening interventions provided through the CHP are available on <http://www.screening.nhs.uk/pku> (bloodspot screening), <http://www.screening.nhs.uk/vision-child> (pre-school vision screening), and <http://www.screening.nhs.uk/growth> (school entry height screening).

Effectiveness of immunisation within the CHP: pneumococcal vaccination

The Joint Committee on Vaccination and Immunisation (JCVI) is an independent advisory committee responsible for reviewing emerging evidence relating to routine childhood (and other) vaccinations and making recommendations on the childhood immunisation programme to the four UK departments of health (<http://www.dh.gov.uk/health/about-us/public-bodies/advisory-bodies/jcvi/>). The Scottish Chief Medical Officer (CMO) is then responsible for issuing policy on immunisation to the NHS in Scotland. The evidence behind the JCVI and CMO

recommendations are summarised in the English Department of Health's 'Green Book' (<http://www.dh.gov.uk/en/Publichealth/Immunisation/Greenbook/index.htm>).

Pneumococcal conjugate vaccine was the vaccine most recently added to the UK routine childhood immunisation programme. The JCVI recommended its addition in October 2005 (Joint Committee on Vaccination and Immunisation 2005) and the CMO confirmed it was to be offered in Scotland in 2006 (Scottish Government 2006). The decision to introduce pneumococcal vaccination was based on detailed consideration of evidence relating to:

- The epidemiology of pneumococcal disease prior to the introduction of routine vaccination, for example the incidence of invasive disease by age and the most commonly identified serotypes (Trotter et al. 2010, Foster et al. 2008, Ihekweazu et al. 2008, Clarke et al. 2006)
- Vaccine effectiveness, in particular the results of a large scale US based RCT of routine vaccination in infancy showing vaccine safety and efficacy against invasive disease (Black et al. 2000) and subsequent longer term population based studies assessing vaccine effectiveness after introduction of routine vaccination in the US (Black, Shinefield 2002, Black et al. 2004).
- Practical considerations such as cost effectiveness estimates (Melegaro, Edmunds 2004, McIntosh et al. 2003) and qualitative research assessing the impact of adding pneumococcal vaccine to the routine childhood schedule (and the associated increased number of injections required per child) on the acceptability of the childhood immunisation programme to parents (Joint Committee on Vaccination and Immunisation 2005).

Despite this range of high quality evidence, areas of uncertainty often exist when new vaccines are being considered for introduction into the childhood schedule. In the case of pneumococcal vaccine, there was uncertainty around the minimum required number of primary and booster doses and their optimal timing (Goldblatt, Southern & Ashton 2006, Lockhart, Hackell & Fritzell 2006). There was also uncertainty around the indirect effects of vaccination, in particular herd immunity effects (i.e. the level of protection afforded to non-vaccinated individuals through

general reduction in population carriage) and serotype replacement effects (i.e. serotypes not covered by the vaccine expanding to take the place of vaccine-included serotypes and hence decreasing the overall reduction in invasive pneumococcal disease associated with vaccination). Detection of these indirect effects requires ongoing epidemiological surveillance after introduction of routine vaccination: herd immunity and serotype replacement effects were found in the UK (Foster et al. 2011, Gladstone et al. 2011, Kaye et al. 2010) and US (Whitney et al. 2003) and their extent continues to be debated (Weinberger, Malley & Lipsitch 2011). The CMO recommended moving to thirteen- rather than seven-valent vaccine in 2010 to partially counteract serotype replacement (Scottish Government 2010c).

In general, infectious disease epidemiology is highly dynamic, novel vaccines regularly become available, and evidence continues to accumulate on the effectiveness of vaccines and practical aspects of their delivery (Hamlin, Senthilnathan & Bernstein 2008). All this results in frequent recommendations for more or less substantial changes to the childhood immunisation schedule from the JCVI. Recent recommendations on the childhood vaccination schedule issued by the JCVI that are yet to be implemented in Scotland include:

- Altering the timing of Meningococcal C vaccination to include a booster for adolescents (Joint Committee on Vaccination and Immunisation 2012b)
- Extending annual influenza vaccination to all school aged children (Joint Committee on Vaccination and Immunisation 2012a)
- Adding rotavirus vaccination to the UK childhood schedule for the first time (<http://www.dh.gov.uk/health/2012/11/rotavirus/>)

Effectiveness of physical examination within Child Health Surveillance reviews: detection of congenital heart disease

The birth prevalence of significant congenital heart disease (CHD) in the UK is estimated to be between 5 and 8 per 1,000 live births (Dastgiri et al. 2002, Dadvand et al. 2009, Bound, Logan 1977, Kenna, Smithells & Fielding 1975). CHD encompasses a wide range of different structural abnormalities with a

correspondingly wide range of clinical presentations. The age at which CHD becomes clinically apparent can vary from the antenatal period to adulthood. Infants with particular types of CHD are at risk of rapid clinical deterioration in the first weeks of life and can present with sudden death (Abu-Harb, Hey & Wren 1994). Untreated CHD often leads to complications that are difficult or impossible to reverse such as arrhythmias or pulmonary hypertension (Centre for Community Child Health, Royal Children's Hospital Melbourne 2002, p49). Even haemodynamically insignificant anomalies can lead to important complications such as infective endocarditis (Hall, Elliman 2003). Early diagnosis potentially improves outcomes by allowing early medical treatment and surgical repair before clinical deterioration, and facilitating the prevention of complications (Brown et al. 2006).

Some, but not all, forms of CHD can be detected before birth and currently around a quarter of cases of CHD are detected antenatally, the majority at the routine 18-20 week fetal anomaly scan (Knowles et al. 2005, Boyd et al. 2012). HFAC4 recommends that the CHP should contribute to the further early detection of CHD through the clinical examinations performed as part of the neonatal and 6-8 week universal child health reviews. Clinical examination can identify asymptomatic (or at least parent-unsuspected) CHD in infants by detecting signs such as cyanosis, cardiac murmurs, and abnormal pulses. Some cases of CHD are not evident in the neonatal period even after full examination, as infants may still be in transition from fetal to postnatal circulation, and there is no correlation between level of severity and ease of detection (Richmond, Wren 2001). The child health reviews can therefore also help to raise the suspicion of CHD even if it is not immediately evident on examination if other congenital anomalies or syndromes such as Down's are identified.

Multiple studies from the Northern region of England have been influential in suggesting that the neonatal and 6-8 week reviews are relatively poor at detecting CHD. An audit of around 1,500 children diagnosed with all forms of CHD by 12 months over an eight year period in the region found that 33% of cases had been detected prior to the neonatal examination, around 30% were initially detected at the

neonatal examination, a further 10% were detected by or at the 6-8 week examination, and the remaining 27% were detected after the 6-8 week review (Wren, Richmond & Donaldson 1999). A further audit of 120 children diagnosed with severe life-threatening anomalies over a five year period found that 10% were detected prior to the neonatal examination, 28% at the neonatal examination, 32% between the neonatal and 6-8 week reviews, 14% at the 6-8 week review, and the remaining 16% after the 6-8 week review (Abu-Harb et al. 1994). A prospective cohort study of around 7,000 babies born in one of the region's hospitals found that, of all cases of CHD diagnosed within the first year of life, 10% were detected prior to the neonatal examination, 40% were first identified at the examination, and 50% were detected later (Ainsworth, Wyllie & Wren 1999). A further study from the same group found that 50% of CHD cases were detected prior to the 6-8 week examination, 30% were first identified at the examination, and 20% were detected later (Gregory et al. 1999). These studies provide little information on false positives generated by the neonatal and 6-8 week examinations but what data there are suggest that false positive rates are low. There is evidence suggesting that routinely offering two neonatal reviews increases the false positive rate without increasing the case ascertainment rate (Glazener et al. 1999).

A systematic review of the early detection of CHD was published by the NHS Health Technology Assessment (HTA) programme in 2005 (Knowles et al. 2005). This review relied heavily on the studies noted above and concluded that the neonatal physical examination detects around half the cases of CHD not previously detected antenatally or in the immediate postnatal period. The review also noted evidence suggesting that infants identified as having probable CHD at their child health reviews do not necessarily go on to receive timely definitive diagnosis and treatment. For example, the study by Abu-Harb cited above reported that only eight of the 34 children with abnormal findings noted at their neonatal examination went on to received prompt treatment (Abu-Harb et al. 1994). Overall the review concluded that the neonatal and 6-8 week examinations do make a significant contribution to the early detection of CHD but that both examinations miss substantial numbers of

cases and there is considerable scope for improving the clinical pathways providing follow on diagnosis and initial treatment.

On the basis of the HTA review, the NSC has recommended that screening for CHD by physical examination should be offered to all children at the neonatal and 6-8 week review (see <http://www.screening.nhs.uk/congenitalheartdisease>) although in Scotland these examinations are offered as part of routine care, with emphasis on good clinical practice, rather than as formal screening procedures (NHS Quality Improvement Scotland 2008). National Institute for Health and Clinical Excellence (NICE) guidance on postnatal care also recommends universal neonatal and 6-8 week physical examinations, specifically including cardiovascular examination (NICE 2006).

A more generic study conducted in Nottingham in 1993/94 examined the ability of the full programme of universal child health reviews to detect five key physical problems in infants: CHD, congenital dysplasia of the hip, undescended testis, squint, and congenital hearing loss (Hampshire 1999). Around 2,000 babies born to mothers who remained registered with 28 general practices to 18 months after delivery were included. The results of the children's CHS reviews (routinely offered at neonatal, 10-14 days, 6-8 weeks, and 6-9 months at that time) and all diagnoses of the five conditions of interest (identified mainly from hospital referral data) were examined. The study found that 30 children were referred for suspected CHD (24 identified through a CHS review) of which 11 were confirmed as having CHD (8 identified through a CHS review). The overall performance of the suite of CHS reviews in identifying CHD was therefore estimated as: sensitivity 72%; specificity 99%; positive predictive value 33%; and negative predictive value >99%.

More recently, a study based in Ashington in England has suggested that the neonatal review in particular can perform very well in terms of early identification of CHD (Patton, Hey 2006, Onuzo 2006). In this study, nurse practitioners were trained to undertake all neonatal examinations. Babies underwent full cardiovascular examination on day one with pulse oximetry done to assess arterial oxygen saturation

if there were any suspicions of CHD. If a murmur was noted, babies were re-examined prior to discharge (day 2-6) and, if still present, re-examined a third time shortly after discharge (day 7-10). Parents were given information about 'red flag' symptoms such as poor feeding and sweating and what to do if these arose. The nurse practitioners referred any babies they suspected of having CHD (and all those with a persistent murmur at the third examination) directly to a paediatric cardiologist. The detection of CHD improved over time as the service developed but in the latter years (2000-2003), of 88 babies born with CHD (from a total of 6,816 live births), 83 were detected prior to neonatal discharge (with the remaining 5 detected at the 6-8 week review). Over this time a total of 239 babies were referred for cardiological opinion after the neonatal review suggesting that the overall performance of the review in detecting CHD was: sensitivity 94%; specificity 98%; positive predictive value 35%; and negative predictive value >99%. This study also noted that 80% of the 88 babies with CHD had received a formal diagnosis and initial treatment as appropriate by 6 weeks of age.

The Ashington protocol recommended pulse oximetry for neonates with a suspicion of CHD identified at their neonatal examination. There has been extensive debate in other papers about offering pulse oximetry to all neonates as a screening test for CHD, either before or alongside clinical examination although no consensus on this has yet emerged (Knowles et al. 2005, Griebisch et al. 2007, Thangaratinam et al. 2007, Valmari 2007, Ewer et al. 2011, Mahle, Koppel 2011, Green, Oddie 2008, Thangaratinam et al. 2012, Kemper, Martin 2012).

Overall, the available data suggest that the physical examinations undertaken as part of the neonatal and 6-8 week CHS reviews identify a substantial proportion of babies with CHD that have not been previously detected. The neonatal review has the highest yield and probably identifies around half of as-yet-undetected cases, although most of the evidence is now at least ten years old and comes from one region in England. Attention to the quality of the review including training may be able to increase this proportion substantially. Information on false positives generated by

the reviews can be difficult to find making the overall impact of the reviews on specialist services and associated costs unclear.

There is an implicit chain of assumptions underlying the provision of the neonatal and 6-8 week examinations including that proactive examinations detect suspected cases earlier than reactive care; that suspected cases progress quickly to definitive diagnosis; that diagnosed cases progress quickly to effective intervention; and that early intervention leads to improved outcomes. The available evidence primarily relates to the first link in the chain i.e. it examines the ability of the child health reviews to detect suspected cases of CHD before they present clinically. There is theoretical and observational evidence suggesting that early intervention can improve outcomes, however the evidence reviewed here casts doubt on the assumption that early suspicion necessarily leads to quick diagnosis and treatment. This reinforces the importance of seeing the child health reviews within the wider system of care and paying attention to referral pathways and follow on services. No studies could be identified that directly assessed the impact of the CHS reviews on the outcome of children with CHD.

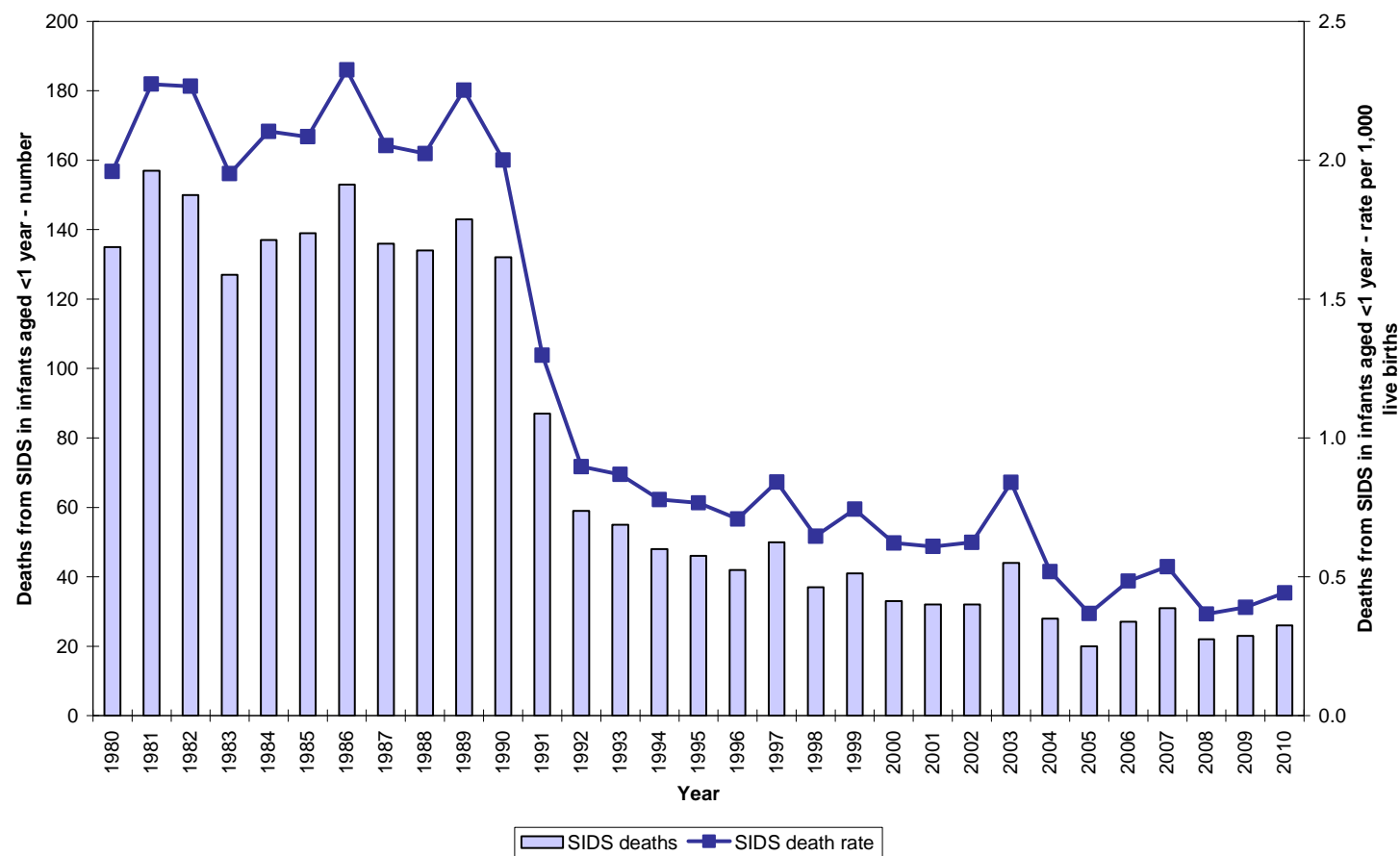
Effectiveness of provision of health promotion advice within Child Health Surveillance reviews: prevention of Sudden Infant Death Syndrome

Sudden Unexpected Death in Infancy (SUDI) refers to the sudden death of an infant that was not known to have a life limiting condition and whose cause of death is not immediately apparent. After detailed post mortem examination, around 20% of SUDI babies will have a specific cause of death identified, for example an infection (Leach et al. 1999). Children whose cause of death remains unexplained after investigation are referred to as dying from Sudden Infant Death Syndrome (SIDS). SIDS therefore accounts for most cases of SUDI. In the UK, SIDS is uncommon in absolute terms but it remains one of the main causes of post-neonatal mortality after congenital anomalies and complications of prematurity (Kurinczuk et al. 2009).

Epidemiological research has elucidated the main risk factors for SIDS (Kinney, Thach 2009). Up to the 1990s the principal risk factor was prone (i.e. on the tummy) sleeping position (Lee et al. 1989, De Jonge et al. 1989, Fleming et al. 1990, Mitchell et al. 1991). In 1991 the national 'Back to Sleep' health promotion campaign advised against prone sleeping and recommended that babies be placed supine (i.e. on their backs) to sleep (Scottish Office 1991). The Back to Sleep campaign was very successful in changing parents' behaviour in relation to infant sleeping position (Blair et al. 2006) and was associated with a substantial reduction in SIDS (see Figure 32) (Wigfield et al. 1992, Fleming 1994, Mitchell 2007). Similar campaigns were held in different countries around the same time and were likewise associated with substantial reductions in SIDS (Task Force on Sudden Infant Death Syndrome, Moon 2011).

Since Back to Sleep, the principal risk factors for SIDS have changed (Blair et al. 2006, Task Force on Sudden Infant Death Syndrome, Moon 2011, Tappin, Ecob & Brooke 2005, Brooke et al. 1997, Fleming et al. 1996). Prone and side sleeping are still important but co-sleeping (in the parental bed or particularly on chairs or sofas) and solitary sleeping (i.e. the baby sleeping in a separate room alone) are also important. Parental smoking (including maternal smoking during pregnancy) and overheating (of the room or directly of the baby by excessive covering, particularly head covering) also significantly increase risk. Other factors such as lack of breastfeeding, incomplete vaccination status, and lack of pacifier use also probably increase risk. Unmodifiable risks such as preterm delivery are also important.

Figure 32 Deaths from SIDS in infants aged less than one year, Scotland, 1980-2010



Data supplied by National Records of Scotland.
SIDS defined as ICD9 798.0 (to 1999) and as ICD10 R95 (from 1999 - dual coding for one year but no difference in figures).

Health Visitors and the Child Health Programme have long been acknowledged as having a role to play in preventing SIDS through the provision of health promotion advice, and in supporting affected families through bereavement and when preparing for and caring for subsequent children (Stewart, Fleming 1993, Waite, McKenzie & Daman-Willems 2011, Baumer, McLindon 1994) (and see <http://www.sudiscotland.org.uk/>). Most national Back to Sleep type campaigns involved the use of mass media messages alongside provision of risk reduction advice to parents in both antenatal (mainly by midwives) and postnatal/Child Health Programme (mainly by Health Visitors) settings. Campaigns often included messages about other risk factors such as parental smoking as well as the main target of sleeping position. A systematic review has concluded that there is good observational evidence that these campaigns were all effective in reducing the prevalence of prone sleeping (Hauck, Tanabe 2009). There is some weak evidence (not from the UK) that some also reduced the prevalence of other risks such as maternal smoking. Overall there is good observational evidence that these campaigns reduced the incidence of SIDS. The reduced incidence is probably mainly attributable to reduction in prone sleeping but other factors may also have contributed. It is impossible, however, to disentangle the specific contribution of advice given through the Child Health Programme to the overall success of the campaigns.

Since the end of the UK campaign, HVs have had an ongoing role in providing consistent advice on SIDS risk reduction. A recommendation to provide SIDS advice has been included in each of the HFAC reports. Key messages are contained within the main Scottish postnatal health promotion resource, Ready, Steady, Baby! (<http://www.readysteadybaby.org.uk/first-days-together/caring-for-your-baby/safe-sleeping.aspx>) and in supplementary leaflets (<http://www.scottishcotdeathtrust.org/wp-content/uploads/2011/01/RTR-2011-update.pdf>).

