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**Growing Right: Unpacking the WHO Child Growth
Standards Development and their Implementation in
Colombia**

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**A Thesis submitted for the Degree of Doctor of Philosophy
Science and Technology Studies
The University of Edinburgh
2018**

To Julio and Elsa

Declaration of Originality of Submitted Work

In conformance to the regulations of the University of Edinburgh, I hereby declare that the present thesis: '**Growing Right: Unpacking the WHO Child Growth Standards Development and their Implementation in Colombia**', has been composed by me, and that the work is my own. The thesis has not been submitted for any other degree or professional qualification, neither has it been published in whole or in part. I have read and understood The University of Edinburgh guidelines on plagiarism and declare that this thesis is all my own work except where I indicate otherwise by proper use of quotes and references.

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Abstract

Child growth reference charts have been used since the 1960s to assess children's growth – enabling comparison of different population groups and the implementation of nutritional surveillance. In 2006, an important critical juncture occurred in the history of anthropometry and nutritional assessment, when the WHO released new growth charts for international comparison after promoting, since 1975, the use of the charts developed by the Centers for Disease Control (CDC) and US National Center for Health Statistics (NCHS). According to the WHO, these charts indicate *how children should grow* for the best health outcome in contrast to the NCHS/CDC charts that indicated *how the average child grows*. This shift from a descriptive to a prescriptive –and rather normative – approach allowed the WHO to state that all children in the world have the potential to grow and develop to within the same range of height and weight, thus implying that all children should develop in specific standardised ways, regardless of ethnicity, socioeconomic status and type of feeding.

By 2011, approximately 125 countries had adopted the WHO charts for individual growth monitoring as well as the means of producing statistics for under- and over-nutrition, which would be used to assess and monitor a population's health status. This shift between charts has direct implications for how children's growth is measured and how malnutrition is assessed. The adoption of the WHO charts has immediate consequences for the calculation of underweight, overweight, stunting, and wasting prevalence. In this sense, the adoption of the new charts considerably changes the estimates to predict nutrition-related emergencies, the assessment of appropriate weaning practices, and the screening and monitoring of populations at risk or with growth deficiencies or excesses.

In my doctoral research, I use Colombia as a case study to unpack how a standard developed by an international organisation is negotiated, adopted and constantly transformed once it is scaled down to a specific country. Using the theoretical approach to standards by authors such as Star, Bowker, Timmermans, Berg, and Epstein, in this dissertation I show how, far from being 'stable' and 'value-free' (as

the World Bank would describe them), growth charts are political tools of measurement, charged with specific values regarding children's bodies.

Given that Colombia had previously used the NCHS charts, this research explores how the WHO charts have been adopted within individual growth monitoring programmes in Colombia. I also describe how the change in charts has destabilised the production of under and over-nutrition indicators by national bodies, such as the Ministry of Health and the Instituto Nacional de Salud. My data includes twenty-eight interviews with policy makers, experts and civil servants who actively participated in the process of adopting and adapting the standards in Colombia at the national level; seventeen interviews with nurses and doctors; observation of 158 anthropometric assessments of children under five years old within six health facilities in the Caribbean region that were implementing a growth monitoring programme. By exploring how the WHO charts are interpreted and used in practice, this research contributes to the study of standards and standardisation as a field of study in its own right.

Lay Abstract

The measurement at birth and follow up of children's weight and height constitutes a routine practice to assess the nutritional status of a child. In order to identify if a child is growing at a normal rate or if a child is at any risk of under or over-nutrition, the child's measurements are plotted on a growth chart that allows comparison of the child's growth with a reference child of the same age and sex. In 2006, the World Health Organization (WHO) published a new set of growth charts to assess children under five years old, after promoting for almost thirty years the charts developed by the United States National Center for Health Statistics (NCHS). According to the WHO, the main difference between the WHO charts and the NCHS charts is that the former indicates how children *should* grow for the best health outcome, in contrast to the latter's indication of how the average child *actually* grows. In 2010, Colombia, just like many other countries in the world, adopted the WHO standards to measure children and to generate national estimates of child malnutrition.

In this research, I analyse the transition from the NCHS to the WHO charts. Using Colombia as a case study, I follow the WHO charts from their creation in the international context to their implementation at the national scale. I explore how the charts were adopted and adapted to the existing regulations of the Colombian national health policy, their use to measure children at the individual level in the context of a growth monitoring programme, and the outcomes of their adoption when measuring the national prevalence of child malnutrition.