There is some evidence that HVs changed the advice they give to parents to reflect new risk reduction messages in the early 1990s (Scott, Campbell & Gorman 1994)

but it cannot be assumed that HVs provide advice to all families, or that it is ‘heard’ and acted upon by parents. A recent small scale qualitative study of new parents in a deprived area of Birmingham found that parents reported getting inadequate or conflicting advice about SIDS from different professionals (for example midwives and HVs) that led them to rely more on other sources such as family members (Miller, Fraser & Moy 2008). Even when parents had been given ‘correct’ advice from HVs, many were distrustful of it or found it impractical, for example they felt their babies were more likely to settle in the prone position or in the parental bed. Some parents were also dismissive of leaflets and felt they did not have time to read them with a new baby to care for. Knowledge of SIDS risk reduction has been found to be lower in disadvantaged, particularly immigrant, mothers in an Australian study (Kemp, Harris & Chavez 2006). On the other hand, a US based study found that health educator-led small group antenatal sessions for deprived black mothers led to substantial increases in knowledge about SIDS and use of safe sleeping practices that persisted to at least six months post delivery, suggesting that in some circumstances health promotion messages can have powerful effects (Moon, Oden & Grady 2004).

There is always the possibility that universally delivered health promotion advice can lead to a widening of inequalities due to preferential take up of the advice in the most affluent groups. This phenomenon has been well documented in relation to SIDS. Inequalities in SIDS (with rates higher in more deprived groups) were noted to increase in the years following the Back to Sleep campaign (Leach et al. 1999). A recent detailed analysis of inequalities in infant mortality over time in Scotland has shown that SIDS fell dramatically in the most affluent group from slightly before the Back to Sleep campaign (postulated as being triggered by the release of key papers showing the risk of prone sleeping and associated media coverage) (Wood et al. 2012b). By contrast, the SIDS rate in the most deprived group fell only slowly from 1992 into the early 2000s. This resulted in a marked increase in relative inequality in SIDS by deprivation over the 1990s, within the context of overall declining rates. Since the mid 2000s, the SIDS rate in deprived groups has almost ‘caught up’ with that in affluent groups and no significant gradient with deprivation is now evident. Similar temporal patterns in inequalities in neonatal and infant deaths from other

causes were not evident, making it more likely that this pattern is a direct result of differential take up of SIDS risk reduction messages. Again, the specific effectiveness of advice delivered through the CHP cannot be ascertained from this analysis. Although risk is now more comparable across the social spectrum, this does not necessarily mean that no further reduction in risk is achievable. Risk factors such as unsafe sleeping position, bed sharing, and parental smoking still persist to varying degrees hence the potential remains to reduce incidence still further (Allen et al. 2009).

In summary, there is good evidence that the provision of risk reduction messages has been very effective at reducing SIDS incidence, with positive effects seen more quickly in more affluent groups. The relative contribution of advice provided through the Child Health Programme, compared to that provided through antenatal care or the mass media, is unknown. There is some evidence that SIDS advice provided by Health Visitors does not always 'reach' parents and succeed in changing behaviour. This evidence reflects wider challenges commonly encountered within health promotion practice. Approaches such as building on parents' existing strengths and using techniques such as agenda matching (Sigerson, Gruer 2011, Chief Medical Officer 2011) and motivational interviewing (Rollnick et al. 2010) are being advocated in recognition of the limitations of simple 'information provision' type approaches. These may be helpful in enhancing the impact of the Child Health Programme on issues such as SIDS although evidence on this is not yet available.

Appendix 4 Read codes used for analysis of trends in GP consultation rates for preventive care of pre-school children

Notes:

For most consultation types, only consultations with children aged 0-4 years were examined. For the following consultation types, consultations with women aged 15-49 years were also (separately) examined:

- Postnatal care
- General health advice and parenting support
- Assessment and advice relating to child nutrition and growth

Restricted code lists (excluding those marked child only) were used to ensure only consultations relating to children were included.

All code lists were finalised in June 2011 using Read code version 2 (Scottish) browser.

6-8 week child health review

64D..	Child 6 week exam.
64D4.	Child 6 week exam. normal
64D5.	6 week exam.abnormal -for obs.
64D6.	6 week exam.abnormal -referred
64D7.	6 week exam.abn.-on treatment
64DZ.	Child 6 week exam. NOS
64a..	Child 8 week exam
64a4.	Child 8 week exam. normal
64a5.	8 week exam.abnormal -for obs.
64a6.	8 week exam.abnormal –referred
64a7.	8 week exam.abn.-on treatment

8-9 month child health review

64E..	Child 8-9 month examination
64E4.	8-9 month exam normal
64E5.	8-9 mnth exam abnormal:for obs
64E6.	8-9 mnth exam abnormal: refer
64E7.	8-9 mnth exam abnormal: on Rx
64EZ.	Child 8-9 month exam NOS

22-24 month child health review

64W..	Child 21 month examination
64W4.	Child 21 month exam normal
64W5.	Child 21/12 exam abnor for obs
64W6.	Child 21/12 exam abnorm: refer
64W7.	Child 21/12 exam abnorm: on Rx
64WZ.	Child 21/12 exam NOS
9N7F.	Child health 21-24 months review
64d..	Child 2 year examination

39-42 month child health review

64X..	Child 3 year examination
64X4.	Child 3 yr exam normal
64X5.	Child 3 yr exam abnorm:for obs
64X6.	Child 3 yr exam abnorm: refer
64X7.	Child 3 yr exam abnorm: on Rx
64XZ.	Child 3 yr exam NOS
64Y..	Child 39 month examination
64Y4.	Child 39 month exam normal
64Y5.	Child 39/12 exam abnor for obs
64Y6.	Child 39/12 exam abnorm: refer
64Y7.	Child 39/12 exam abnorm: on Rx
64YZ.	Child 39 month exam NOS
64H..	3.5 year child exam.
64H4.	3.5 year exam. normal
64H5.	3.5 year exam.abn.- for obs.
64H6.	3.5 year exam.abn.- referred
64H7.	3.5 year exam.abn-on treatment
64HZ.	3.5 year exam. NOS

Other pre-school child health reviews

64T1.	Child 3 month examination
64T2.	Child 6 month examination NEC
64V..	Child 6 month examination
64V4.	Child 6 month exam normal
64V5.	Child 6/12 exam abnorm for obs
64V6.	Child 6/12 exam abnorm: refer
64V7.	Child 6/12 exam abnorm: on Rx
64VZ.	Child 6/12 exam NOS
9N7E.	Child health 7 months review
64b..	Child 7 month exam
64b3.	Child 7 month examination normal
64b4.	Child 7 month examination abnormal for observation
64b5.	Child 7 month examination abnormal referred
64b6.	Child 7 month examination abnormal on treatment
64T3.	Child 1 year examination NEC
64U..	Child 1 year examination
64U4.	Child 1 year exam.normal
64U5.	1 year exam.abnormal for obs.
64U6.	1 year exam.abnormal referred
64U7.	1 year exam.abn.-on treatment
64UZ.	Child 1 year exam.NOS
64F..	Child 18 month exam.
64F4.	18 month exam. normal
64F5.	18 month exam.abnormal for obs
64F6.	18month exam.abnormal-referred
64F7.	18month exam.abn.-on treatment
64FZ.	Child 18 month exam. NOS
64G..	Child 2.5 year exam.
64G4.	2.5 year exam. normal
64G5.	2.5 year exam.abn. - for obs.
64G6.	2.5 year exam.abn.- referred
64G7.	2.5 year exam.abn-on treatment
64GZ.	2.5 year exam. NOS
64I..	4.5 year child exam.
64I4.	4.5 year exam. normal
64I5.	4.5 year exam. abn. - for obs.
64I6.	4.5 year exam.abn.- referred
64I7.	4.5year exam.abn.-on treatment
64IZ.	4.5 year exam. NOS
69D4.	Pre-school child health exam.
ZV705	[V]Health examination of defined subpopulation (Pre-school child health exam is synonym)
9N7G.	Child health 4 years review
64...	Child health care

ZV202	[V]Routine child health check
ZV708	[V]Routine child health examination
9N0Y.	Seen in baby clinic
9N0S.	Seen in well child clinic

Postnatal care

62Q2.	P/N care from G.P.	
62Q3.	P/N - shared care	
62Q6.	Postnatal care	
62QZ.	Post natal care NOS	
62R..	Postnatal visits	
62R1.	P/N - first day visit	
62R2.	P/N - second day visit	
62R3.	P/N - third day visit	
62R4.	P/N - fourth day visit	
62R5.	P/N - fifth day visit	
62R6.	P/N - sixth day visit	
62R7.	P/N - seventh day visit	
62R8.	P/N - eighth day visit	
62R9.	P/N - ninth day visit	
62RA.	P/N - tenth day visit	
62RB.	P/N care started at birth	
62RC.	P/N care <48hrs after birth	
62RD.	P/N care >48hrs after birth	
62RZ.	Postnatal visit NOS	
62S..	Maternal P/N 6 week exam.	
62S5.	Maternal P/N exam. done	
62S6.	Postnatal examination minor problem found	
62S7.	Postnatal examination normal	
62SZ.	Maternal P/N 6 week exam. NOS	
64B..	Child exam. - birth	
64B2.	Child birth exam. - normal	
64B3.	Birth exam. abnormal -for obs.	
64B4.	Birth exam. abnormal -referred	
64B5.	Birth exam abn. - on treatment	
64BZ.	Child exam. - birth NOS	
64C..	Child exam. - 10 day	
64C2.	Child 10 day exam. - normal	
64C3.	10 day exam.abnormal -for obs.	
64C4.	10 day exam. abnormal-referred	
64C5.	10 day exam. abn.-on treatment	
64CZ.	Child 10 day exam. NOS	
6G...	Postnatal care	
6G0..	Postnatal counselling	
6G00.	Postnatal depression counselling	
ZV24.	[V]Postpartum care and examination	
ZV240	[V]Examination immediately after delivery	
ZV242	[V]Routine postpartum follow-up	
ZV24y	[V]Other specified postpartum care and examination	

ZV24z	[V]Unspecified postpartum care and examination	
8CH..	Post partum care	
Z29..	Postnatal examination observations	
6B23.	Sure Start postnatal visit	
67C..	Postnatal support group	
9N05.	Seen in postnatal clinic	

Immunisation

6571	Meningitis vaccination
6572	Pneumococcal vaccination
654..	Diphtheria vaccination
655..	Pertussis vaccination
656..	Tetanus vaccination
657A.	1st haemophilus B vaccination
657B.	2nd haemophilus B vaccination
657C.	3rd haemophilus B vaccination
657D.	Booster (single) haemophilus B vaccination
657E.	First meningitis C vaccination
657F.	Second meningitis C vaccination
657G.	Third meningitis C vaccination
657I.	Single meningitis C vaccination
657K.	Booster pneumococcal vaccination
657L.	First pneumococcal conjugated vaccination
657M.	Second pneumococcal conjugated vaccination
657N.	Third pneumococcal conjugated vaccination
658..	Polio vaccination
65A..	Measles vaccination
65a..	Diphtheria tetanus and five component acellular pertussis, haemophilus influenzae type b, inactivated polio vaccination
65B..	Rubella vaccination
65b..	Haemophilus influenzae type B and meningitis C vaccination
65F5.	Mumps vaccination
65H..	Triple - DTP - vaccination
65I..	DTP (triple)+polio vaccination
65J..	Double - DT - vaccination
65K..	DT (double)+polio vaccination
65L..	Tetanus + polio vaccination
65M1.	Measles/mumps/rubella vaccn.
65M2.	Measles/rubella vaccination
65M3.	Tetanus/low dose diphtheria vaccination
65M7.	First HiB and DTP vaccine given
65M8.	Second HiB and DTP vaccine given
65M9.	Third HiB and DTP vaccine given
65MA.	Measles mumps and rubella booster vaccination
65MB.	MMR pre-school booster vaccination
65MC.	MMR vaccination - 2nd dose
65MH.	First DTP polio and Hib vaccination
65MI.	Second DTP polio and Hib vaccination
65MJ.	Third DTP polio and Hib vaccination
65MK.	Fourth DTP polio and Hib vaccination
65MP.	Booster diphtheria, tetanus, acellular pertussis, haemophilus influenzae type b, inactivated polio vaccination

65MQ.	Booster diphtheria tetanus and three component acellular pertussis, haemophilus influenzae type b, inactivated polio vaccination
ZV035	[V]Diphtheria vaccination
ZV036	[V]Pertussis vaccination
ZV037	[V]Tetanus toxoid vaccination
ZV040	[V]Poliomyelitis vaccination
ZV042	[V]Measles vaccination
ZV043	[V]Rubella vaccination
ZV046	[V]Mumps vaccination
ZV061	[V]Diphtheria-tetanus-pertussis, combined (DTP) vaccination
ZV063	[V]Diphtheria-tetanus-pertussis with poliomyelitis (DTP + polio) vaccination
ZV064	[V]Measles-mumps-rubella (MMR) vaccination

Note all daughter codes for all these codes were also included

Medical and developmental assessment

64L..	Child exam.: general/head
64L1.	Child exam.: general behaviour
64L2.	Child exam.: appearance
64L3.	Child exam.: skin
64L4.	Child exam.: fontanelle
64L5.	Child exam.: palate
64LZ.	Child exam.: general/head NOS
64M..	Child exam.: special senses
64M1.	Child exam.: vision
64M2.	Child exam.: eyes
64M3.	Child exam.: squint
64M4.	Child exam.: ears
64M5.	Child exam.: hearing
64M6.	Child exam.: speech
64MZ.	Child exam.:special senses NOS
64N..	Child exam.: trunk/limbs
64N1.	Child exam.: heart
64N2.	Child exam.: femoral arteries
64N3.	Child exam.: hips
64N30	Ortolani's test
64N31	Barlow test
64N4.	Child exam.: spine
64N5.	Child exam.: feet
64N6.	Child exam.: herniae
64N7.	Child exam.: testes
64N8.	Child exam.: genitalia
64NZ.	Child exam.: trunk/limbs NOS
64O..	Child exam.: motor/sphincter
64O1.	Child exam.: bowel control
64O2.	Child exam.: bladder control
64O3.	Child exam.: motor tone
64OZ.	Child exam.:motor/sphincter NOS
64P..	Child exam.: development
64P1.	Child exam.:gross motor devel.
64P2.	Child exam.: fine motor devel.
64P3.	Child exam.:social development
64P4.	Child exam.: language develop.
64P5.	Child examination: gait development
64PZ.	Child exam.: development NOS
64Q..	Child: refer for surveillance
64T..	Other child examinations NEC
64TZ.	Other child examinations NOS
64Z..	Child health care NOS

Z32..	Child health assessments
Z34..	Child health screening
Z341.	Child health opportunistic screening
Z342.	Developmental screening
Z3421	Child health screening of gross motor development
Z3422	Child health screening of fine motor development
Z3423	Child health screening of vision
Z3424	Child health screening of hearing
Z3425	Child health screening of speech and language
Z3426	Child health screening of social behaviour and play
ZV20.	[V]Infant or child health supervision
ZV201	[V]Care of other healthy infant
ZV20y	[V]Other specified child health supervision
ZV20z	[V]Unspecified child health supervision
ZV6y1	[V]Hlth supervisn+care of other healthy infant and child
ZV7..	[V]Well persons examination, investigation and screening
ZV70.	[V]General medical examination
ZV700	[V]Routine health checkup
ZV70y	[V]Other specified general medical examination
ZV70z	[V]Unspecified general medical examination
ZV79.	[V]Screening for mental disorders and developmental handicap
ZV792	[V]Screening for mental retardation
ZV793	[V]Screening for early childhood developmental handicap
ZV79y	[V]Screening for OS mental disorder/developmental handicap
ZV79z	[V]Screening for unsp mental disorder/developmental handicap
ZV7z.	[V]Unspecified well person screening
ZVu00	[X]Other general examinations
ZVu0P	[X]Special screen exam for certain developm disord in childh
64A..	Infant milestones
64A1.	First smiled
64A2.	First tooth
64A3.	First sat
64A4.	First crawled
64A5.	First stood
64A6.	First walked
64A7.	First talked
64A8.	Toilet trained
64AZ.	Infant milestones NOS
38C0.	Child in care health assessment

Health promotion advice and parenting support

6722.	Family counselled	
6723.	Relative counselled	
6741.	Marital counselling	
6742.	Child guidance counselling	
6747.	Relationship counselling	Child only
6783.	Health education given	Child only
6797.	Health ed. - immunisation	
6798.	Health ed. - exercise	Child only
13HP2	Poor family relationship	
13HP3	Parental marital problems	
13HP4	Parent relationship problem	
13HP5	Stepparent relationship problem	
13HP7	Child relationship problem	
13WM.	Parental concern about child	
63C2.	Bonding problems	
63CA.	H.V.: mother not managing well	
63C5.	Maternal tobacco abuse	
63C6.	Maternal drug abuse	
63C7.	Maternal alcohol abuse	
67...	Counselling/health education	Child only
671..	Counselling - general	Child only
671Z.	Counselling - general NOS	Child only
672..	Person counselled	Child only
672Z.	Person NOS counselled	Child only
674..	Social counselling	Child only
674Z.	Social counselling NOS	Child only
677G.	Family counselling	
678..	Health education - general	Child only
678Z.	Health education - general NOS	Child only
679I.	Health education - infant massage	
679N.	Health education - parenting	
679Z.	Health education - subject NOS	Child only
67H2.	Lifestyle advice regarding exercise	Child only
67I0.	Advice about child safety	
67IB.	Home safety advice	Child only
67IC.	Falls advice	Child only
67Ig.	Advice about shaking babies	
67IG.	Oral health advice given	Child only
67IK.	Advice about psychological well-being	Child only
67IP.	Advice to carer regarding child's safety	
67IQ.	Advice to carer regarding child's toilet training	
67IR.	Advice to carer regarding child's immunisations	
67IS.	Advice to carer regarding child's travel needs	

67IT.	Advice to carer regarding child's sleep	
67IV.	Advice to carer regarding child's behaviour	
67IW.	Advice to carer regarding child's minor illnesses	
67IX.	Advice to carer regarding child's dental health	
67IY.	Advice to carer regarding prevention of SIDS	
67IZ.	Advice to carer regarding child's development programme	
67J..	Stress counselling	Child only
67Z..	Counselling/health ed. NOS	Child only
6B...	Health promotion	Child only
6B0..	Nurse health promotion	Child only
6B1..	Child health promotion	
8C9..	Reassurance given	Child only
8C91.	Parent reassured	
8C95.	Carer reassured	
8CA5.	Patient advised re exercise	Child only
8CF..	Self-help group address given	Child only
8CI..	Had a chat to parent	
8O4..	Vulnerable family support	
8O7..	Carer support	
8O80.	Parental support	
Z4D..	Family counselling	
Z9M1.	Family support	
Z9M2.	Parental support	
Z9M4.	Post-adoption support	
Z9MN.	Long term social support	
Z9MP.	Special needs support	
Z9MQ.	Carer support	
ZG112	Advice about maintaining safety	Child only
ZG113	Advice about child safety	
ZG12.	Advice to undertake activity	Child only
ZGA..	Advice relating to social and personal circumstances	Child only
ZGB2.	Advice on immunisation	
ZN102	Vulnerable families support	
ZN117	Parental support	
ZV608	[V]Carer unable to cope	
ZV61.	[V]Other family reason for encounter	
ZV610	[V]Family disruption	
ZV611	[V]Marital problems	
ZV613	[V]Other parent-child problems	
ZV61A	[V]Problems in relationship with parents and in-laws	
ZV61y	[V]Other specified family reason for encounter	
ZV61z	[V]Unspecified family reason for encounter	
ZV6D.	[V]Person consulting for counselling or advice	Child only
ZVu4E	[X]Other stressful life events affecting family & household	
6B2..	Sure Start programme	

6B21.	Sure Start visit	
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Assessment and advice relating to child nutrition and growth

6411.	Bottle fed at 10 days	
6412.	Breast fed at 10 days	
6413.	Breast + supp. fed at 10 days	
6421.	Bottle fed at 6 weeks	
6422.	Breast fed at 6 weeks	
6423.	Breast fed + supp. at 6 weeks	
6424.	On solids at 6 weeks	
6431.	Bottle fed at 3 months	
6432.	Breast fed at 3 months	
6433.	Breast + supp.fed at 3 months	
6434.	On solids at 3 months	
6441.	Bottle fed at 6 months	
6442.	Breast fed at 6 months	
6443.	Breast + supp. fed at 6 months	
6444.	On solids at 6 months	
6445.	On normal diet at 6 months	
6451.	Bottle fed at 9 months	
6452.	Breast fed at 9 months	
6453.	Breast + supp. fed at 9 months	
6454.	On solids at 9 months	
6455.	On normal diet at 9 months	
6461.	Bottle fed at 1 year	
6462.	Breast fed at 1 year	
6463.	Breast + supp. fed at 1 year	
6464.	On solids at 1 year	
6465.	On normal diet at 1 year	
6471.	Child weight < 3rd centile	
6472.	Child weight=3rd-9th centile	
6473.	Child weight=10th-24th centile	
6474.	Child weight=25th-49th centile	
6475.	Child weight=50th-74th centile	
6476.	Child weight=75th-89th centile	
6477.	Child weight=90th-96th centile	
6478.	Child weight > 97th centile	
6479.	Child weight < 0.4th centile	
6481.	Child height < 3rd centile	
6482.	Child height=3rd-9th centile	
6483.	Child height=10th-24th centile	
6484.	Child height=25th-49th centile	
6485.	Child height=50th-74th centile	
6486.	Child height=75th=89th centile	
6487.	Child height=90th-96th centile	
6488.	Child height > 97th centile	

6489.	Child height < 0.4th centile	
6799.	Health ed. - diet	Child only
615H.	Breast feeding problem	
62P..	Infant feeding method	
62P1.	Breast fed	
62P2.	Bottle fed	
62P3.	Breast feeding with supplement	
62P4.	Breast changed to bottle feed	
62P5.	Breast feeding started	
62P6.	Breast feeding stopped	
62P7.	Bottle feeding started	
62P8.	Bottle feeding stopped	
62P9.	Infant weaned	
62PA.	Mother currently breast feeding	
62PB.	Bottle changed to breast	
62PC.	Breast feeding problem	
62PD.	Lactation established	
62PZ.	Infant feeding method NOS	
63CC.	Difficult to establish feeding	
641..	Infant feeding - at 10 days	
641Z.	Infant feeding at 10 days NOS	
642..	Infant feeding at 6 weeks	
642Z.	Infant feeding at 6 weeks NOS	
643..	Infant feeding at 3 months	
643Z.	Infant feeding at 3 months NOS	
644..	Infant feeding at 6 months	
644Z.	Infant feeding at 6 months NOS	
645..	Infant feeding at 9 months	
645Z.	Infant feeding at 9 months NOS	
646..	Infant feeding at 1 year	
646Z.	Infant feeding at 1 year NOS	
647..	Child weight centiles	
647A.	Child weight = 0.4th centile	
647B.	Child weight 0.5th - 1.9th centile	
647C.	Child weight = 2nd centile	
647D.	Child weight 3rd - 8th centile	
647E.	Child weight 9th centile	
647F.	Child weight 10th - 24th centile	
647G.	Child weight = 25th centile	
647H.	Child weight 26th - 49th centile	
647I.	Child weight = 50th centile	
647J.	Child weight 51st - 74th centile	
647K.	Child weight = 75th centile	
647L.	Child weight 76th - 90th centile	
647M.	Child weight = 91st centile	

647N.	Child weight 92nd - 97th centile	
647O.	Child weight = 98th centile	
647P.	Child weight 98.1st - 99.6th centile	
647Q.	Child weight > 99.6th centile	
647Z.	Child weight centiles NOS	
648..	Child height centiles	
648A.	Child height 0.5th - 1.9th centile	
648B.	Child height = 2nd centile	
648C.	Child height 3rd - 8th centile	
648D.	Child height = 9th centile	
648E.	Child height 10th - 24th centile	
648F.	Child height = 25th centile	
648G.	Child height 26th - 49th centile	
648H.	Child height = 50th centile	
648I.	Child height 51st - 74th centile	
648J.	Child height = 75th centile	
648K.	Child height 76th - 90th centile	
648L.	Child height = 91st centile	
648M.	Child height 92nd - 97th centile	
648N.	Child height = 98th centile	
648O.	Child height 98.1st - 99.6th centile	
648P.	Child height > 99.6th centile	
648Q.	Child height = 0.4th centile	
648Z.	Child height centiles NOS	
64e..	Infant feeding at birth	
64e0.	Bottle fed at birth	
64e1.	Breast fed at birth	
64f..	Infant feeding at 4 months	
64f0.	Breast fed at 4 months	
66C..	Obesity monitoring	Child only
66C9.	Target weight discussed	Child only
66CA.	Ideal weight discussed	Child only
679P.	Health education - weight management	Child only
679Q.	Health education - nutrition	Child only
67A1.	Infant feeding advice	
67AD.	Neonatal feeding education	
67I3.	Advice about weaning	
67Ik.	Patient advised about nutrition	Child only
67II.	Child feeding advice	
67IN.	Advice to carer regarding child's diet	
8C1H.	Breast feeding education	
8CA4.	Patient advised re diet	Child only
8CA40	Pt advised re wt reducing diet	Child only
8CJ0.	Paediatric feeding management	
Z16..	Breast care procedure	

Z161.	Application of dressing to breast	
Z162.	Application of medicament of breast	
Z163.	Nipple care procedure	
Z1631	Applying expressed breast milk to nipples	
Z1632	Applying topical preparations to nipples	
Z1633	Exposing nipples to air	
Z164.	Breast stimulation	
Z165.	Tight binding of breast	
Z166.	Supporting breasts during breast-feeding	
Z167.	Expressing colostrum	
Z1P24	Instruction relating to breast-feeding	
Z1P25	Instruction on breast hygiene	
Z1P26	Instruction on correct fixing of baby to breast	
Z2B..	Breast-feeding procedures	
Z2B1.	Removing baby from breast	
Z2B2.	Positioning of baby at the breast	
Z2B21	Lying baby by mother's side when feeding at the breast	
Z2B22	Sitting baby on mother's lap when feeding at the breast	
Z2B23	Turning baby's body towards mother when breast-feeding	
Z2B24	Supporting baby's head when breast-feeding	
Z2B25	Placing baby's mouth opposite the nipple	
Z2B26	Extending the baby's neck slightly for breast-feeding	
Z2B3.	Resting the breast	
Z2B31	Resting right breast	
Z2B32	Resting left breast	
Z2B33	Resting both breasts	
Z2B4.	Encouraging rooting reflex	
Z2B41	Stroking baby's mouth with nipple	
Z2B42	Stroking baby's top lip	
Z2B5.	Lactation management	
Z2B51	Suppression of lactation	
Z2B52	Natural suppression of lactation	
Z2B53	Suppression of lactation with hormones	
Z2B54	Establishing lactation	
Z2B55	Weaning from the breast	
Z2C..	Ability to perform breast-feeding	
Z2C1.	Able to perform breast-feeding	
Z2C2.	Unable to perform breast-feeding	
Z2C3.	Does perform breast-feeding	
Z2C4.	Does not perform breast-feeding	
Z2C5.	Difficulty performing breast-feeding	
Z2C6.	Ability to position baby at breast for feeding	
Z2C61	Able to position baby at breast for feeding	
Z2C62	Unable to position baby at breast for feeding	
Z2C63	Positions baby at breast for feeding	

Z2C64	Does not position baby at breast for feeding	
Z2C65	Difficulty positioning baby at breast for feeding	
Z2D..	Ability to latch on to breast for feeding	
Z2D1.	Able to latch on to breast for feeding	
Z2D2.	Unable to latch on to breast for feeding	
Z2D3.	Does latch on to breast for feeding	
Z2D4.	Does not latch on to breast for feeding	
Z2D5.	Difficulty latching on to breast for feeding	
Z44..	Breast-feeding counselling	
ZC2C7	Patient advised about weight reduction diet	Child only
ZC2CE	Dietary advice for failure to thrive	
ZC2CM	Dietary advice for obesity	Child only
ZC2CN	Dietary advice for weight gain	Child only
ZC2CO	Dietary advice for weight loss	Child only
ZC2D.	Advice about weaning	
ZC2L.	Dietary advice for breast-feeding	
ZC4..	Dietary health promotion advice	Child only
ZC7..	Food hygiene advice	Child only
ZC71.	Advice for hygienic feed preparation	Child only
ZC72.	Advice for hygienic feed storage	Child only
ZC73.	Advice for hygienic food preparation	Child only
ZC74.	Advice for hygienic food storage	Child only
ZG53.	Advice about weight	Child only
ZN116	Breastfeeding support	
ZV241	[V]Examination of Lactating mother	
ZV4K3	[V]Inappropriate diet and eating habits	Child only
ZV653	[V]Dietary surveillance and counselling	Child only
ZV778	[V]Screening for obesity	Child only

Child protection

13FX.	Lives in care home
13FY.	Lives in a children's unit
13IB.	Child in care
13IB0	Child in foster care
13IC.	Child on "at risk" register
13ICZ	Child on "at risk" regist NOS
13Id.	On child protection register
13If.	Child is cause for concern
13IF.	Child at risk
13Ig.	Family member on child protection register
13Ih.	Subject to supervision order under Children Act 1989
13Ii.	Subject to care order under Children Act 1989
13Ij.	Subject to interim care order under Children Act 1989
13Ik.	Child in care voluntarily
13Il.	Subject to interim supervision order under Children Act 1989
13IM.	Child on protection register
13IN.	Family member on protection register
13Ip.	Family is cause for concern
13Iq.	Vulnerable family
13IQ.	Vulnerable child in family
13IS.	Child in need
13Iv.	Subject to child protection plan
13IV.	Looked after child - Children (Scotland) Act 1995
13Ix.	Child for permanence
13Iy.	Family member subject of child protection plan
13VJ.	In care
13W3.	Child abuse in family
13W4.	Parent/child conflict
13W40	Child/parent violence
63C..	Baby misc. "at-risk" factors
63C3.	Cot death liability
63C4.	Battered baby suspect - FH
63CB.	Risk of non-accidental injury
63CD.	High risk infant
63CZ.	Baby "at-risk" factors NOS
64c..	Child protection procedure
SN55.	Child maltreatment syndrome
SN550	Emotional maltreatment of child
SN551	Nutritional maltreatment of child
SN552	Non-accidental injury to child
SN553	Battered baby or child syndrome NOS
SN554	Multiple deprivation of child
SN555	Physical abuse of child

SN55z	Child maltreatment syndrome NOS
SN57.	Maltreatment syndromes
SN570	Neglect or abandonment
SN571	Sexual abuse
SN572	Child affected by Munchausen's by proxy
SyuH5	[X]Other maltreatment syndromes
Z31..	Adoption and fostering procedures
Z311.	Adoption
Z3111	Open adoption
Z3112	Semi-open adoption
Z312.	Fostering
Z3121	Long-term fostering
Z3122	Short-term fostering
Z313.	Matching process for adoption / fostering
Z315.	Consent to adoption
Z331.	Child protection plan
Z3311	Intra-agency protection plan
Z35..	Child protection procedure
Z351.	Immediate protection of child
Z352.	Child protection investigation
Z353.	Provision of accommodation
Z3531	Child accommodated
Z3532	Child taken into care
ZV4G1	[V]Removal from home in childhood
ZV4G4	[V]Problem relatd/alle.g. sex abuse cld by person prim sup grp
ZV4G5	[V]Problems related to alleged physical abuse of child
ZV4H.	[V]Other problems related to upbringing
ZV4H0	[V]Inadequate parental supervision and control
ZV4H1	[V]Parental overprotection
ZV4H2	[V]Hostility towards and scapegoating of child
ZV4H3	[V]Emotional neglect of child
ZV4H4	[V]Other problems related to neglect in upbringing
ZV4H5	[V]Inappropriat parental press+oth abn qualities/upbringing
ZV4H6	[V]Lack of learning and play experience
ZV4Hy	[V]Other specified problems related to upbringing
ZV612	[V]Child abuse
ZVu4B	[X]Other problems related to neglect in upbringing
ZVu4C	[X]Inapprop parental pressure & oth abnorm quals upbringing
63C4.	Battered baby suspect - FH
U3M1.	[X]Neglect and abandonment, by parent
U3N1.	[X]Other maltreatment syndromes, by parent
13ZR.	At risk of emotional/psychological abuse
13ZS.	At risk of discriminatory abuse
13ZT.	At risk of physical abuse
13ZV.	At risk of neglect by others

13ZW.	At risk of sexual abuse
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Appendix 5 Research outputs and impact

The following published **journal articles** directly report work presented in this thesis. These papers are provided for reference at the end of the thesis. Permission to include the papers has been obtained from all co-authors. An additional paper reporting the international comparison of different countries' CHPs is being prepared for submission.

- Wood R (2009) Services for children: emerging as a genuine priority within health policy at last? *Child: Care, Health & Development*, 35, 289-92.
- Wood R, Stirling A, Nolan C, Chalmers J & Blair M (2012) Trends in the coverage of 'universal' child health reviews: observational study using routinely available data. *BMJ Open*, 2, e000759.
- Wood R, Stockton D & Brown H (2012) Moving from a universal to targeted Child Health Programme: which children receive enhanced care? A population based study using routinely available data. *Child: Care, Health & Development*, doi 10.1111/j.1365-2214.2012.01423.x.
- Wood R & Wilson P (2012) General Practitioner provision of preventive child health care: analysis of routine consultation data. *BMC Family Practice*, 13, 73.

The following selected **presentations and working papers** also directly reported work presented in this thesis. These and all other outputs referred to below are available on request.

- Wood R (2006) Moving from universal to targeted Child Health Surveillance: plans for evaluation. Powerpoint presentation summarising the proposed work to be undertaken for this thesis presented to the Faculty of Public Health annual conference in November 2006.
- Wood R (2008) Child Health Surveillance in Scotland: policy issues and implications for evaluation. Powerpoint presentation summarising the Health for All Children reports, how HFAC4 had been translated in the 2005 Scottish Child Health Programme guidance, and how the 2005 guidance interacted with broader Scottish policy. Presented to the Scottish Government's Hall 4 network group in January 2008.
- Wood R (2008) Placing Child Health Surveillance in an international context: approaches to the provision of 'well child care' in selected industrialised countries. Unpublished working paper. Presented to the Scottish Government's Hall 4 network group in September 2008.
- Wood R (2010) *Implementation and impact of Health for All Children 4 (HFAC4) in Scotland: insights from nationally collected health data*. Research briefing summarising the quantitative analyses presented in this thesis. Provided to the Scottish Government child health policy leads in January 2010.
- Wood R (2010) Increased targeting of Child Health Surveillance: impact on equity of early years support. Powerpoint presentation on the coverage of universal child health reviews presented to the Faculty of Public Health annual conference in November 2010.

Undertaking the work presented in this thesis has facilitated the following **research collaborations**.

- Updating a chapter on preventive health care for children in the main UK paediatrics textbook with Prof Harry Campbell, University of Edinburgh. Published as Campbell H & Wood R (2008) *Preventive paediatrics*. In: McIntosh N, Helms P, Smyth R & Logan S, eds. Forfar & Arneil's Textbook of Pediatrics. 7th ed. Edinburgh: Elsevier, pp27-44.
- Undertaking an analysis of data from the Starting Well intensive home visiting and family support demonstration project with Prof Charlotte Wright, University of Glasgow. Published as Wright CM, Jeffrey SK, Ross MK, Wallis L & Wood R (2009) Targeting Health Visitor care: lessons from Starting Well. *Archives of Disease in Childhood*, 94, 23-27.
- Undertaking an analysis of Millennium Cohort Study data looking at delayed language development with Prof James Law, University of Newcastle. Published as Law J, Rush R, Anandan C, Cox, M & Wood R (2012) Predicting language change between three and five years and its implications for early identification. *Pediatrics*, 130 (1), e132-e137.
- Working with Prof Phil Wilson, University of Aberdeen, on analysis of linked data on children's early circumstances and developmental status. Funded as Wilson P, Wood R, Reynolds L, Thompson L, Forde M, McClung M. *Enhancing information systems to enhance children's health and development: exploring options in Glasgow*. £39,969 funded by Scottish Collaboration for Public Health Research and Policy. Project start April 2010.
- Working with Prof Jill Pell, University of Glasgow, on a national test linkage of routinely available health and education data as a potentially powerful tool for researching children's outcomes. Funded as Pell J, Wood R, King A, Mackay D, Reynolds, L, Morris C & Springbett A. *Impact of health interventions on educational outcomes: an exemplar study of the management of breech infants*. £61,394 funded by Scottish Collaboration for Public Health Research and Policy. Project start January 2012.

The work presented in this thesis continues to have a direct impact on my day to day work as Consultant in Public Health Medicine in the Information Services Division of NHS Scotland (ISD) responsible for use of **national data relating to child health**. Specific examples of impact include the following.

- Developing the national statistical publications relating to child health. When the proposed 24-30 month child health review is fully implemented, ISD plans to extend its range of publications relating to the Child Health Programme. Information will be published on the coverage of child health reviews (using the methodology used for this thesis), on the allocation of the Health Plan Indicator, and on children's development at 24-30 months.
- Developing the linkage of routine data relating to maternal and child health. ISD has historically routinely linked together data relating to maternal and neonatal health but this thesis involved linkage of maternal and Child Health Programme records for the first time in Scotland. I am currently leading a project within ISD to modernise the approach to data linkage so that all of the datasets held by ISD that relate to maternal and/or child health can be easily linked together to allow analysis of both mothers' and babies' outcomes over long periods of time.
- Supporting a range of colleagues to use the national data relating to child health to support research. As well as the research collaborations noted above that have built directly on my thesis work, the broad knowledge of national data relating to child health that I obtained through my thesis allows me to provide advice and support to a range of colleagues who would like to use the data for research purposes. Current colleagues I am working with include Prof Jane Norman, University of Edinburgh (follow up of twins involved in a clinical trial of maternal progesterone to prevent preterm birth), Prof Peter Helms, University of Aberdeen (developing methods for pharmacovigilance in children), and Dr David Conway, University of Glasgow (examining the health outcomes of looked after children).

Throughout the time I have been working on this thesis, I have been actively engaged in the ongoing **development of policy** relating to the Child Health Programme in Scotland. Specific examples of engagement and impact include the following.

- Member of the Scottish Government's Hall 4 network group from 2007 to the cessation of the group in 2009 and the group's HPI working subgroup from 2008 to 2009.
- Member of the Child Health Commissioners group 2010 to present.
- Member of the Children and Young People's Health Support ministerial advisory group 2010 to present.
- Member of a Scottish Government working group that planned the consultation events that informed the January 2011 CHP policy update
- Chair of a Scottish Government short life working group on the 24-30 month child health review that was proposed in the January 2011 policy update. The group was tasked with producing national guidance on the review, in particular on the clinical content, recommended assessment procedures and health promotion resources, and the minimum dataset to be returned to ISD on completed reviews. The group was established in December 2011 and presented draft guidance to the Scottish Government in June 2012. The final guidance was published in December 2012.

Services for children: emerging as a genuine priority within health policy at last?

R. Wood

Public Health Sciences, University of Edinburgh, Medical School, Edinburgh, UK

Correspondence:

Rachael Wood, MBChB,
MPH, FFPH, Public Health
Sciences, University of
Edinburgh, Medical
School, Teviot Place,
Edinburgh EH8 9AG, UK
E-mail:
rachael.wood@ed.ac.uk

There is currently a determined focus on improving children's early experiences and opportunities within broad social policy in the UK. Questions remain, however, regarding the extent to which health policy is contributing to this focus on children's needs, although recent developments give cautious grounds for optimism.

There has been a gradually increasing recognition in the UK and elsewhere over many years of the particular needs and vulnerability of children and young people. In particular, the profound influence of children's earliest experiences on their subsequent development and health trajectories is now well recognized (Shonkoff & Phillips 2000). There is concurrent acknowledgement that at least some recent economic and social trends have disproportionately disadvantaged children and contributed to significant shifts in their well-being (Roberts 1997). Income inequality has risen and the UK has one of the highest rates of child poverty in Europe (Child Poverty Action Group 2008). Inequalities in school readiness and educational attainment persist, family breakdown and lone parenthood are commonplace, and high levels of intergenerational mistrust are evident (The Children's Society 2006). Against this backdrop, although many aspects of children's physical health continue to improve, indicators of their mental health are deteriorating. Around 1/10 British children aged 5–16 has a clinically significant mental health and/or behavioural problem (Green *et al.* 2005), and the UK has been ranked last among 21 industrialized countries for child well-being, with our children faring particularly badly with respect to the quality of their relationships, their

participation in health damaging behaviours and their subjective well-being (Innocenti Research Centre 2007).