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List of Abbreviations

ENDS	Encuesta Nacional de Demografía y Salud (National Survey of Demography and Health)
ENSIN	Encuesta Nacional de Situación Nutricional (National Nutrition Survey)
FAO	Food and Agriculture Organization of the United Nations
G&DP	Growth and Development Program
ICBF	Instituto Colombiano de Bienestar Familiar (Colombian Institute of Family Welfare)
IDB	Inter-American Development Bank
INS	Instituto Nacional de Salud (National Institute of Health)
MDGs	Millennium Development Goals
MGRS	WHO-Multicentre Growth Reference Study
NCHS	National Centre for Health Statistics of the United States
PAHO	Pan American Health Organization
SIVIGILA	Sistema de Vigilancia en Salud Pública (National Health Surveillance System)
UNICEF	United Nations Children's Fund
WHO-CGS	WHO Child Growth Standards
WHO	World Health Organization

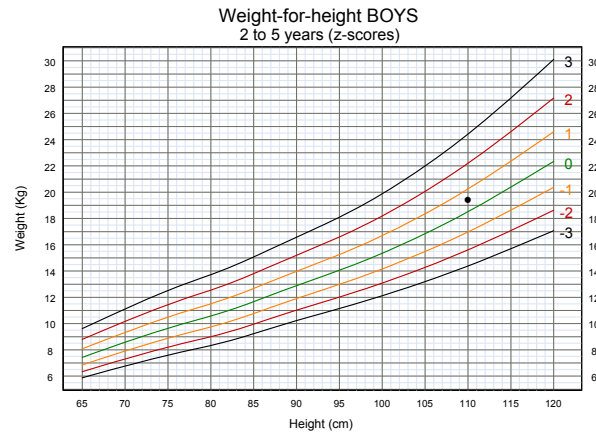
Chapter 1. Introduction

The use of anthropometry¹ to measure children's growth is one of the most common practices in public health and paediatric care to assess the general nutritional status of an individual or a population group. Even though there are several anthropometric measures to assess the nutritional status of a child, such as the mid-upper arm circumference or skinfold measures, the most common anthropometric indices are based on the child's weight, height and age. These three variables can provide enough information to assess if a child is stunted (low height-for-age), wasted (low weight-for-height), overweight (high weight-for-age) or underweight (low weight-for-age) (Zemel, Riley and Stallings 1997).

To identify if a child is following normal or abnormal growth through anthropometric measurements, it is necessary to have some means of comparison with a reference child of the same sex and age. When a child is measured, weight and height are compared against a growth chart that shows a series of curves in the form of percentiles or standard deviations that visually depict the growth pattern of a reference sample. Each anthropometric index (weight-for-age, height-for-age and weight-for-height) has its own chart for girls and boys. When a child is measured each variable is plotted on a chart with the aim of identifying how far or close from the mean the child is. Figure 1 is an example of a weight-for-height chart designed by the WHO, indicating (with a black dot) a boy with normal growth.

¹ Anthropometry is the measurement of human morphology; it is used by different disciplines including biological anthropology, human biology, clinical medicine, applied physiology, health sciences and ergonomics. One important characteristic of anthropometry is that it can be used to 'define population characteristics or to assess individuals with respect to some physical parameter'(Ulijaszek and Mascie-Taylor 1994:XI).

Figure 1. Representation of a boy with normal weight-for-height using a WHO chart.



Source (WHO 2008b:16)

The measurement of children's growth as a routine practice in medical settings can be traced back to the beginning of the twentieth century, a period in which children gained social recognition as a subgroup of the population with specific needs (Turmel 2008). More than a century later, individual growth assessment continues to be a key procedure in the field of child health care. According to most of the guideless in preventive care, children are expected to be measured for the first time at birth. From that moment on, children's bodies should be measured at regular intervals in order to identify if the child is following a healthy growth pattern. The American Academy of Paediatrics, for example, recommends measuring children during the first two weeks of life and then during the first, second, fourth, sixth, ninth, twelfth, fifteenth and eighteenth months (AAP 2008).

Anthropometric measurement is also widely used as an effective tool to assess the social and economic wellbeing of a population (Cogill 2003). Since growth and body size in paediatric age ranges are highly affected by environmental factors conditioned by poverty and socioeconomic status such as infectious diseases, nutritional deprivation, food contaminants, and psychological stress, children's bodies are a 'sensitive marker of the quality of life' of a society (Ulijaszek and

Komlos 2010:188). Taking this into account, since the 1970s, agencies such as the World Bank have been using children's height as a proxy for national wellbeing and the change of height over time as a criterion of the success of economic aid (Tanner 1998b).