Serious attempts to address these challenges are being made across departments within the UK Government and across the devolved administrations through legislative and policy developments. The UK ratification of the United Nations Convention on the Rights of the Child (Office of the United Nations High Commissioner for Human Rights 1989) in 1991 was a significant early indication of the desire to take children's rights seriously. Subsequent appointment of Children's Commissioners in (eventually) all four constituent countries of the UK to advocate for implementation of the Convention has been an important further step, and recent reports have demonstrated considerable (but not complete) progress towards implementation (Department for Children, Schools and Families 2007a). The UK Government's commitment to eradicating child poverty by 2020 is also of potentially profound importance to children's lives. Substantial progress has been made since the late 1990s in reducing the number and proportion of children living in relative poverty (i.e. in households with equivalized income before housing costs of less than 60% of the Great Britain median), but this positive trend appears to have stalled or possibly even reversed since 2005/2006 (HM Treasury 2008), and the current global financial crisis is a clear threat to further reductions in poverty. Other developments have sought to support children by increasing the advice and support available to parents (Department for Education and Skills 2006), improving the availability of high-quality, affordable childcare

(HM Treasury 2004), improving and equalizing educational attainment (Scottish Executive 2004), and providing children with more play and other constructive leisure opportunities (Department for Children, Schools and Families 2008). These individual strands of work have been drawn together in both England and Scotland under the umbrella of long-term children's plans/strategies (Department for Children, Schools and Families 2007b; Scottish Government 2008).

Alongside this work, specific reform programmes for children's services (i.e. preschool and school education, child protection, youth justice services and other services specifically for children) are also underway in both England (Every Child Matters Website 2008) and Scotland (Scottish Government Children's Services Website 2008). These reform programmes have set out a vision of the range of children's services forming an integrated single system providing a strong universal base of services available to all children supplemented by individualized, proportionate, additional services for children that require them. Other key aspirations include much more emphasis on preventive/early interventions rather than crisis management, and retaining a focus on improving children's outcomes. Sure Start has been important in developing and testing innovative ways of integrating services for vulnerable children, although the programme is now developing differently across the UK (Sure Start Scotland Website 2008; Sure Start Website 2008).

It is salient to consider to what extent health policy and consequently health services are contributing to these broad attempts to promote the development and well-being of children and to equalize their life chances. The Child Health Promotion (CHP) Programme is the National Health Service (NHS) service most clearly focusing on improving young children's well-being. The CHP Programme is the integrated package of immunization, screening, surveillance, health promotion and parenting support delivered predominantly by health visitors to preschool-age children and their families. Updated professional guidance on the programme (Hall & Elliman 2003) has led to considerable recent change in CHP policy across the UK (Scottish Executive Health Department 2005; Department of Health 2008). The core universal CHP Programme has been condensed and refocused on health promotion and parenting support rather than detection of medical or development problems in children. Greater emphasis has also been placed on targeting additional support to families with particular needs in an attempt to address inequalities, and integrating delivery of the CHP Programme with other children's services. In practice, these reforms mean a reduced number of routine health visitor contacts being offered to 'low risk' families, less emphasis on repeated formal growth and developmen-

tal surveillance and very intensive support, often modelled on previously trialled programmes such as the Incredible Years parenting programme (Webster-Stratton & Reid 2008) or Nurse Family Partnership programme (Olds 2002) for 'vulnerable' families.

These reforms are broadly congruent with reform of other children's services, although the extent, to which the core CHP Programme can be reduced while remaining a robust universal service base capable of providing effective support to all families and successfully identifying families in need of additional input, is a matter of debate (Wright *et al.* 2009). The details of implementation and how policy on the content of CHP fits with other policy developments (particularly those focusing on health visitor workforce issues) vary considerably across the UK, however, and they impact significantly on the likelihood of attaining policy goals. In England, complementary policies emphasize strengthening health visiting as an independent profession with leadership responsibility for CHP and delivery of key elements of the CHP Programme from multi-agency children's centres (Department of Health 2007). In Scotland, conversely, a recent review of community nursing has called for the amalgamation of health visiting, school nursing and district nursing into a single discipline with an apparently dominant focus on adults' rather than children's health (Scottish Executive Health Department 2006). This has raised serious questions around future delivery of the CHP Programme, although the community nursing policy has been the focus of substantial professional opposition, and it is unclear at present how or even whether it will actually be implemented (O'Rourke 2007).

In addition to policies governing CHP, both England and Scotland have developed laudable specialist policies governing the provision of the range of health services to children that attempt to ensure that children receive clinically safe, age-appropriate care focused on their individual needs and well-being (Department of Health 2004; Scottish Executive 2007). A review of implementation of England's National Service Framework for Children's standards for care of children in hospital has shown that these policies can be difficult to deliver outwith specialist paediatric departments, however (Commission for Healthcare Audit and Inspection 2007).

A number of generic (i.e. non-child specific) health policy developments continue to demonstrate little attention to children's needs. The 2003 GP Contract is a key example of a generic health policy that singularly fails to take adequate account of children's requirements or promote their well-being. Although children are frequent users of primary care services, the new contract pays little attention to their needs (Department of Health 2003). The contract offers general practitioners (GPs) the

choice of opting out of providing childhood immunizations and of contributing to the CHP Programme. The Quality and Outcomes Framework (QOF) part of the contract that was developed to remunerate GPs for providing high-quality care offered GPs only six out of a possible 1050 quality points for the provision of the CHP Programme in its original 2003 format, and the QOF points available for the management of chronic conditions that affect patients of all ages, e.g. diabetes and epilepsy, excluded young children from their scope. The QOF has been repeatedly revised since 2003; however, no substantive changes to the incentives offered to GPs for the provision of CHP or other services to children have been made, and new conditions now covered by the quality framework, e.g. obesity, again exclude children (British Medical Association 2008). There is a lack of published research evidence on the effect of the new GP Contract on the quality of primary care for children, but calls have been made for future revisions of the contract to better reflect children's needs (Scottish Executive 2007, p. 27).

In Scotland, overarching policy governing the long-term development of the NHS sets out a vision of services that are focused on proactive health promotion, local, individualized, rapid delivery of care and integration with other services. These features of a health system would in theory benefit the whole population, but in practice, until recently, overarching NHS policy has been framed almost exclusively as a response to meeting the requirements of an ageing population and hence focused on the needs of adults with multiple chronic conditions (Scottish Executive 2005). There are signs, however, that this long-standing situation may be changing: the new Scottish Government elected in 2007 has published its updated policy on the future of the NHS which explicitly does not change the basic vision governing service development but does include an unprecedented focus on the healthcare needs of children in addition to those of the adult population (Scottish Government 2007).

It is difficult to quantify the contribution of health policy and health services to Governments' attempts to improving children's lives or the priority afforded to children's services within generic health policy; however, several key messages deserve emphasis. There is now widespread recognition across UK Governments of the importance of improving and equalizing children's experiences both as a moral duty and as a means of achieving numerous social policy goals such as reduced health inequalities. A wide range of actions are consequently being taken including substantial reform of children's services. Specialist children's health policy, e.g. that relating to the CHP Programme, clearly aspires to contributing to the active promotion of children's well-being, although how such policies are

implemented in practice may remain problematic. Overarching NHS policy still tends to pay little attention to children's needs, by contrast, although there are some signs that this may be changing, at least in Scotland. This can lead to tensions, with different strands of policy having apparently incompatible aims. The challenge remains therefore to ensure that generic health policy balances the needs of all demographic groups and thus plays its full part in the drive to improve children's lives.

Competing interests: The author has no competing interests to declare.

Funding: The author is in receipt of a Clinical Academic Training Fellowship from the Chief Scientist Office of the Scottish Government (CAF/06/05) to fund evaluation of the child health promotion programme in Scotland. No additional funding was received for the work leading to this article. The author has been independent of funders at all times with respect to preparing this article and deciding to submit it for publication.

Acknowledgements

The author is grateful to Harry Campbell, Graham MacKenzie and Allyson Pollock for comments on drafts of this article.

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Trends in the coverage of 'universal' child health reviews: observational study using routinely available data

Rachael Wood,¹ Alex Stirling,² Claire Nolan,¹ Jim Chalmers,¹ Mitch Blair³

To cite: Wood R, Stirling A, Nolan C, *et al.* Trends in the coverage of 'universal' child health reviews: observational study using routinely available data. *BMJ Open* 2012;**2**:e000759. doi:10.1136/bmjopen-2011-000759

► Prepublication history for this paper is available online. To view this file please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2011-000759>).

Received 13 December 2011
Accepted 10 February 2012

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¹Information Services Division, NHS National Services Scotland, Edinburgh, UK

²Department of Public Health, NHS Greater Glasgow and Clyde, Glasgow, UK

³River Island Academic Centre for Paediatrics and Child Health, Imperial College London, Harrow, Middlesex, UK

Correspondence to
Dr Rachael Wood;
rachaelwood@nhs.net

ABSTRACT

Objectives: Universally offered child health reviews form the backbone of the UK child health programme. The reviews assess children's health, development and well-being and facilitate access to additional support as required. The number of reviews offered per child has been reduced over recent years to allow more flexible provision of support to families in need: equitable coverage of the remaining reviews is therefore particularly important. This study assessed the coverage of universal child health reviews, with an emphasis on trends over time and inequalities in coverage by deprivation.

Design: Assessment of the coverage of child health reviews by area-based deprivation using routinely available data. Supplementary audit of the quality of the routine data source used.

Setting: Scotland.

Participants: Two cohorts of around 40 000 children each. The cohorts were born in 1998/1999 and 2007/2008 and eligible for the previous programme of five and the current programme of two preschool reviews, respectively.

Outcome measures: Coverage of the specified child health reviews for the whole cohorts and by deprivation.

Results: Coverage of the 10 day review is high (99%), but it progressively declines for reviews at older ages (86% for the 39–42 month review). Coverage is lower in children living in the most deprived areas for all reviews, and the discrepancy progressively increases for reviews at older ages (78% and 92% coverage for the 39–42 month review in most and least deprived groups). Coverage has been stable over time: it has not increased for the remaining reviews after reduction in the number of reviews provided.

Conclusions: The inverse care law continues to operate in relation to 'universal' child health reviews. Equitable uptake of reviews is important to ensure maximum likely impact on inequalities in children's outcomes.

INTRODUCTION

Children's early experiences profoundly shape their development and long-term health and well-being.^{1 2} The UK child health

ARTICLE SUMMARY

Article focus

- A series of universally offered child health reviews providing assessment of children's health, development and well-being forms the backbone of the UK child health programme.
- The number of reviews offered per child has been reduced over recent years to increase capacity to provide effective individualised support to families in need: equitable coverage of the remaining reviews is therefore particularly important.
- We used routinely available data to assess the coverage of the various child health reviews (overall and by deprivation) before and after the change in the number of reviews offered.

Key messages

- Coverage of reviews offered in early infancy is high, but it progressively declines for reviews at older ages (around 99% coverage for the 10 day review and 86% for the 39–42 month review).
- Coverage is lower in the most deprived groups for all reviews, and the discrepancy progressively increases for reviews at older ages (78% and 92% coverage for the 39–42 month review in most and least deprived groups).
- Coverage has not changed for the remaining reviews after reduction in the number of reviews offered: the inverse care law continues to operate in relation to provision of 'universal' child health reviews.

Strengths and limitations of this study

- To our knowledge, no quantitative assessment of the coverage of child health reviews offered in the UK has previously been published.
- This analysis involved large numbers of children: over 80 000 children eligible to receive their child health reviews in Scotland were included.
- Careful consideration must be given to data quality when analysing routinely available data: we conducted an audit of data quality to allow the uncertainty in the results to be quantified.

promotion programme aims to support children through their early years and help them attain their developmental and health potential.^{3 4} The programme comprises screening, immunisation, developmental

Coverage of universal child health reviews

reviews, parental support and health promotion. A number of reviews are offered to all children at specified ages. The reviews are usually carried out by health visitors (HVs), sometimes alongside others such as general practitioners (GPs), and focus on assessing children's growth, development, health and wider family well-being and thus determining the need for further professional input.

Professional guidance on the delivery of the child health programme issued in 2003⁵ suggested that there was too much emphasis on provision of these 'routine' reviews leading to a relatively inflexible system that had done little to address persistent inequalities in children's outcomes.⁶ Adoption of this guidance across the UK has led to a new emphasis on a 'progressive universalism' model of delivery, with a reduced programme of universal reviews complemented by more intensive individualised care for those families in need of professional services.⁷

The Scottish Government took particularly decisive action in this regard. Policy issued in 2005 reduced the number of universal preschool child health reviews from six (at 10 days, 6–8 weeks, and 8–9, 22–24, 39–42 and 48–54 months) to two (at 10 days and 6–8 weeks).⁸ At the same time, a three-category indicator of need (the Health Plan Indicator—core, additional and intensive) was introduced to facilitate the identification of those children requiring enhanced support in addition to that offered through the universal programme. The revised programme was implemented in different NHS board areas between 2005 and 2010.

People who are most in need of health services are often the least likely to access them.⁹ People from deprived areas are particularly disadvantaged in terms of access to preventive/proactive healthcare.^{10–11} There is evidence from the USA of marked inequalities in uptake of 'well child' care,^{12–14} but, to our knowledge, no information on inequalities in uptake of child health reviews in the UK has been published to date. Ambivalence towards, or disinclination to engage with, the child health programme has been documented, however, particularly among families from deprived areas.^{15–18}

For the programme to contribute to reducing inequalities in children's outcomes, it is essential that children from across the social spectrum participate in the universal reviews and hence have the opportunity to receive the level of input required to secure good outcomes. We therefore used routine Scottish data to explore the following questions:

- ▶ What proportion of children actually receives the universal child health reviews?
- ▶ How does review coverage vary by deprivation?
- ▶ How has (inequality in) review coverage changed over time, in particular before and after the reduction in number of reviews offered?

We also audited the quality of the relevant routine data to provide additional information not previously available.

METHODS

Routine data sources used

All children in Scotland have a record created in the child health programme national information system. One element of the system, Child Health Surveillance Programme—PreSchool (CHSP-PS), administers the child health reviews offered to preschool children.¹⁹ When a child is due for a review, CHSP-PS sends an appointment to the family and the appropriate paper review form (in triplicate) to the HV. After the review, one copy of the completed form is returned to the local child health department where administrative staff enter the findings into the CHSP-PS system; one copy is retained in the child's HV notes and the third copy is inserted into the child's parent held record. The NHS Information Services Division (ISD) receives quarterly downloads from the system for analytical purposes.

Child health reviews included

Table 1 shows the reviews offered to all children in Scotland before and after implementation of the 2005 policy that are included in this study. It was not mandatory to record provision of the old 48–54 month review on CHSP-PS (a situation that reflects a historical decision) hence that review has been excluded. HVs are

Table 1 Cohorts included in the analysis

Cohort	Date of birth range	Included child health reviews		
		Review name	Upper age limit by which the review should be completed	Date of CHSP-PS extract used in analysis
Old child health programme	1 November 1998–31 October 1999	10 day	None specified	November 2003
		6–8 week	12 weeks	
		8–9 month	10 months	
		22–24 month	26 months	
		39–42 month	44 months	
New child health programme	1 July 2007–30 June 2008	10 day	28 days	February 2009
		6–8 week	12 weeks	

CHSP-PS, Child Health Surveillance Programme—PreSchool.

solely responsible for provision of the 10 day review. The 6–8 week review usually involves an initial assessment by the HV, followed by a medical examination by the GP. GP input into provision of reviews at older ages varied.

Cohorts included in study

Table 1 also shows the two cohorts that were studied. The ‘old child health programme’ cohort had the opportunity to receive all five previously offered reviews, whereas the ‘new child health programme’ cohort had the opportunity to receive the current reduced programme of two reviews. Children who were consistently registered to receive their child health programme in selected NHS board areas from birth up to the date of the relevant CHSP-PS data extracts were included. Boards that were established users of the CHSP-PS system by November 1998 and had implemented the revised child health programme by the beginning of 2007 were selected. These were Argyll and Clyde, Ayrshire and Arran, Borders, Fife, Forth Valley, Greater Glasgow, Lanarkshire, Lothian and Tayside. These areas together contain around 82% of the Scottish population aged younger than 5 years. The CHSP-PS downloads taken around 4 months after the upper age at which the children should have had the last included review were used for analysis.

Assessing coverage of universally offered child health reviews

All included children in each cohort were identified. Their postcode of residence at the time of data extract was used to derive their 2006 Scottish Index of Multiple Deprivation quintile and whether they lived in one of the 15% most or least deprived areas of Scotland.²⁰ Whether the children had a record on CHSP-PS of receiving each of the relevant reviews was then noted. Whether they received their reviews below the recommended upper age limit²¹ (see table 1) was also noted for all reviews except the 10 day review as the age of the child at this review is incompletely recorded. Coverage of the various reviews (at any age or where possible within the recommended age range) by deprivation level was calculated.

Differences in coverage were assessed by χ^2 tests with Yates’ continuity correction.²² CIs for differences in coverage between least and most deprived groups were calculated using the Newcombe–Wilson formula.²³ Finally, the total number of registered births occurring within the corresponding date ranges and NHS board areas was noted to assess the number of children

excluded due to dying or moving over the period of study.

Audit of CHSP-PS data quality

Due to the way the CHSP-PS system works, it may be that some children with no CHSP-PS record of a review did actually receive their review, but the paper form went astray prior to data entry. To quantify this potential for underestimation of review coverage, we conducted an audit of CHSP-PS data.

ISD prepared a case listing of all children from the new child health programme cohort that were registered with a GP practice in two localities as at February 2010 who had no CHSP-PS record of receiving a 10 day and/or a 6–8 week review. The two localities (in Greater Glasgow and Fife) were selected as they both had review coverage rates similar to that seen for Scotland as a whole, included a range of deprived/affluent and urban/rural areas, and had HV managers who were enthusiastic to undertake the audit.

Individual audit forms for all children on the case listings were securely transferred to the relevant HV teams. The forms asked whether the apparently missing review had in fact been received and then either why it had been missed or why no record was available on CHSP-PS as appropriate. The HVs completed the forms after reviewing the children’s contemporaneous clinical notes. All audit returns were entered into SPSS V. 17.0. Two authors (AS and RW) agreed on appropriate coding of free text fields. Additional variables derived from the children’s overall child health programme electronic records, specifically the child’s sex, deprivation quintile and most recently recorded Health Plan Indicator category were merged into the analysis file. The resulting data were analysed using simple descriptive statistics.

RESULTS

Coverage of universally offered child health reviews

The number of children included in each cohort is shown in table 2. The proportion of children born in the relevant board areas that were excluded from the analysis is higher for the old child health programme cohort as these children had to remain resident in the same board area for a longer period to be included. The proportion of children with an unknown deprivation category was low in both cohorts.

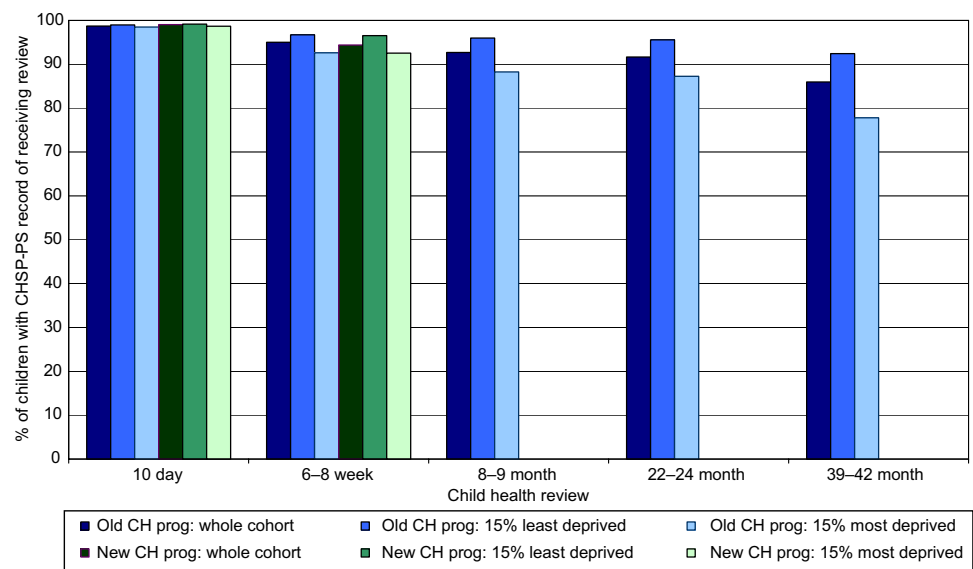
The proportion of children in each cohort that had a CHSP-PS record of receiving the various child health

Table 2 Number of children in each cohort

Cohort	Total number of births in included boards in relevant date range	Number (%) of children included in cohort	Number (%) of children in cohort with known deprivation status
Old child health programme	45 122	37 668 (83.5)	37 325 (99.1)
New child health programme	48 310	45 777 (94.8)	45 624 (99.7)

Coverage of universal child health reviews

Figure 1 Coverage of universally offered child health reviews. Least and most deprived groups are children living in the 15% least and most deprived areas of Scotland, respectively. CH, child health; CHSP-PS, Child Health Surveillance Programme—PreSchool.



Data for figure 1

	Total number of children	Received 10 day review		Received 6-8 week review		Received 8-9 month review		Received 22-24 month review		Received 39-42 month review	
		N	%	N	%	N	%	N	%	N	%
Old child health programme whole cohort	37 668	37 185	98.7	35 795	95.0	34 913	92.7	34 520	91.6	32 382	86.0
Old child health programme least deprived	5587	5530	99.0	5403	96.7	5363	96.0	5339	95.6	5163	92.4
Old child health programme most deprived	7322	7210	98.5	6781	92.6	6462	88.3	6390	87.3	5697	77.8
Difference in coverage (least-most deprived) % (95% CI)		0.5% (0.1% to 0.9%) p=0.015		4.1% (3.3% to 4.9%) p<0.0001		7.7% (6.8% to 8.7%) p<0.0001		8.3% (7.3% to 9.2%) p<0.0001		14.6% (13.4% to 15.8%) p<0.0001	
New child health programme whole cohort	45 777	45 334	99.0	43 199	94.4						
New child health programme least deprived	5726	5678	99.2	5528	96.5						
New child health programme most deprived	9932	9801	98.7	9190	92.5						
Difference in coverage (least-most deprived) % (95% CI)		0.5% (0.1% to 0.8%) p=0.008		4.0% (3.3% to 4.7%) p<0.0001							

reviews is shown in figure 1. In the old child health programme cohort, coverage declined for each subsequent review: 98.7% and 86.0% of children had a record of receiving their 10 day and 39-42 month reviews, respectively. For each review, children living in the most deprived areas were significantly less likely to have a record of receiving the review than those living in the least deprived areas. The absolute difference in review coverage between deprived and affluent areas increased for each subsequent review: for example, 77.8% and 92.4% of children from the most and least deprived areas had a record of receiving their 39-42 month review, respectively (difference of 14.6%, 95% CI 13.4% to 15.8%, $p<0.0001$). Coverage of the 10 day and 6-8 week reviews was very similar for the new child health programme cohort to that seen for the earlier cohort. The degree of inequality in coverage of these reviews also remained unchanged.

When coverage was assessed for all deprivation quintiles rather than just the least and most deprived groups, a clear deprivation gradient was found for all reviews

except the 10 day review for each cohort (figure 2). Coverage of the 10 day review was very high for both cohorts, and although the most deprived quintile always had lower coverage than the least deprived quintile, no clear gradient was evident for the intermediate deprivation groups.

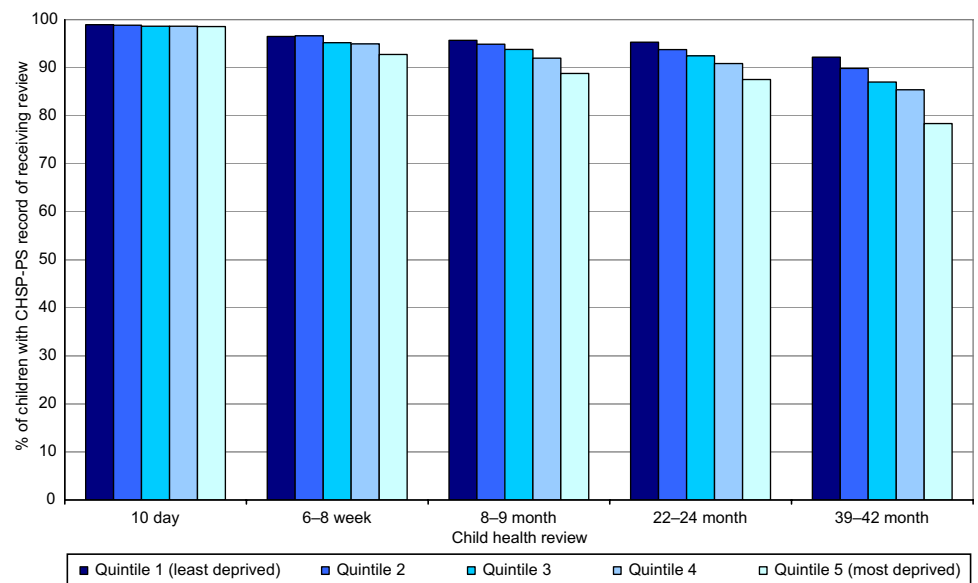
When only reviews conducted within the recommended age limit were included, overall coverage reduced by between 3.0% and 5.6%. Children from deprived areas were consistently more likely to have their reviews late hence inequalities in coverage of timely reviews were particularly wide. In the new child health programme cohort, 93.8% of children from the least deprived areas had a record of receiving a 6-8 week review before 12 weeks of age (96.5% at any age) compared with 87.8% of children from the most deprived areas (92.5% at any age).

Audit of CHSP-PS data

A total of 2784 children were resident in the two audit areas and eligible for inclusion: 51 (1.8%) had no

Coverage of universal child health reviews

Figure 2 Coverage of universally offered child health reviews by deprivation quintile (old child health programme cohort for illustration). CHSP-PS, Child Health Surveillance Programme—PreSchool.



Data for figure 2

Old child health programme cohort	Total number of children	Received 10 day review		Received 6-8 week review		Received 8-9 month review		Received 22-24 month review		Received 39-42 month review	
		N	%	N	%	N	%	N	%	N	%
Quintile 1 (least deprived)	7333	7257	99.0	7076	96.5	7018	95.7	6988	95.3	6760	92.2
Quintile 2	6552	6476	98.8	6331	96.6	6217	94.9	6144	93.8	5886	89.8
Quintile 3	6111	6027	98.6	5818	95.2	5732	93.8	5651	92.5	5317	87.0
Quintile 4	7763	7657	98.6	7372	95.0	7141	92.0	7055	90.9	6631	85.4
Quintile 5 (most deprived)	9566	9429	98.6	8874	92.8	8495	88.8	8373	87.5	7496	78.4

CHSP-PS record of a 10 day review and 131 (4.7%) had no record of a 6–8 week review. Six children were in both categories; hence, a total of 182 missing reviews for 176 children were included in the audit. The audit results are summarised in figure 3. A very high rate of return (177/182, 97%) was achieved, and in the large majority of cases (156/177, 88%), the child's clinical notes had been available to the HV, hence the returned form was informative.

For 42 of the 45 (93%) children with no CHSP-PS record of a 10 day review (and who had an informative audit return), the clinical notes indicated that a review had actually taken place. By contrast, a review had only been provided to 59 of the 111 (53%) children with no record of a 6–8 week review. For 21 of the 52 (40%) children who had genuinely missed their 6–8 week review, the HV specifically indicated that this was due to being unable to contact the family or the family repeatedly not attending appointments. In a further seven (13%) cases, the review was not provided due to the child being in hospital.

There was a clear tendency for children who genuinely missed their 6–8 week review (compared with those who received the review but had no CHSP-PS record) to have higher needs. For example, 41/52 (79%) of the children who missed their review lived in one of the two most deprived quintile areas compared with 23/59 (39%) of the children who did receive the review. Similarly, 35/52

(67%) of children who missed their review had 'additional' or 'intensive' as the most recently recorded Health Plan Indicator category on their overall child health programme electronic record compared with 20/59 (34%) of children who received their review.

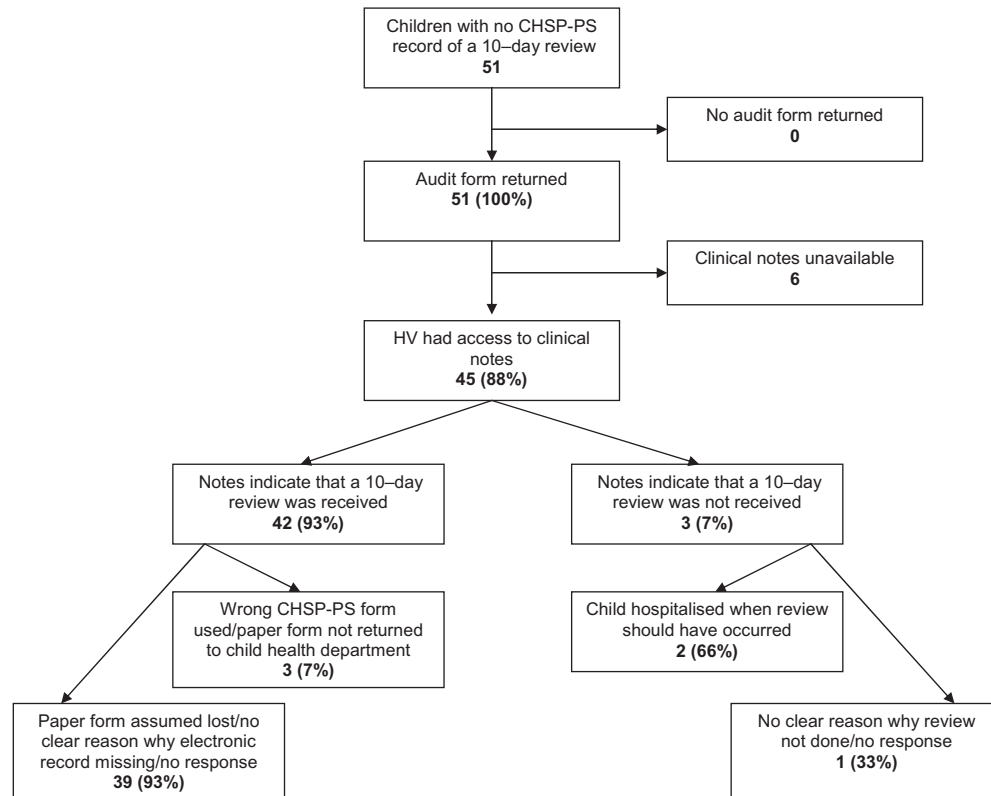
HVs were asked whether they had had any contact with the children who genuinely missed their 6–8 week review when the children were aged between 4 and 12 weeks: in 45/52 (87%) cases, the HV indicated they had had at least one face-to-face or telephone contact with the child or parents; in four cases, the HV indicated they had had no contact at all (and in all cases, this was ascribed to the child being in hospital), and no response was provided in three cases.

DISCUSSION

This analysis of routinely available data shows that not all children who are offered 'universal' child health reviews actually receive them. Coverage of the 10 day review is very high, but it declines for each subsequent review. The 'inverse care law'⁹ applies to coverage of child health reviews: children from more deprived areas are less likely to receive their reviews and the inequalities are wider for reviews offered at older ages. The level of inequality in coverage has been stable over time and (for the remaining reviews) has not changed following the implementation of a new child health programme offering a much reduced number of reviews.

Coverage of universal child health reviews

A



B

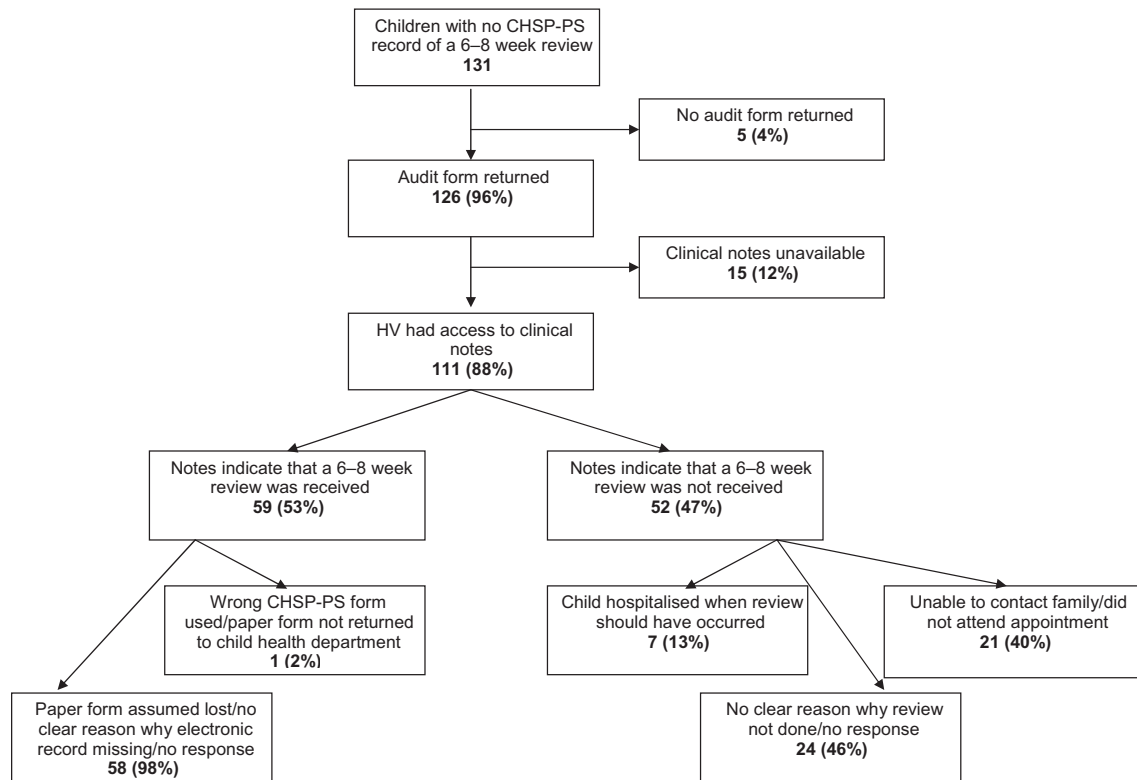


Figure 3 Results of audit of Child Health Surveillance Programme—PreSchool (CHSP-PS) data. (A) Children with no CHSP-PS record of a 10 day review. (B) Children with no CHSP-PS record of a 6–8 week review. HV, health visitor.

A further two cohorts were examined to confirm the consistency of the findings. One cohort of children born November 2000 to October 2001 that had the opportunity to receive the old child health programme immediately before it was withdrawn and one born April 2006 to July 2006 who received the revised programme immediately after its implementation: (inequalities in) review coverage was very similar for these cohorts.

We recognise that our analysis is restricted to children who remained resident in the same NHS board area for the period of study, that is, up to 59 months of age for the old child health programme cohort and up to 18 months for the new cohort. A previous unpublished analysis conducted by ISD found that the coverage of child health reviews experienced by children who remain in the same NHS board area throughout childhood is marginally, but not significantly, higher than that experienced by children who move between board areas. Coverage of child health reviews for children who emigrate out of Scotland altogether is unknown, but emigration is commoner among least deprived groups. Our results are therefore likely to provide a reasonable estimate of the child health review coverage in the whole Scottish population.

The audit of CHSP-PS data provides valuable information on the reliability of the findings. The audit shows that the reliance on transfer of paper forms before data entry does result in some data loss. The actual level of review coverage is therefore likely to be somewhat higher than the results suggest. For example, the overall percentage of children missing their 6–8 week review is likely to be closer to 2.5% than 5%. The general patterns observed are very likely to be real, however. Indeed, the audit findings emphasise the association between missing child health reviews and greater vulnerability: the level of inequality in review coverage may therefore actually be wider than that presented.

For children born after the implementation of the revised child health programme, it has obviously only been possible to examine the coverage of the two remaining reviews, both of which are offered in early infancy. Implementation of the revised review schedule aimed to strengthen the programme's ability to consistently reach children in need of support, provide effective early intervention and thus reduce inequalities in children's outcomes.⁸ One would therefore have hoped and expected to see reduced inequality in coverage for the remaining reviews. The finding that there has been no change is disappointing.

It appears that a minority of families (with relatively high needs) continue to miss out on their child health reviews. This analysis cannot fully explain why children miss their reviews, but the audit results suggest that unavailability (eg, child in hospital) or parental disengagement (eg, failure to respond to multiple invitations) are the most common underlying reasons. The audit results provide reassurance that almost all children who genuinely missed their 6–8 week review had some kind

of contact with their HV, however, indicating that few if any children are completely unknown to services. Further qualitative work with HVs and parents will be required to more fully understand why some families do not participate in child health reviews and to develop innovative services that meet their needs. There has been a significant reduction in inequalities in breastfeeding rates in Scotland over recent years (driven mainly by increasing rates in more deprived groups),²⁴ giving cause for optimism that child health promotion activities can effectively engage deprived groups and reduce inequalities. Work looking at facilitation of, and barriers to, engagement of families in other child well-being services such as Sure Start may also hold valuable lessons for the child health programme.^{25–27} There is evidence that the distribution of HV resources are not always adequate for, or aligned with, population needs. Achieving equitable coverage of child health reviews will therefore also require careful consideration of the HV resources available in different areas.^{28–30}

There has been debate in Scotland recently as to whether the core programme of universal child health reviews has been reduced too far. HVs have expressed unease at the lack of a 'safety net' opportunity for reassessment of children's needs after early infancy. The Scottish Government therefore issued guidance in early 2011 recommending a further review at 24–30 months of age,³¹ although this is yet to be fully implemented. It will be particularly important to strive for equitable coverage of this new review in light of the historical results presented here that show marked inequalities in uptake of reviews in this age group.

In England, despite an established policy to review all children at 24–30 months, there are still only 60% of Primary Care Trusts commissioning this.³² A robust universal service is essential on which to base targeted professional input, but this is not being uniformly achieved. It is clear that children who do not attend their child health reviews are likely to have relatively high needs, and robust efforts should be made to assess their needs and engage them and their families with appropriate and sensitive services. It will remain important to monitor the coverage of universal child health reviews as an indicator of the performance of the child health programme and its likely impact on inequalities in children's outcomes.

Acknowledgements We are grateful to the HV managers and practitioners who contributed to the audit of CHSP-PS data, in particular Cathy Holden and Lorraine Ronalson, and to Heather Graveson for inputting audit results. We are also grateful to Harry Campbell and Sarah Cunningham-Burley for guidance and comments.

Funding RW undertook this work while in receipt of a Clinical Academic Fellowship from the Scottish Government's Chief Scientist Office (CAF/06/05). Study design, conduct and reporting were independent of funders at all times.

Competing interests None.

Ethics approval Ethical approval was not required for this study. Information Services Division staff adhered to NHS National Services Scotland Confidentiality Guidelines at all times when handling patient data.

Coverage of universal child health reviews

Provenance and peer review Not commissioned; externally peer reviewed.

Data sharing statement The routine data analysed for this study are held by NHS National Services Scotland Information Services Division (<http://www.isdscotland.org/>).

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Moving from a universal to targeted child health programme: which children receive enhanced care? A population-based study using routinely available data

R. Wood,* D. Stockton* and H. Brown†

*Information Services Division, NHS National Services Scotland, Edinburgh, UK, and

†The Roslin Institute and Royal (Dick) School of Veterinary Studies, University of Edinburgh, Midlothian, UK

Accepted for publication 24 May 2012

Abstract

Background There is a current emphasis on 'progressive universal' delivery of the UK child health programme, with a core universal service complemented by enhanced support provided according to need. In Scotland, a three-category indicator of need, the 'Health Plan Indicator' (HPI) is used to identify children requiring enhanced support from the child health programme to facilitate this.

Methods Routine child health programme and hospital delivery records for a cohort of 36 871 Scottish children were used to explore the factors associated with being identified as requiring enhanced child health programme support using multilevel logistic regression modelling.

Results The following factors were all independently associated with an increased likelihood of being assessed as requiring enhanced support: (i) deprivation; (ii) young maternal age, maternal smoking and drug misuse; (iii) a previous stillbirth; (iv) prematurity; (v) being small for gestational age; (vi) no breastfeeding, admission to a special care baby unit; and (vii) medical, social or developmental concerns about the baby. There was a tendency for children living in areas with higher Health Visitor staffing levels to be more likely to be assessed as requiring enhanced support but this effect was not statistically significant. There was significant residual variation between areas in the likelihood of children being assessed as requiring enhanced support.

Discussion This study suggests Health Visitors take a complex range of factors into account when assessing which children require enhanced support from the child health programme. Health Visitors' workload may influence the likelihood of them identifying children as requiring enhanced support but this requires further clarification. There are clear differences between areas in allocation of the different HPI categories. Further work is required to explore the relationship between being identified as in need of enhanced support, the care actually provided to children, and their outcomes.

Keywords

deprivation, health promotion, needs assessment, pre-school children, service provision, surveillance

Correspondence:

Rachael Wood,
Information Services
Division, NHS National
Services Scotland, Gyle
Square, 1 South Gyle
Crescent, Edinburgh
EH12 9EB, UK
E-mail:
rachaelwood@nhs.net

Introduction

Children's early experiences are powerful influences on their long-term health and development (Shonkoff & Phillips 2000; Shore 2003; Hertzman & Boyce 2010; Marmot 2010). In recognition of the importance of the early years, the UK has a long

history of providing a structured child health programme to all families (Committee on Child Health Services 1976). The programme for pre-school children comprises various elements including growth and development surveillance, health promotion and parenting support (Blair & Hall 2006). Delivery of these elements of the programme is founded on repeated contacts

between families and their Health Visitors as children attain specified ages.