The use of anthropometric assessment has also been promoted by international organisations such as the World Health Organisation (WHO), the United Nations Children's Fund (UNICEF) and the Food and Agriculture Organization (FAO) as one of the fastest, least expensive and least invasive techniques to evaluate the nutritional status of children. Since the 1960s, the WHO and the FAO have promoted the measurement of children's weight and height as a key source of data to assess the prevalence of child malnutrition worldwide.² The latest report of the WHO, UNICEF and the World Bank on child malnutrition stated that in 2016, 155 million children under five years old were stunted, 41 million were overweight, and 52 million were wasted (UNICEF, WHO and World Bank Group 2017). The production of these kinds of statistics often seems transparent, objective, scientific and above politics (Merry 2016); however, as I will discuss throughout this dissertation, the measurement of malnutrition is mediated by standards that are the product of diverse negotiations and political agendas. To understand the production of quantitative knowledge about child malnutrition and child growth, in this research I focus on the development of child growth charts that have been promoted by the WHO as tools for international comparison.

² Even though fighting malnutrition should be an obligation as it is a violation to the Convention on the Rights of the Child (Lewis, 1999), in the international discourse it is the economic reasoning that prevails to justify why malnutrition needs to be eradicated and why the investment in early childhood needs to be a priority for development. According to different agencies such as the WHO and the World Bank, child malnutrition slows down economic growth and perpetuates poverty as it produces high health care costs, direct losses in productivity and indirect losses in terms of poor cognitive function and deficits in schooling (World Bank, 2006). During the late 1990s, this discourse was intensified by the development of theories of human capital that state that the return of the investment on interventions during early childhood is higher than if it is done during other stages of life (Penn, 2012)

1. 1 Dissertation Outline

Since the early nineteenth century, many growth charts have been developed to assess children's growth (Tanner 2010); however, it was during the 1960s that international organisations, particularly the WHO, began to promote their use to assess the growth of children, implement nutritional surveillance and compare how different groups of the population were growing (de Onis and Yip 1996). Starting in 1978, and continuing for the following 28 years, the WHO recommended the use of growth charts developed by the National Center for Health Statistics (NCHS) for international comparison. In 1993, however, the WHO decided to replace the NCHS charts, mainly because they were based on data from white children who were predominantly formula-fed (Garza and Onis 2004).

To gain a wider perspective on child growth, the WHO implemented a study called the Multicentre Growth Reference Study (MGRS) between 1997 and 2003. This study collected primary data from a total of 8,440 children from Brazil, Ghana, India, Norway, Oman and the United States. In addition, the MGRS included children that were exclusively breastfed for at least four months. In 2006, the WHO launched a new set of charts based on the MGRS, called the WHO Child Growth Standards (WHO-CGS), replacing the NCHS charts as the reference for international comparison.

According to the WHO, the difference between both sets of charts is that the NCHS references indicated *how the average child grows*, in contrast with the new charts that indicate *how children should grow* for the best health outcome (WHO 2007). According to the WHO, while the NCHS charts were 'growth references', the new charts were 'growth standards'. In other words, the latter provided a visualisation of the growth pattern of healthy children living under ideal conditions to achieve an optimal growth. This shift from a descriptive to a prescriptive approach allowed the WHO to state that all children under five years old had the potential to grow and

develop to within the same range of height and weight, thus, implying that all children could develop in specific standardised ways regardless of ethnicity, socioeconomic status and type of feeding.

The development of the WHO-CGS diverged from previous methodologies for constructing growth charts, by shaping the reference sample of the MGRS to include exclusively children living under conditions that the WHO prescribed as ideal for achieving optimal growth. Stating that the new WHO-CGS could indicate the growth pattern of a ‘standard human’ under five years old, regardless of variables such as ethnicity and genetics, also suggested that the new charts could be used as a universal standard to make normative statements regarding children’s growth.

Once the standards were published by the WHO in 2006, several countries decided to adopt them to measure their own population under five years old. A study conducted by the WHO in 2012 found that by 2011, 125 countries were using the WHO charts (de Onis et al. 2012). Eighteen years after its publication, the WHO-CGS continues to be positioned as the international standard to assess malnutrition in children under five years old. As an example of this, the Sustainable Development Goals use the WHO-CGS to follow up the targets related to child malnutrition.