The Royal College of Paediatrics and Child Health has aimed to improve the quality of the child health programme by periodically issuing evidence-based guidance on its content and delivery in the Health for all Children (HFAC) reports. The most recent report, HFAC4, noted the persistent inequalities in children's outcomes (Hall & Elliman 2003). It emphasized the need for a flexible and individualized approach to the delivery of the child health programme to ensure that all children are appropriately supported to attain their health and development potential.

This emphasis on a 'progressive universalism' model of child health programme provision has been seen in subsequent policy developments across the UK (Department of Health 2009). The Scottish Government issued national guidance on the implementation of HFAC4 in 2005 (Scottish Executive 2005). This signalled major changes to the delivery of the child health programme. It acknowledged that providing the most vulnerable children with the intensity of support likely to secure meaningful improvements in their outcomes would require providing the least vulnerable with reduced input. In practice this meant that the number of face-to-face Health Visitor reviews universally offered to pre-school children was reduced from six (at 10 days, 6–8 weeks, 8–9, 22–24, 39–42, and 48–54 months) to two (at 10 days and 6–8 weeks), with a further selective review provided to some children at 24 months.

Alongside the reduction in reviews, the guidance introduced an indicator of need, the 'Health Plan Indicator' (HPI), to facilitate identification of children requiring more support than that provided by the reduced universal programme. Health Visitors were asked to allocate children to one of three HPI categories: core, additional, or intensive. No specific guidance was provided on the needs assessment processes underpinning HPI allocation or the timing of allocation but in practice almost all areas allocated children before or at their 6–8 week review. The guidance suggested that children allocated a 'core' HPI would subsequently receive the reduced universal programme only whereas those allocated 'additional' would receive extra Health Visitor support and those allocated 'intensive' would receive structured interagency care. Precise levels of input to be provided were not defined further. Individual NHS Boards implemented the guidance at different time points between 2005 and 2008.

There is a range of information available in the literature on the concept of child/family vulnerability and how Health Visitors assess families' support needs (Appleton 1995; Appleton & Cowley 2008). There is also some information on how moving from a more traditional model of child health programme provision (focused on provision of a relatively high number

of universal reviews) to a more progressive universal model (focused on ensuring that children in need get enhanced support) has impacted on Health Visitor practice (Condon 2008; Condon 2011). There is however to our knowledge no quantitative information available on the characteristics of children that are currently receiving enhanced/targeted support from the child health programmes across the UK. In this study we have used routinely available data to explore factors associated with being identified as requiring enhanced support from the Scottish child health programme (as indicated by the HPI) following the changes to the programme implemented in response to HFAC4.

Methods

The national information system Child Health Surveillance Programme: Pre-School (CHSP-PS) is used to call children for, and record the delivery of, the universal child health reviews. Extracts from the system are passed to the NHS Scotland Information Services Division (ISD) on a quarterly basis for analytical purposes. Children born between July 2007 and June 2008 inclusive who were consistently registered to receive their child health programme in one of the included NHS Boards were identified. Grampian, Orkney and Shetland were excluded as these boards did not use CHSP-PS during the period of study and Lothian NHS Board was excluded as it did not assign a HPI until children attained 6 months of age: all other Boards were included. CHSP-PS records of 6–8 week reviews undertaken on relevant children were identified. The HPI assigned at this review was noted. Children with an HPI of core, additional or intensive were included in the final study sample.

A framework of individual child/family factors known or likely to be associated with increased need for support from the child health programme was developed based on a literature scan. Data on some potential predictor variables were available from the children's CHSP-PS records, specifically their birth details, 10 day Health Visitor first visit, or 6–8 week review records. Data on other variables were available from the children's mothers' hospital delivery (Scottish Morbidity Record 02, SMR02) records. Data were not routinely available on some variables hence these were not considered further.

A linkage between the children's CHSP-PS records and their mothers' SMR02 records was performed. ISD routinely maintains a linked maternal and neonatal dataset which holds mothers' SMR02 records together with their children's statutory birth records. Children's personal identifiers held on their CHSP-PS records were therefore firstly linked to their statutory birth records using previously developed probability matching algorithms (Kendrick & Clarke 1993; Kendrick 1997). Their

mothers' SMR02 records were then found by direct matching based on maternal and neonatal dataset 'link number' and the child's date of birth and gender. Some predictor variables were available from both CHSP-PS and SMR02. In these cases, the source with the most complete data was selected as the primary data source. When appropriate, composite variables were created to maximize data completeness, e.g. gestational age was taken from SMR02 or from the Health Visitor first visit record if unavailable. Continuous variables were categorized to facilitate analysis and maximize data quality, e.g. the composite gestational age variable was categorized as very preterm if <32 weeks, preterm if 32–36 weeks, or term if ≥ 37 weeks, with values of <20 or >45 weeks or missing values categorized as unknown. As gestational age and birth weight are highly correlated, a derived variable indicating 'small for gestational age' (birth weight on or below the 5th centile for gestational age) was created using previously developed methods (Bonellie 2006). Gestational age and 'small for gestational age' (but not birth weight) were then retained as predictor variables.

In addition to the child/family factors, we hypothesized that the workload of individual Health Visitors may influence how likely they are to assign children to a non-core HPI. The caseload of the Health Visitor assigning a child's HPI at their 6–8 week review was not known hence the total number of Health Visitors per 1000 children aged 0–4 years in the Community Health Partnership (CHP) where the child lived was used as a proxy indicator. CHPs are administrative subunits of NHS Boards with responsibility for management of the child health programme. The data on the number of Health Visitors were obtained directly from CHPs by email survey issued in August 2009. CHP managers were asked to provide information on the '*in-post whole time equivalent number of qualified Health Visitors/Public Health Nurses (i.e. registered nurses holding the relevant Specialist Practitioner Qualification) who were actively managing a case load of pre-school children*' at that time. National snap shot data on the NHS workforce is provided by all NHS Boards every September via the Scottish Workforce Information Standard System (SWISS). SWISS data from 2008 were used for the two CHPs that did not respond to the survey after two reminders. SWISS data were not used for all areas due to problems with recording in some areas. National Records of Scotland 2007 mid year population estimates provided the denominator data. This Health Visitor workload variable was included as an additional predictor variable.

Finally, NHS Boards and/or CHPs developed additional local guidance for their staff on assigning children to the different HPI categories, for example requiring the use of specific needs assessment tools. The NHS Board in which children were reg-

istered to receive their child health programme, and the CHP in which they lived, were therefore also included as area level predictor variables.

Simple counts and percentages describing the occurrence of the predictor and outcome variables were calculated using spss version 17.0. The relationship between each individual predictor variable and the outcome variable was assessed by calculation of odds ratios with 95% confidence intervals and Pearson's χ^2 tests also using spss. Three-level multilevel logistic regression models were fitted using SAS Release 9.2 to assess the joint influence of the predictor variables, with CHP and NHS Board taken as levels 2 and 3. The multilevel approach ensures that predictor variables are assessed at the correct level of variation, for example Health Visitor staffing level was assessed at the CHP level (Diez-Roux 2000). Two multilevel models were fitted: one comparing children receiving an intensive HPI to those receiving a core HPI, and one comparing children receiving any non-core HPI (i.e. additional or intensive) to those receiving a core HPI.

Ethical approval was not required for this study. The Privacy Advisory Committee approved the linkage of child and maternal data.

Results

Figure 1 shows the number of children included in the analysis. Table 1 shows the conceptual framework of potential predictor variables, and the variables that were included in the study.

Table 2 summarizes the occurrence of the individual level predictor variables in the sample, and the data completeness for each variable. When the CHSP-PS to SMR02 linkage was performed, 55 of the 36 871 children (0.1%) had no birth record identified in the maternal and neonatal dataset, indicating likely failure of the probabilistic linkage algorithms. A further 3517 (9.6%) had no SMR02 record identified, indicating either that an SMR02 record was missing (e.g. child born outwith hospital or the hospital failed to return an SMR02) or failure of the birth record-SMR02 matching process. Therefore, 3572 of the 'unknown' cases for variables derived solely from SMR02 are accounted for by these cases. It can be seen that when this is taken into account, data completeness was very high for all variables with the exception of maternal ethnicity and maternal drug misuse during pregnancy. The prevalence of specific factors in the sample is very similar to that seen for the Scottish child population as a whole, indicating that the sample is broadly representative of the general population.

The workforce data indicated that the availability of qualified Health Visitors was very variable across Scotland. One CHP had

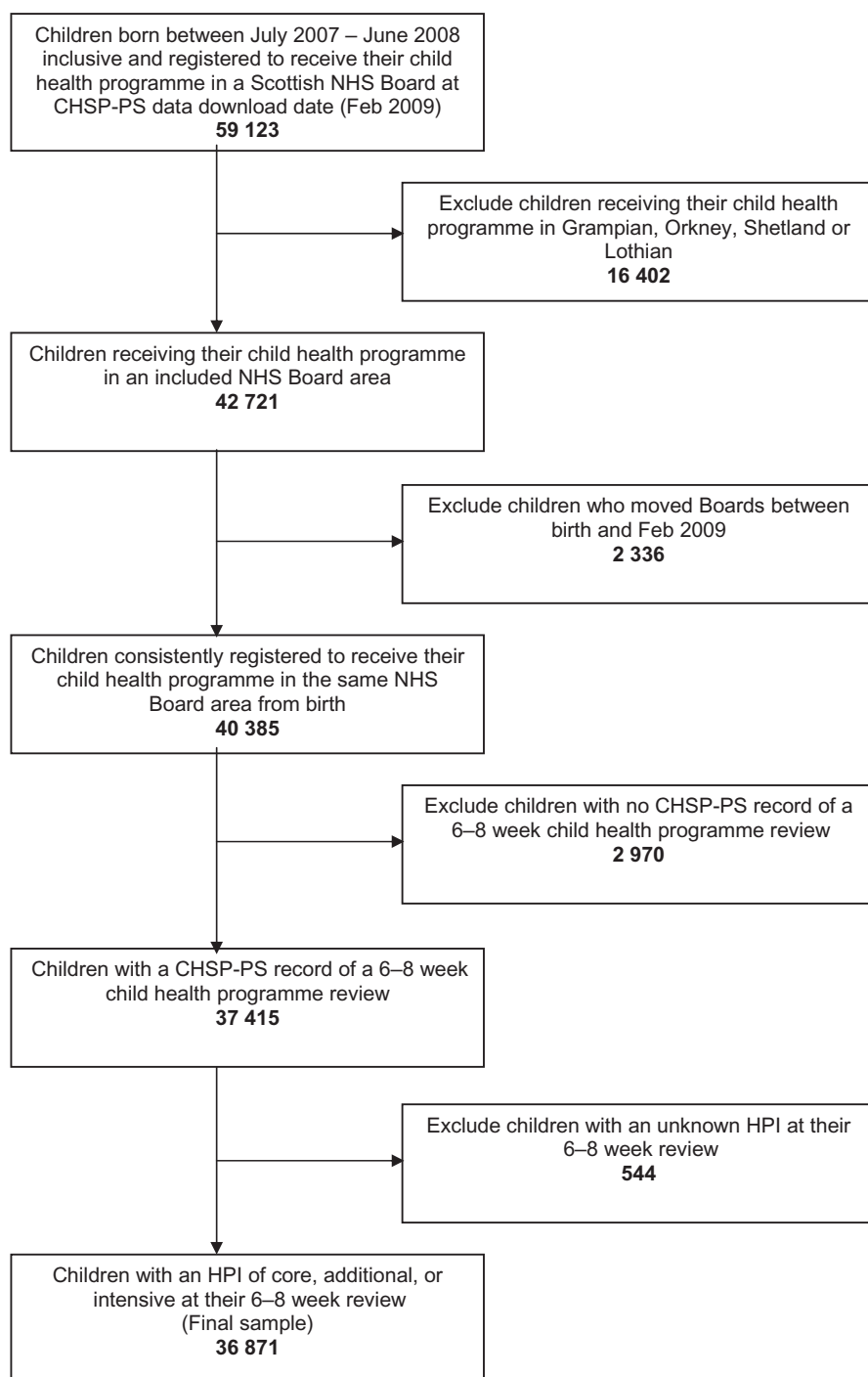


Figure 1. Sample inclusion criteria. CHSP-PS, Child Health Surveillance Programme: Pre-School; HPI, Health Plan Indicator.

an estimated 2.28 whole time equivalent Health Visitors per 1000 resident children aged 0–4 years whereas another had 7.66 (Table 2). There was no clear pattern evident in staffing availability, e.g. by rurality or deprivation. The children included in the sample lived in a total of 33 CHP areas and nine NHS Boards. A total of 18 846 (51.1%) children had been assigned a

core HPI at their 6–8 week review, 16 962 (46.0%) had an additional HPI, and 1063 (2.9%) an intensive HPI.

Table 3 summarizes the results of the multilevel models. The following factors were all independently associated with an increased likelihood of being allocated an intensive (rather than core) HPI at the 6–8 week child health review: (i) increasing

Table 1. Conceptual framework showing variables that may be associated with increased need for support from the child health programme

Variable	Data available for inclusion in model and data definition/source	
Family social risk/vulnerability		
Income/poverty/material deprivation	✓	Deprivation level (SIMD 2006 quintile) derived from maternal postcode of residence at time of delivery on birth registration records
Young maternal age	✓	Maternal age at HV first visit (CHSP-PS) or at delivery (SMR02)
Mother with low educational attainment	✗	
Single mother/lack of social support	✗	
Workless household	✗	
Intimate partner violence	✗	
Parental criminal involvement	✗	
Homeless family	✗	
Child protection intervention/looked after status for this child or previous children	✗	
Either parent 'looked after' as a child	✗	
Geographical isolation/remoteness	✓	SG urban–rural category 2007/2008 derived from maternal postcode of residence at time of delivery on birth registration records
Mother from ethnic minority	✓	SMR02
Parental health		
Parental smoking	✓	Maternal smoking status at HV first visit from CHSP-PS
Parental alcohol misuse	✗	
Parental drug misuse	✓	Maternal drug misuse during this pregnancy from SMR02
Parental mental health	✗	
Parental physical health	✗	
Obstetric history and delivery		
Previous stillbirth or infant death	✓	Previous stillbirth or neonatal death from SMR02
First child(ren)	✓	SMR02
Multiple birth	✓	SMR02
Prematurity	✓	Gestation at delivery from SMR02 or CHSP-PS (HV first visit)
Low birth weight/intrauterine growth restriction	✓	Small for gestational age derived from SMR02 and CHSP-PS (Birth details and HV first visit)
Operative delivery	✓	Mode of delivery from SMR02
Infant health and development		
Infant sex	✓	CHSP-PS (any record)
Infant feeding	✓	Infant feeding at birth recorded at HV first visit on CHSP-PS
Admitted to special care baby unit	✓	SMR02 and CHSP-PS (Birth details)
Medical/social concerns in early infancy	✓	Any concern about child's medical/social state recorded by HV on CHSP-PS at first visit or 6–8 week review
Developmental concerns in early infancy	✓	Any concern about child's development recorded by HV on CHSP-PS at 6–8 week review
Infant attachment	✗	
Service delivery factors (may influence categorization of level of need)		
Health visitor caseload	✓	Number of qualified HVs per 1000 children aged 0–4 years in CHP area of residence from special survey and SWISS
CHP	✓	CHP of residence derived from postcode of residence in CHSP-PS at download date
NHS Board area	✓	NHS Board area where registered to receive child health programme from CHSP-PS at download date

CHP, Community Health Partnership; CHSP-PS, Child Health Surveillance Programme – Pre-School information system (child health programme records); HV, Health Visitor; SG, Scottish Government; SIMD, Scottish Index of Multiple Deprivation; SMR02, Scottish Morbidity Record 02 (delivery record); SWISS, Scottish Workforce Information Standard System (NHS workforce records).

Variable	Category	Number	%
Deprivation quintile	5 (most deprived)	10 627	28.8
	4	8 067	21.9
	3	7 054	19.1
	2	6 135	16.6
	1 (least deprived)	4 896	13.3
	Unknown	92	0.2
Maternal age	12–19 years	2 730	7.4
	20–50 years	33 986	92.2
	Unknown	155	0.4
Urban–rural category	Very remote	1 248	3.4
	Remote	1 532	4.2
	Accessible	33 999	92.2
	Unknown	92	0.2
Maternal ethnicity	Non-white	268	0.7
	White	2 436	6.6
	Unknown	34 167	92.7
Maternal smoking	Yes	7 243	19.6
	No	28 114	76.2
	Unknown	1 514	4.1
Maternal drug misuse	Yes	292	0.8
	No	9 741	26.4
	Unknown	26 838	72.8
Previous stillbirth or neonatal death	Yes	358	1.0
	No	32 437	88.0
	Unknown	4 076	11.1
First child(ren)	Yes	14 943	40.5
	No	18 071	49.0
	Unknown	3 857	10.5
Multiple birth	Yes	1 026	2.8
	No	32 273	87.5
	Unknown	3 572	9.7
Gestation	Very pre-term (<32 weeks)	300	0.8
	Pre-term (32–36 weeks)	2 154	5.8
	Term (\geq 37 weeks)	34 356	93.2
	Unknown	61	0.2
Small for gestational age	Yes	1 407	3.8
	No	31 858	86.4
	Unknown	3 606	9.8
Mode of delivery	Emergency Caesarean	5 119	13.9
	Elective Caesarean	3 729	10.1
	Forceps, ventouse, breech	1 728	4.7
	Spontaneous vaginal	20 926	56.8
	Unknown	5 369	14.6
Infant sex	Male	18 701	50.7
	Female	18 170	49.3
	Unknown	0	0.0
Infant feeding at birth	Formula only	16 012	43.4
	Any breastfeeding	20 280	55.0
	Unknown	579	1.6
Admitted to special care baby unit	\geq 48 h	1 503	4.1
	<48 h	975	2.6
	No	30 992	84.1
	Unknown	3 401	9.2
Medical/social concerns noted by HV	Yes	9 575	26.0
	No	27 296	74.0
	Unknown	0	0.0
Developmental concerns noted by HV	Yes	740	2.0
	No	34 559	93.7
	Unknown	1 572	4.3
HV availability within CHP (whole time equivalent HV per 1000 children aged 0–4 years)	Minimum	2.28	N/A
	Maximum	7.66	N/A
	Unknown	200	0.5

Table 2. Prevalence of characteristics of interest within sample

Table 3. Association between characteristics of interest and allocation of a non-core Health Plan Indicator (HPI) at the 6–8 week review

Variable	Comparison	Intensive vs. core HPI			Additional or intensive vs. core HPI		
		Odds ratio	95% CI	P value	Odds ratio	95% CI	P value
Deprivation quintile	5 vs. 1	7.12	4.47–11.32	<0.001	1.54	1.41–1.67	<0.001
	4 vs. 1	4.11	2.56–6.60	<0.001	1.31	1.21–1.43	<0.001
	3 vs. 1	2.88	1.77–4.71	<0.001	1.08	0.99–1.17	0.099
	2 vs. 1	2.15	1.29–3.60	0.004	0.98	0.90–1.07	0.686
Maternal age	12–19 vs. 20–50 years	4.45	3.46–5.72	<0.001	2.09	1.89–2.30	<0.001
Urban–rural category	Very remote vs. accessible	1.66	0.83–3.32	0.152	1.07	0.86–1.34	0.537
	Remote vs. accessible	0.86	0.53–1.39	0.535	0.81	0.71–0.92	0.002
Maternal ethnicity	Non-white vs. white	1.89	0.97–3.68	0.062	0.90	0.67–1.19	0.449
Maternal smoking	Yes vs. no	4.16	3.49–4.94	<0.001	1.50	1.41–1.60	<0.001
Maternal drug misuse	Yes vs. no	34.64	21.37–56.14	<0.001	5.37	3.71–7.78	<0.001
Previous stillbirth or neonatal death	Yes vs. no	2.23	1.22–4.06	0.009	1.60	1.26–2.03	<0.001
First child(ren)	Yes vs. no	0.82	0.68–1.00	0.053	1.73	1.64–1.83	<0.001
Multiple birth	Yes vs. no	1.91	0.98–3.71	0.057	2.10	1.69–2.61	<0.001
Gestation	Very pre-term vs. term	7.88	3.85–16.11	<0.001	3.53	2.29–5.46	<0.001
	Pre-term vs. term	1.44	1.07–1.94	0.017	1.31	1.16–1.47	<0.001
Small for gestational age	Yes vs. no	1.98	1.46–2.68	<0.001	1.30	1.15–1.48	<0.001
Mode of delivery	Emergency Caesarean vs. spontaneous vaginal	0.87	0.67–1.12	0.271	1.09	1.02–1.18	0.015
	Elective Caesarean vs. spontaneous vaginal	1.04	0.80–1.36	0.779	1.01	0.93–1.10	0.748
	Forceps, ventouse, breech vs. spontaneous vaginal	0.63	0.41–0.98	0.040	1.05	0.94–1.18	0.397
Infant sex	Male vs. female	0.96	0.82–1.12	0.606	0.98	0.93–1.02	0.318
Infant feeding at birth	Formula vs. any breast	1.37	1.16–1.63	<0.001	1.02	0.97–1.07	0.447
Admitted to special care baby unit	≥48 h vs. no	4.30	3.03–6.09	<0.001	1.90	1.63–2.22	<0.001
	<48 h vs. no	1.42	0.90–2.26	0.136	1.16	1.00–1.35	0.055
Medical/social concerns noted by HV	Yes vs. no	4.88	4.14–5.75	<0.001	3.47	3.27–3.68	<0.001
Developmental concerns noted by HV	Yes vs. No	4.06	2.77–5.94	<0.001	2.12	1.77–2.55	<0.001
HV availability within CHP	per increase of 1 whole time	1.24	0.94–1.65	0.128	1.17	0.91–1.50	0.226
	equivalent HV per 1000 children aged 0–4 years						
Number of cases included in the models*			19 803			36 671	

Italics in the table indicate non-significant results.

*Cases with unknown HV availability excluded as no missing category could be assigned to this continuous variable.

CHP, Community Health Partnership; HV, Health Visitor.

deprivation; (ii) young maternal age; (iii) maternal smoking; (iv) maternal drug misuse; (v) a previous stillbirth or neonatal death; (vi) prematurity; (vii) being small for gestational age; (viii) no breastfeeding from birth, admission to a special care baby unit; and (ix) the Health Visitor noting medical, social or developmental concerns about the baby. All of these variables except lack of breastfeeding were also associated with an increased likelihood of being allocated a non-core (i.e. additional or intensive) HPI. Being a first child, being one of twins or a higher order birth, and being born by emergency Caesarean were also associated with being allocated a non-core HPI. In general the odds ratios for the significant predictors were much higher in the intensive versus core (rather than non-core vs. core) model. This would be expected as this model compares two extreme groups. Maternal ethnicity and infant sex were not

found to be associated with HPI allocation. There was a tendency for children living in areas with higher Health Visitor staffing levels to be more likely to be allocated non-core HPIs, but this effect was not statistically significant.

Even when the characteristics of individual children and Health Visitor staffing levels had been taken into account, the models showed that there was significant residual variation between CHPs and NHS Boards in the likelihood of children being allocated to intensive or any non-core HPI (likelihood ratio test $P < 0.001$ for CHP and NHS Board for both models).

Discussion

This study used routine data to explore the relationship between individual and area level variables and children being assessed as requiring enhanced support from the child health programme.

It shows that many of the individual level factors considered, including those relating to family social risk, parental health, obstetric history and infant health, are independently associated with being assessed as requiring enhanced support. This suggests that child/family needs assessments undertaken by Health Visitors are complex, with many risk and protective factors being taken into account. Indeed, it is likely that Health Visitors consider a wide range of additional factors that were not included in this study due to lack of available data. Health Visitors have frequently commented on the complex nature of child/family needs assessment and resisted the introduction of simplistic 'check list' type assessment tools although broad frameworks that guide and support the process have been welcomed (Houston & Cowley 2002; Cowley & Houston 2003; Mitcheson & Cowley 2003). HFAC4 also specifically recommends against the use of a 'check list' approach to needs assessment (Hall & Elliman 2003, pp. 362–363). Understanding the complexity of needs assessment and its fundamental place in delivery of the child health programme has implications for Health Visitor education and training.

Certain factors, notably maternal drug misuse despite the low data completeness for this variable, stand out as being exceptionally strongly associated with assessed need for enhanced support. Factors that were not found to be significantly associated may have been genuinely unimportant (e.g. infant sex) or a reflection of poor data quality (e.g. maternal ethnicity). Recording of maternal drug misuse on delivery records is now mandatory hence completeness of this variable has improved considerably. Recording of maternal ethnicity remains optional, and data completeness rates consequently poor, limiting the ability to assess the impact of ethnicity on care and outcomes.

The sheer level of variability found in Health Visitor staffing levels across Scotland was striking, with more than a threefold difference in whole time equivalent numbers per pre-school population. The lack of apparent correlation between staffing levels and factors such as deprivation and rurality found in this study is congruent with previous work noting that the provision of Health Visitors often reflects historical accident rather than the needs of local populations (Reading & Allen 1997; Crofts *et al.* 2000; Appleton & Cowley 2004). There was a suggestion that Health Visitors working in areas with higher staffing levels may be more likely to assess children as requiring enhanced levels of support but this was not statistically significant. It would have been interesting to include individual Health Visitors' case loads and an indicator of the availability of wider skill mix team members in the model but these were not available. The results strongly suggest that the threshold for allocating children to non-core HPI categories varies between different

CHPs and NHS Boards. This is likely to reflect the limited national guidance initially provided on the allocation of the HPI. These threshold differences limit the intended utility of the HPI as a tool to facilitate communication about children's needs when families move between areas.

The models were re-run on a separate cohort of children born immediately after the implementation of the revised child health programme in a smaller number of early implementer Boards: the results were found to be very similar to those presented here. The distribution of HPIs allocated at 6–8 week reviews has remained similar to that seen in this study up to the latest figures available (children born 2010). This suggests that the findings of this study are likely to be stable over time.

Children's child health programme records were linked to their mothers' delivery records for the first time for this study: such a linkage had not previously been done using Scottish data. Overall, a delivery record was successfully linked for just over 90% of children. The majority of unsuccessful links were due to a delivery record not having been returned rather than technical linkage failure. Three NHS Boards were known to be experiencing difficulties in returning their SRM02 records during the period covered by this study. A delivery record was linked for over 96% of children in the separate cohort noted above. This study demonstrates the potential utility of linkage of routinely available data to answer policy-relevant research questions (Lloyd & Hertzman 2009; Stanley *et al.* 2011).

Although this study provides reassurance that Health Visitors are identifying children with known vulnerability markers as being in need of enhanced support from the child health programme, it does not address the thorny question of whether the current balance between universal and targeted aspects of the programme is appropriate (Elkan *et al.* 2001). There has been recent recognition in Scotland that the 2005 policy changes probably went too far away from the traditional universal basis of the child health programme in favour of a highly targeted delivery model. In early 2011, the Scottish Government issued revised guidance which recommended the (re)introduction of a universal review for all toddlers aged 24–30 months (Scottish Government 2011). The guidance also recommended allocating the HPI at any point from the antenatal period up to 6 months of age and moving to a two-category (core and additional) classification. The aspiration is that moving to a two-category HPI will increase the consistency of its use across Scotland; however, this is not based on evidence. The results presented here suggest that at the local level Health Visitors have made meaningful distinctions between the additional and intensive categories, although the absolute thresholds for allocating the different categories has varied between areas. Perhaps unsur-

prisingly, the proposal for a two-category HPI has met with some resistance from practitioners who find the three categories useful, and consequently this proposal is still to be fully implemented.

This study focused on the likelihood of children being assessed as requiring enhanced support from the child health programme. It did not explore whether children subsequently received enhanced support or their eventual outcomes. There are minimal data available at national level on the activity of Health Visitors outwith the provision of universal child health reviews. There is national information available on a range of relevant children's physical health outcomes such as growth, dental health and injuries, but there is a distinct lack of data on other outcomes that the child health programme seeks to influence such as the quality of parenting, aspects of children's mental health, and the various domains of child development. It will continue to be important to explore ways to assess the care and support provided to vulnerable children and their families and monitor children's wider health and development (Rigby *et al.* 2003; Goldfeld & Oberklaid 2005).

Key messages

- The child health programme is the only service that provides support to all families with young children. There is a current emphasis on 'progressive universalism' delivery of the programme, with the core universal service complemented by enhanced support provided according to need. In Scotland a three-tiered indicator of need is used to facilitate identification of children requiring enhanced child health programme support.
- This study demonstrates that many individual-level risk factors relating to family social circumstances, parental health, obstetric history and infant health are associated with being identified as requiring enhanced child health programme support by 6–8 weeks of age. This reinforces the complex nature of child/family needs assessments undertaken by Health Visitors.
- There are clear differences between areas in allocation of the different categories of need. This limits the ability of the indicator to facilitate communication about children's needs when families move between areas.
- Further work is required to explore the relationship between children being identified as in need of enhanced child health programme support, the care actually provided to them and their outcomes.

Conflict of interest

No author has any conflict of interest to declare in relation to this paper.

Acknowledgements

Funding source

RW undertook this work whilst in receipt of a Clinical Academic Fellowship from the Scottish Government's Chief Scientist Office (CAF/06/05). Study design, conduct and reporting were independent of funders at all times.

Individuals

We acknowledge the contribution of Claire Nolan and Carole Morris to data extraction and linkage and are grateful to Jim Chalmers, Harry Campbell, and Sarah Cunningham-Burley for guidance and comments.

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RESEARCH ARTICLE

Open Access

General practitioner provision of preventive child health care: analysis of routine consultation data

Rachael Wood^{1,2*} and Philip Wilson³

Abstract

Background: GPs contribute to preventive child health care in various ways, including provision of child health surveillance (CHS) reviews, opportunistic preventive care, and more intensive support to vulnerable children. The number of CHS reviews offered in Scotland was reduced from 2005. This study aimed to quantify GPs' provision of different types of preventive care to pre-school children before and after the changes to the CHS system.

Methods: GP consultation rates with children aged 0–4 years were examined for the 2½ years before and after the changes to the CHS system using routinely available data from 30 practices in Scotland. Consultations for CHS reviews; other aspects of preventive care; and all reasons were considered.

Results: Prior to the changes to the CHS system, GPs often contributed to CHS reviews at 6–8 weeks and 8–9 and 39–42 months. Following the changes, GP provision of the 6–8 week review continued but other reviews essentially ceased. Few additional consultations with pre-school children are recorded as involving other aspects of preventive care, and the changes to CHS have had no impact on this. In the 2½ years before and after the changes, consultations recorded as involving any form of preventive care accounted for 11% and 7.5% respectively of all consultations with children aged 0–4 years, with the decline due to reductions in CHS reviews.

Conclusions: Effective preventive care through the early years can help children secure good health and developmental outcomes. GPs are well placed to contribute to the provision of such care. Consultations focused on preventive care form a small minority of GPs' contacts with pre-school children, however, particularly since the reduction in the number of CHS reviews.

Keywords: Child health, General practice, Preventive health services, Health promotion, General practitioners, Health visitors

Background

Children's earliest experiences profoundly influence their long term health and development [1–3] and access to effective preventive child health care has been acknowledged as important for many years [4–6]. The UK National Health Service (NHS) offers a core service of proactive care through the universal child health programme (CHP). This comprises certain screening procedures; routine childhood vaccinations; surveillance of children's growth and development; and provision of age appropriate health promotion and parenting advice

[7]. The surveillance and advice components take place in child health surveillance (CHS) reviews offered to all children at specified ages. Practice nurses (PNs) and health visitors (HVs) usually have lead responsibility for delivery of vaccinations and child health surveillance reviews respectively but general practitioners (GPs) also provide substantial input to delivery of the universal elements of the CHP. In some practices, GPs retain responsibility for provision of vaccinations, and in almost all practices GPs provide at least some elements of the CHS reviews.

Beyond these core universal services, there is a complex web of additional preventive care provided to young children with particular needs due to health, developmental, or wider social issues. Health visitors often lead delivery of this additional preventive care but again GPs

* Correspondence: rachael.wood@ed.ac.uk

¹Centre for Population Health Sciences, University of Edinburgh, Teviot Place, Edinburgh EH8 9AG, UK

²Public Health Medicine, Information Services Division, NHS National Services Scotland, Gyle Square, 1 South Gyle Crescent, Edinburgh EH12 9EB, UK

Full list of author information is available at the end of the article

also make an important contribution [8]. GPs provide detailed assessment of children suspected of having a medical, developmental, or family wellbeing problem; directly provide medical care for these children; and refer on to specialist care as required. As GPs frequently see families with young children, they also play an important role in provision of opportunistic preventive care and alerting relevant colleagues to families that could benefit from additional support [9].

The Royal College of Paediatrics and Child Health periodically issues recommendations on the content and delivery of the CHP. The latest report, *Health for all Children 4 (HFAC4)*, was published in 2003 [10]. One of its key messages was that the core programme of CHS reviews should be reduced to allow more flexible and intensive preventive care and support to be offered to families with additional needs. HFAC4 has influenced child health policy across the UK [11–13]. The linked policy in Scotland, published in 2005, went further than HFAC4 in recommending a marked reduction in the number of universal CHS reviews provided to pre-school children, from six (at 10 days; 6–8 weeks; and 8–9; 22–24; 39–42; and 48–54 months) to two (at 10 days and 6–8 weeks), with a selective review at 24 months for children thought to need it due to additional needs or vulnerability [13]. In Scotland the 10 day review is always provided as a home visit by the Health Visitor but GPs can potentially be involved in the provision of any of the other reviews, either on a routine basis or on an ‘as required’ basis if requested by the HV.

The 2005 policy gave NHS Boards across Scotland some flexibility regarding when to implement the revised programme of CHS reviews and the implementation date in different Boards consequently varied between 2005 and 2010. NHS Boards offered the traditional schedule of CHS reviews right up to the date of implementation in their area, then the revised schedule from the implementation date onwards [14]. The changes to the CHS system in Scotland were implemented without piloting or any central plans for evaluation.

This study aimed to explore the following questions using routinely available GP consultation data:

- To what extent were GPs in Scotland involved in the delivery of CHS reviews for pre-school children before and after the changes to the CHS system?
- To what extent were GPs involved in the delivery of other preventive care to this age group before and after the changes to the CHS system?
- What proportion of GP consultations with pre-school children is focused on preventive care and how has this changed over time?

Methods

GP consultation data were obtained from the NHS Scotland Information Services Division (ISD) Practice Team Information (PTI) system [15]. Under the PTI system, a sample of GP practices from across Scotland, that together are broadly representative of all practices, return data on all face to face GP consultations. Participation in the PTI system is voluntary, and practices are free to join and leave at any time. At any one time, around 60 practices serving around 5% of the Scottish population contribute to the scheme. Data captured on each consultation include patient demographics and Read codes for one or more aspects (symptom, sign, diagnosis, or scheduled care event) of the consultation.

For this analysis, the 30 practices that submitted complete GP consultation data from 1 April 2003 to 31 March 2010 and were in an NHS Board area that implemented the revised CHS system on a specified date prior to mid 2007 were included. The included practices had a combined list size of 200,852 on 1 April 2010, including 11,214 children aged 0–4 years. Practices were drawn from 10 of the 14 NHS Board areas across Scotland, were of a range of sizes (list size from around 4,000 to around 19,000), and served a range of affluent/deprived and urban/rural areas. The revised CHS system was implemented in the included practices’ NHS Board areas on dates ranging from 1 Oct 2005 to 1 May 2007. Consultations for each practice occurring during the 2½ years (10 sequential quarters) before and after the implementation date were included in the analysis.

Consultations for the reasons shown in Table 1 were identified using specially developed lists of Read codes. The lists were specified after:

- Review of relevant (previously developed) ISD Read code groupings (e.g. ‘child health care’).
- Supplementary manual searching of Read code version 2 (Scottish) browser.
- Survey of practices. To confirm that all relevant codes relating to provision of CHS reviews had been captured, a survey of practices was undertaken. The largest practice from each NHS Board area was sent an email survey in February 2011: 8 out of 10 responded. The survey asked about GP contribution to specific child health reviews before and after implementation of revised CHS and which Read codes were assigned to the relevant consultations.
- Review by relevant colleagues. The final code lists were reviewed for completeness and accuracy by a Consultant in Public Health Medicine with expertise in health information and maternal and child health and a specialist clinical coder.

Table 1 Consultations included in the analysis

Broad category	Subcategory
Child health reviews	6-8 weeks
	8-9 months
	21-24 months
	39-42 months
	48 months/pre-school
	Scheduled reviews of pre-school children at other specified ages
Other preventive care consultations	Postnatal care (including examination of newborn)
	Immunisation (all universally offered pre-school vaccinations)
	Medical and developmental assessment (eg examination of hips or heart or any aspect of development)
	Health promotion advice and parenting support (eg provision of advice on child safety or behaviour or parental support)
	Assessment and advice relating to child nutrition and growth (eg advice on breastfeeding or weaning or child growth monitoring)
Other consultations	Child protection (eg child 'at risk' or neglected/abused)
	Any other reason
Total	All consultations

Notes:

For most consultation types, only consultations with children aged 0-4 years were examined. For the following consultation types, consultations with women aged 15-49 years were also (separately) examined. Restricted code lists were used to ensure only consultations relating to children were included.

Postnatal care.

General health advice and parenting support.

Assessment and advice relating to child nutrition and growth.

Code lists finalised June 2011 using Read code version 2 (Scottish) browser. Full details of the Read codes used are provided in the Appendix.

The codes indicating child health reviews were divided into subcategories indicating each of the specific reviews offered prior to the change in CHS that GPs were potentially involved in and an additional subcategory of 'scheduled reviews of pre-school children at other specified ages'. This last subcategory included all other codes indicating reviews at different ages at which universal reviews were not usually offered. All 'other preventive care' consultations, and those that were not also coded as a child health review (i.e. those that represented additional consultations), were identified separately. For relevant subcategories of 'other preventive care' (postnatal care; health promotion advice and parenting support; and assessment and advice relating to child nutrition and growth), consultations with women aged 15-49 were also examined since maternal consultations may be for preventive care of young children. Restricted code lists were used to identify consultations with women to ensure that only relevant consultations were picked up: all codes lists are provided as an Appendix.

Practice population figures at the end of September for every year studied were used to give approximate list sizes for the preceding April to the subsequent March. Consultation rates per 1,000 children aged 0-4 years (or women aged 15-49 years where appropriate) were then calculated for each practice individually and all practices

combined for 10 sequential quarters pre- and post-implementation of the changes to the CHS system.

Analysis for this study was conducted within the NHS Scotland Information Services Division and no patient identifiable data were involved. PTI practices are informed by ISD that the data they submit will be used in anonymised form for routine NHS publications and research purposes, and practices are made aware of research outputs based on PTI data. No ethical approval was required for this study (confirmed by the West of Scotland Research Ethics Committee). ISD's Caldicott Guardian confirmed that the analysis for this study was within normal ISD practice and no additional permissions were required.

Results

Scheduled child health reviews

Prior to the changes to CHS, the commonest child health review recorded as being provided (at least in part) by GPs was the 6-8 week review (average quarterly consultation rate of 25.4 per 1,000 children aged 0-4 years for the 10 quarters prior to the change in CHS). GP provision of the 8-9 month review was slightly less common (22.5 consultations per 1,000 children 0-4 years per quarter) with provision of the 39-42 month review (10.3 consultations per 1,000 children 0-4 years per

quarter) and reviews at 'other specified ages' (14.4 consultations per 1,000 children 0–4 years per quarter) less common still. Very few GP consultations were coded as 21–24 month or 48 month reviews (Figure 1).

GP provision of 6–8 week reviews was broadly consistent over the period of study (average quarterly consultation rate of 25.8 per 1,000 children 0–4 years for the 10 quarters after the change in CHS). By contrast, there was a sudden, almost complete fall in the provision of all other child health reviews provided at specified ages (8–9, 21–24, 39–42, and 48 months) immediately after the implementation of the revised CHS system (average consultation rates all <0.5 per 1,000 children 0–4 years per quarter). There were essentially no GP consultations coded as 21–24 month reviews after the changes to CHS despite the availability of the selective 24 month review during this period which would have been identified by the codes used. Consultations for child health reviews at other, non-standard, ages dropped slightly around the time the CHS schedule was changed before increasing back to previous levels (average consultation rate of 10.4 per 1,000 children 0–4 years per quarter).

Other preventive care

Across the study period there were consistently few additional (i.e. non-child health review) GP consultations with children aged 0–4 years recorded as being for the various types of 'other preventive care', with the exception of the immunisation subcategory (Figure 2). Overall, consultations for immunisation steadily declined over the first part of the study period then sharply increased around six months after the changes to CHS. More detailed examination of the rates for the individual practices show that this overall trend was driven by two practices with sharply declining rates early in the period of study and two other practices with sharply increasing rates over the latter part of the study. Additional consultations for child protection were consistently particularly uncommon.