In 2010, Colombia adopted the WHO-CGS after using the NCHS charts for almost thirty years to measure individuals and the population. Using Colombia as a case study, in this research I explore the social life of the standards – how they are created and how they are adopted, adapted and integrated into local practice. In my analysis I examine how standards created at an international scale are integrated into the existing infrastructures and networks responsible for the child health care of a specific country, in this case Colombia.

My interest for this research topic began in 2009 when I was working as a qualitative researcher of the Nutrition Unit of the Instituto Nacional de Salud (INS)³. During this year the Ministry of Health, the INS and the Instituto Colombiano de Bienestar Familiar (ICBF)⁴ became deeply involved in discussing the adoption of the WHO-CGS and its implications for the assessment of child malnutrition. Even though I was not part of the team in charge of planning the transition between charts, I soon became interested in understanding the implications that changing standards would have for health and nutrition programmes targeting children, as well as for the nutrition surveillance systems and national surveys that produced malnutrition statistics. The shift between charts not only had technical implications, such as changing the forms that doctors were using to assess children, or requiring training for health professionals in the use of the WHO-CGS, it also had consequences in the way child malnutrition was diagnosed and quantified.

In order to analyse the development of the WHO-CGS and their adoption and implementation in the Colombian context, I took inspiration from theoretical approaches to standards and standardisation developed by scholars such as Geoffrey Bowker, Marc Berg, Steve Epstein, Martha Lampland, Susan Leigh Star, and Stefan Timmermans. Within this scholarship, standards and standardisation are understood as forms of classification of the world that facilitate the construction of uniformities across time and space to make things work together between different communities of practice (Bowker and Star 2000). More than thinking about the growth charts as representations of a biological reality, I am interested in unpacking the processes that made the growth charts perform as apolitical, ahistorical and objective tools to measure children's bodies. My research responds to the above scholars' call for opening the 'black box' of standards and standardisation in medical practices.

Just like many other standards, I argue that child growth charts are stabilised tools no longer questioned, examined or viewed as problematic. Authors like Star and

³ National Institute of Health

⁴ Colombian Family Welfare Institute

Lampland (2009) describe standards as having the property of becoming invisible through the naturalisation of their use, and it is mainly when a standard stops working or when it is replaced that the invisible forces of standardisation become visible again. This was indeed the case for the charts that the WHO promoted for international comparison. Most of this research therefore probes the transitional phase between charts – a liminal moment that denaturalised the growth standards.

Research on the production of child growth standards has mainly focused in the period between 1850 and 1950. This research contributes to the study of standards in contemporary societies and standards targeting the human body. With the aim of unpacking the ways in which standards were constructed, and how diverse social understandings of children's bodies and their health status shaped the design of the standards and later shaped their use, I decided to follow the life cycle of the WHO-CGS through three different stages: 1) creation, 2) adoption and 3) implementation. The first one covers the development of the WHO charts, the second one covers its adoption by the Colombian national government, and the third one is centered on the use and implementation of the standards. This last implementation stage is examined at two levels: measurement of the individual in the context of a growth assessment programme, and measurement of the population through the Encuesta Nacional de Situación Nutricional (ENSIN)⁵.

In the next chapter, I present the existing historical and sociological literature on child growth charts. I also present the key literature on standards and standardisation that I have used to analyse the WHO-CGS. I emphasise the dearth of studies on child growth charts developed after the Second World War, and the value of using theories of standards to comprehend growth charts in contemporary societies.

⁵ Colombian National Nutrition Survey

In Chapter Three I focus on the methodology of this study, providing a detailed account of data collection and analysis, as well as ethical considerations and methodological limitations.

Chapter Four is the first empirical chapter, examining the process of construction of the WHO charts. In this chapter, I analyse why the WHO stopped promoting the NCHS charts and replaced them with the WHO-CGS. I pay particular attention to the transition from a descriptive approach to measuring children's bodies, to a prescriptive one. Besides analysing the transition from the average child to the standard child, I also locate the development of the WHO charts within the agenda of the WHO and its efforts to standardise children's measurement since the 1960s.

Chapter Five covers the process of adoption and adaption of the WHO-CGS within the Colombian national context. Based on twenty-eight interviews with civil servants, policymakers and scholars who participated in the decision of adopting the new charts, I analyse why the national government opted to migrate standards and how, in this process, the WHO charts were transformed to make them match local requirements for measurement.