The majority of consultations coded to the various subcategories of 'other preventive care' (overall 87%) were not also coded as a child health review hence trends were very similar whether all 'other preventive care' consultations, or only those that were additional to child health reviews, were examined. Consultation

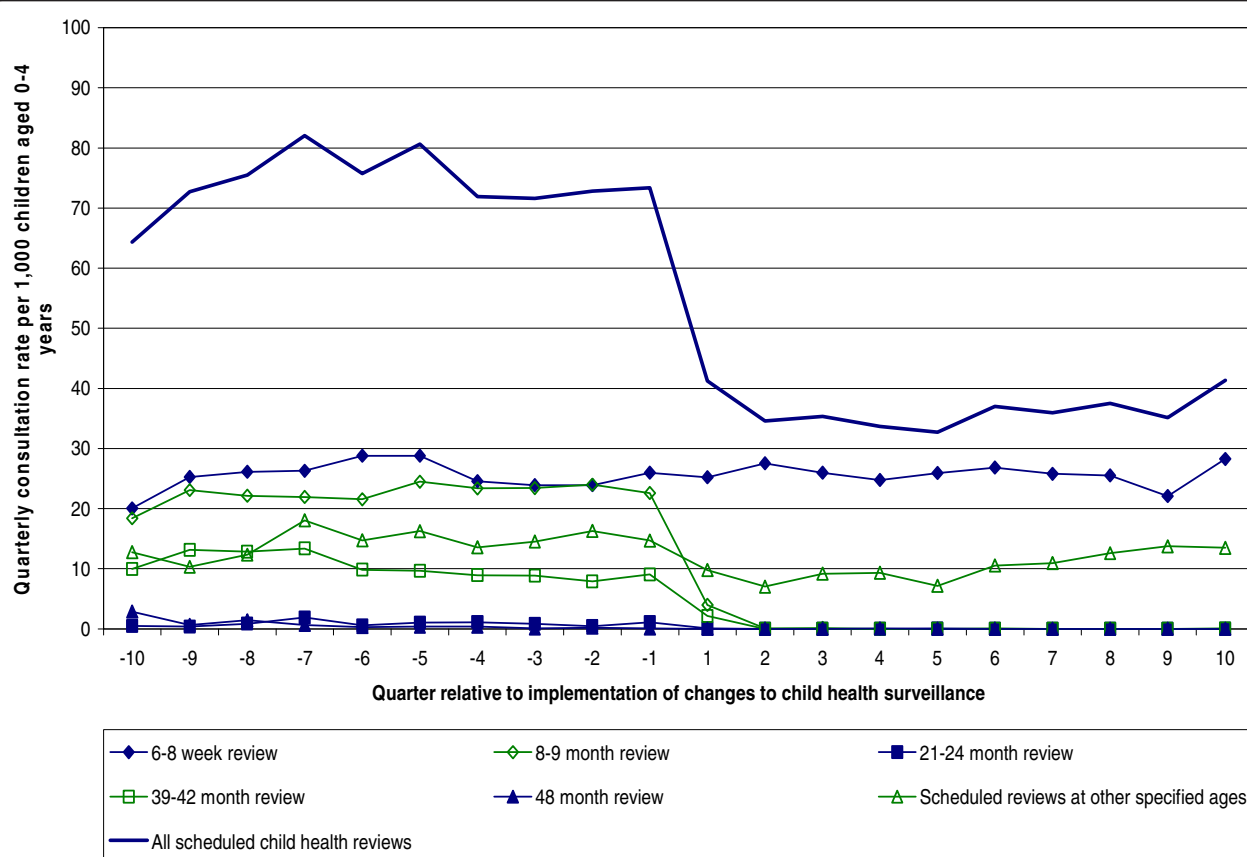


Figure 1 GP consultations with children aged 0–4 years for child health reviews, rates before and after implementation of changes to the child health surveillance system.

rates with women aged 15–49 years for postnatal care; health promotion advice and parenting support; and assessment and advice relating to child nutrition and growth also showed no change around the time the revised CHS system was implemented.

All consultations

The overall GP consultation rate with pre-school children was relatively constant over the period of study, with some seasonal periodicity evident (Figure 3). Child health reviews and, in particular, additional consultations coded as other types of preventive care, form a small proportion of all GP consultations with children aged 0–4 years. In the 2½ years before and after the changes to CHS, all preventive consultations combined accounted for around 11% (9,606 / 87,938) and 7.5% (6,709 / 88,698) respectively of all consultations with this age group, with the decline due to reductions in GP provision of child health reviews.

Discussion

We have used routinely available consultation data to explore GPs' contribution to the preventive care of pre-

school children, and to examine the impact of the changes to the child health surveillance system that were implemented in Scotland from 2005.

Prior to the changes to the CHS system, GPs made a substantial contribution to the provision of child health reviews, particularly those offered at 6–8 weeks and 8–9 months (and to a lesser extent 39–42 months) of age. Following the changes, GPs have continued their involvement in the 6–8 week review but provision of other standard reviews has essentially ceased. This finding is broadly in line with what would have been expected from the policy recommendations, although it is worth noting that policy is by no means always implemented as intended [16,17]. Our findings also show that, since 2005, GPs have had minimal involvement in provision of the selective 24 month review. This is perhaps not surprising as GPs historically had little involvement with the universally provided 21–24 month review, but it does suggest that GPs now have minimal input into proactively assessing children's development after early infancy.

Despite extensive code lists, relatively few additional (non-child health review) GP consultations with pre-

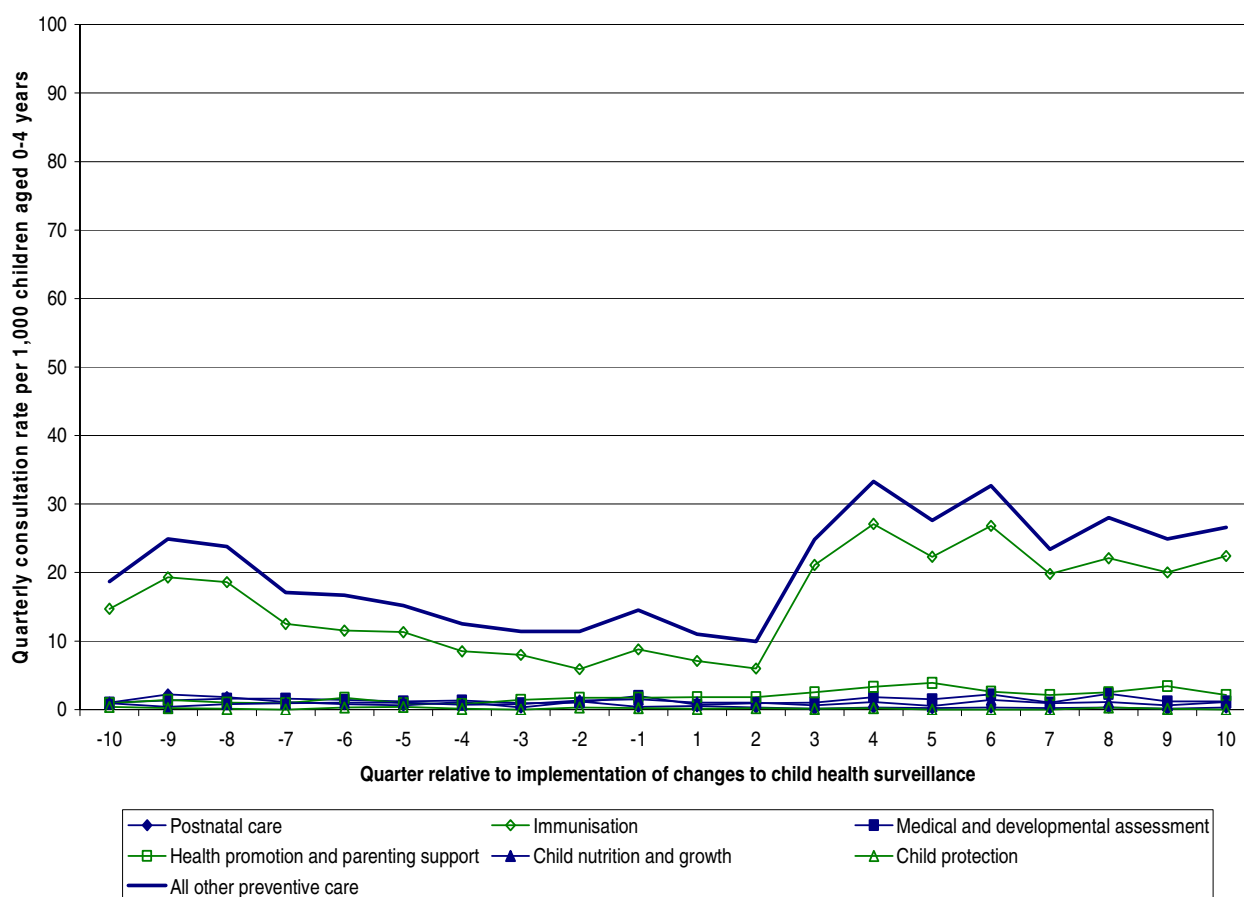
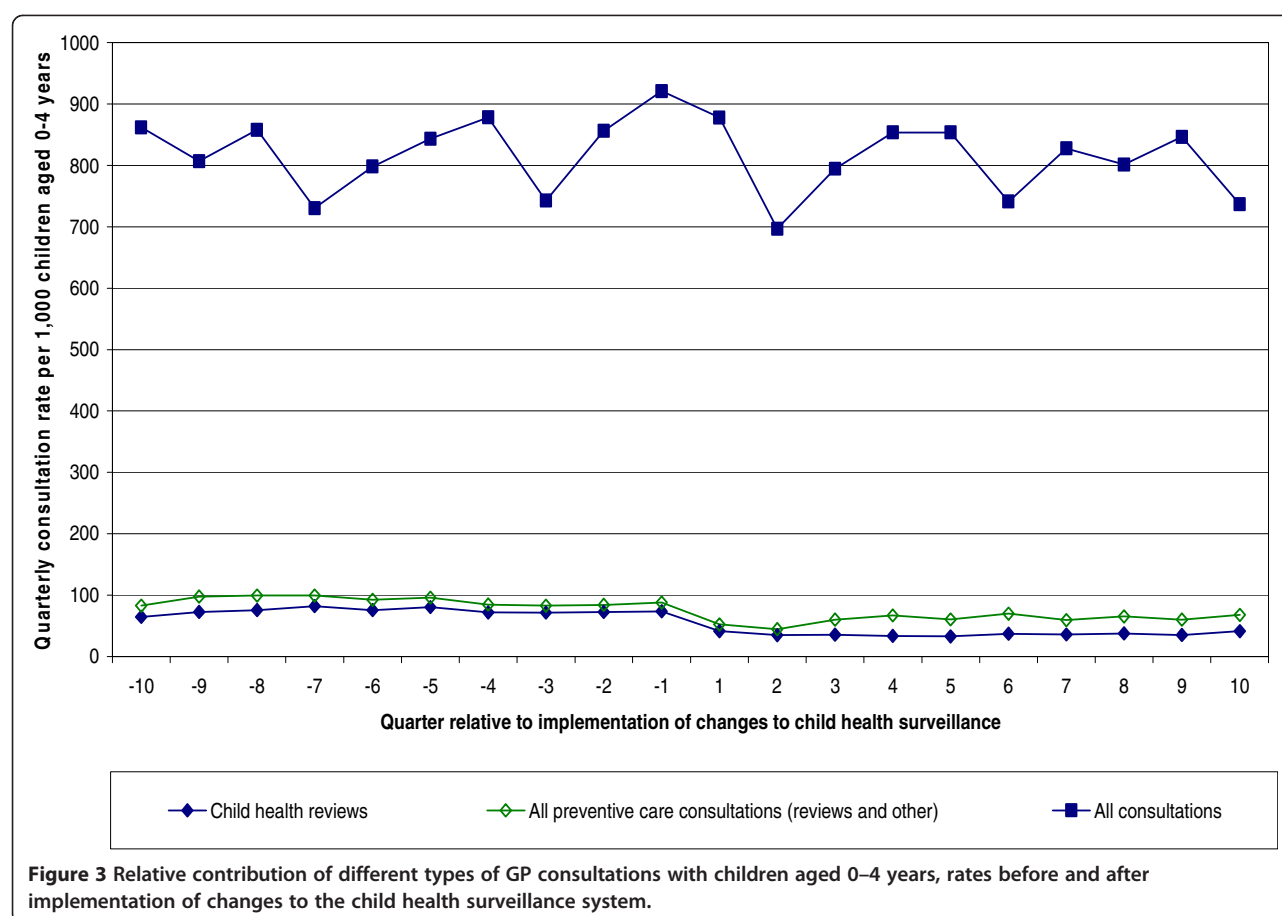


Figure 2 Additional (non-child health review) GP consultations with children aged 0–4 years for other preventive care reasons, rates before and after implementation of changes to the child health surveillance system.



school children for other aspects of preventive care were identified. Changes over time in the number of GP consultations involving childhood immunisations appear to reflect occasional changes in GP provision of routine immunisations in individual practices rather than any specific effect of the changes to the CHS system on GP involvement in this aspect of children's care. Consultations coded as involving child protection were noticeably rare, particularly in light of evidence that unhelpful parenting, neglect, and abuse are very common and have serious implications for children's outcomes [18]. In general, changes to the CHS system appear to have had minimal, if any, impact on GPs' provision of these wider aspects of preventive child health care. In particular, there is no evidence that withdrawal of 'routine' child health reviews has led to an increase in the number of non-child health review consultations for pre-school children that are focused on preventive care. Our results cannot comment on whether or how the characteristics of pre-school children receiving preventive consultations have changed over time however.

This study involved 30 practices from across Scotland that together serve over 11,000 pre-school children. The PTI information system is well established and subject

to ongoing data quality assurance procedures [15]. PTI practices are asked to code all the clinical findings/activity relevant to each consultation as precisely as possible using as many Read codes as necessary and GPs usually assign the Read codes themselves during the course of their consultations. The Read code lists used in this analysis were carefully specified to reflect the range of preventive child health care that GPs may be involved in and all recorded codes were included in the analysis. The codes assigned to a consultation will be those considered necessary by a GP for safe and effective care hence may not reflect all aspects of the consultation. It is likely that some opportunistic health promotion activity will not have been recorded and therefore not reflected in this analysis. Consultations that had provision of preventive care as a substantive component should have been identified however and the trends (or lack of them) identified are likely to be genuine.

This study has specifically examined changes over time in the preventive care delivered to pre-school children by GPs. Preventive health care provided by GPs is only one element of the complex system of services that aims to protect and promote young children's health and development however, with Health Visitor and early

education/childcare services amongst others also being important. A separate national information system, Child Health Surveillance Programme – Pre School (CHSP-PS) collects information on completed child health reviews from Health Visitors but this system does not record information on all contacts between HVs and young children [14]. The PTI system did collect information on all Health Visitor consultations with the practices' patients from 2003/04 but this data collection stopped in 2005/06 hence PTI data cannot provide information on how the totality of HV consultations with pre-school children changed after the changes to the CHS system [15].

It is known from the CHSP-PS data that HVs also ceased universal provision of child health reviews after 6–8 weeks after implementation of the 2005 policy [14,19], hence our results reflect a genuine withdrawal of these later universal reviews rather than just a shift in their delivery from GPs to HVs. Since implementation of the revised CHS system, HVs have provided the selective 24 month review to around 25% of children, although GPs have had minimal involvement in this review as noted above.

The changes to the Scottish CHS system were explicitly designed to free up existing HV time to focus available resources on children most in need of preventive care. The lack of data on care apart from routine child health reviews provided by Health Visitors means that the overall impact of the changes to the CHS system on the amount, content, and distribution of HV care (and how this relates to changes in GP provision of preventive care) therefore cannot be directly assessed. Some local areas are starting to use electronic HV case record systems which may in time make more detailed analysis of HV activity, and hence a more complete assessment of the preventive care provided to young children, feasible.

The configuration of the child health surveillance system has been the subject of longstanding debate [5]. The question of how many universal reviews are required, and at which ages, to form an effective and efficient service through which to reliably deliver early identification of health and developmental problems and provide universally relevant health promotion advice and parenting support, and from which to target additional support to families most in need, continues to exercise policy makers. Some elements of the child health programme (for example neonatal hearing screening, immunisation, and certain aspects of the CHS reviews such as provision of advice on reducing the risk of sudden infant death syndrome) are supported by high quality evidence, but in general robust evidence that directly answers detailed service organisation questions is lacking. The HFAC reports are therefore explicitly based on drawing together multiple stands of different types of evidence

along with consensus professional opinion to provide the best possible recommendations given the evidence available. It is notable that the revised CHS system implemented in Scotland from 2005 onwards has delivered a considerably reduced schedule of pre-school child health reviews compared to that recommended in HFAC4.

This study did not set out to investigate the impact of the changes to the CHS system on young children's outcomes although ultimately securing equitable positive health and developmental outcomes for children is the goal of the preventive care system. There is some evidence that the changes to the Scottish CHS system implemented from 2005 have compromised the early detection of some developmental problems. An audit in one NHS Board area suggested that the age of children referred to speech and language therapy increased considerably after the changes, and a separate pilot project looking at reinstating universal developmental reviews for toddlers found a large number of children with previously undetected developmental delays [20]. This evidence is clearly limited (and it is not possible to comment on whether changes in GP provided care have made a specific contribution to the changes seen) but comprehensive data on the detection of childhood developmental problems are lacking, making more definitive assessments difficult. Nevertheless, in response to concerns about the impact of the CHS changes on the overall functioning of the preventive care system, the Scottish Government has recently recommended the introduction of a new 24–30 month child health review for all children, although this is yet to be fully implemented [21,22].

Conclusions

GP provision of universal child health reviews has fallen considerably in Scotland since implementation of the revised child health surveillance system from 2005 as would have been expected. Since 2005, GPs have also had minimal involvement in the selective child health reviews provided by Health Visitors to vulnerable toddlers: this raises questions about the adequacy of developmental and physical health assessments being provided to this age group.

Additional (non-child health review) GP consultations with young children for any aspect of preventive care (except immunisation in some practices) are uncommon, with consultations recorded as involving child protection virtually non-existent, and the changes to child health surveillance system have had no obvious impact on provision of these additional consultations. GPs are well placed to make an important contribution to the overall preventive care of young children by promoting positive family relationships; supporting parenting; providing

consistent, evidence based guidance on issues such as child nutrition; and recognising and intervening swiftly when children's health or development is at risk [23]. The relatively low proportion of GP consultations with young children that is focused on preventive care suggests it may be debatable whether this potential is being fully realised at present.

Abbreviations

CHP: Child health programme; CHS: Child health surveillance; CHSP-PS: Child health surveillance programme – pre-school (Scottish national information system that provides information on delivery of child health reviews); GP: General Practitioner; HFAC4: Health for all children 4; HV: Health Visitor (community nurse with particular responsibility for preventive child health); ISD: NHS Scotland Information Services Division; NHS: National Health Service; PN: Practice Nurse (GP employed nurses providing a range of 'treatment room' services to patients of all age groups); PTI: Practice Team Information (Scottish national information system that provides information on GP and PN consultations); UK: United Kingdom.

Competing interests

No author has a financial or non-financial conflict of interest to declare.

Authors' contributions

RW led on study design and data analysis and wrote the first draft of the manuscript. PW provided substantive input on study design, Read code selection, interpretation of findings, and revision of manuscript drafts. Both authors read and approved the final manuscript.

Authors' information

Rachael Wood – corresponding author, Honorary Clinical Senior Lecturer, Centre for Population Health Sciences, University of Edinburgh, Teviot Place, Edinburgh EH8 9AG, rachael.wood@ed.ac.uk and Consultant in Public Health Medicine, Information Services Division, NHS National Services Scotland, Gyle Square 1 South Gyle Crescent, Edinburgh EH12 9 EB
Philip Wilson Senior Lecturer, Institute of Health and Wellbeing, General Practice and Primary Care, University of Glasgow, 1 Horselethill Road, Glasgow G12 9LX, philip.wilson@glasgow.ac.uk

Funding

Rachael Wood undertook this work whilst in receipt of a Clinical Academic Training Fellowship from the Chief Scientist Office for Scotland (CAF/06/05).

Acknowledgements

We acknowledge the assistance of Jim Chalmers and Charlie Clark for general advice, Jim Chalmers and the ISD terminology team for review of code lists, members of the ISD PTI team for data extraction, and the PTI practices for data supply and participation in the survey of coding practice relating to child health reviews.

Author details

¹Centre for Population Health Sciences, University of Edinburgh, Teviot Place, Edinburgh EH8 9AG, UK. ²Public Health Medicine, Information Services Division, NHS National Services Scotland, Gyle Square, 1 South Gyle Crescent, Edinburgh EH12 9EB, UK. ³General Practice and Primary Care, Institute of Health and Wellbeing, University of Glasgow, 1 Horselethill Road, Glasgow G12 9LX, UK.

Received: 10 February 2012 Accepted: 23 July 2012

Published: 3 August 2012

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doi:10.1186/1471-2296-13-73

Cite this article as: Wood and Wilson: General practitioner provision of preventive child health care: analysis of routine consultation data. *BMC Family Practice* 2012 **13**:73.

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