In Chapter Six, I focus on the use of the new charts in the context of individual growth monitoring. This chapter is based on interviews with health professionals and observation of 158 individual growth assessments that took place in six health facilities (located in the Caribbean region) offering the services of the Growth and Development Programme, a preventive initiative in which children's growth is monitored.

Finally, in Chapter Seven I continue exploring the implementation of the WHO charts, however instead of observing the role of the standard in individual assessment, I shift to the measurement of children as a population. In this chapter I

return to the national scale, in order to analyse the implications of changing standards for the analysis of the ENSIN of 2010. The analysis focuses on how the shift between charts altered the estimates of child malnutrition in the country. As a consequence of using the WHO charts, the national prevalence of stunting and wasting was higher than when it was measured against the NCHS charts. Thus, the new chart enabled a new epidemiological reality for the country.

Chapter 2. Existing Scholarship

The development and adoption of child growth charts for international comparison, has been relatively unexplored within the social sciences. Most of the existing literature on this topic is concentrated in the fields of public health and paediatrics. Since the WHO charts replaced the NCHS charts in 2006, these fields of research have focused on assessing changes in malnutrition estimates. Most of these studies concluded that, by comparison with NCHS measurements, the rates of stunting, wasting and overweight could increase when using the WHO charts (e.g Fenn and Penny 2008, Johnson, Wright and Cameron 2012, Madarina 2009, Mei et al. 2008, de Onis et al. 2006, Wang et al. 2009)⁶.

Rather than explaining the technical aspects of chart design, or the epidemiological implications of the transition from one chart to another – a topic already covered extensively by De Onis et al.(2004a)– I analyse the social and political dynamics surrounding the design of the WHO charts, as well as their adoption and implementation in Colombia. Far from being neutral tools of measurement, I argue that growth charts are socially shaped artefacts, able to perform as if they were objective graphic representations of human growth. Growth charts are constantly negotiated and interpreted among different users including health researchers, policymakers, health professionals, caregivers and within different contexts. Given that the WHO charts were created by an international organisation for adoption in several countries, my analysis focuses on understanding how the charts ‘travel’ from an international setting to the national policy of a country (here, Colombia), and into the everyday lives and work of health professionals in growth monitoring programs.

In this dissertation, I suggest that the best way to analyse the development, adoption and implementation of the WHO child growth charts is by thinking about them as standards designed to facilitate cooperation between diverse communities of practice,

⁶ I discuss these findings in more detail in chapter seven.

in assessing children's growth at the scale of both the individual and the population. I argue that the literature on standards in the field of Science and Technology Studies provides an ideal theoretical framework through which to analyse the development of the WHO charts, their adoption and implementation in the Colombian context. This chapter is divided in two main sections; in the first one I review the work of authors that have explored the development of child growth charts specifically. In the second part, I focus on the literature on standards and standardisation in which this research is framed.

2.1 Studies of Child Growth Charts

While the social sciences have somewhat neglected the development of child growth charts after the mid-twentieth century, there is a significant body of work on their origins and development into the end of the twentieth century and the beginning of the twenty-first century. Scholars such as Ulijaszek and Kolmos (2010), Tanner (2010), Young (1979) and Lowrey and Watson (1973) have written in-depth accounts of the history of children's anthropometric measurement. Most of their work consists in describing the characteristics of studies conducted in Europe and the United States targeting children's growth and development after the 1910s⁷. In the United States, these studies included the University of Iowa Child Welfare Study (1914), the Harvard Growth Study (1922), the Berkeley Growth Study (1928) and the Fels Longitudinal Study (1929); studies in United Kingdom included the Oxford Child Health Survey (1943) and the Harpenden Growth Study (1948). Though they do mention how growth charts were constructed, these authors did not set out to problematize chart design, or to think about them as socially embedded artefacts. Most of these studies are concentrated in developing the history of anthropometry as a discipline leaving the historicity of its artefacts unexplored.

⁷ Chapter four provides a review of some of the history of anthropometry, and its relevance in understanding the NCHS and the WHO growth charts.

Other authors, including Armstrong (2002, 1995, 1979), James (2005) Steedman (1995, 1992), Turmel (2008, 2004), and Wong (1994), explored the importance of the development of growth charts in the construction of the category of childhood and child normality at the beginning of the twentieth century. These authors emphasised that the extensive anthropometric study of children responded to a context in which children were becoming recognized as differentiated social actors with particular needs. Progressive control of child labour, compulsory schooling, and the child-welfare movement, along with the development of public hygiene, paediatrics, psychology and education, framed childhood as an 'autonomous category of thinking and acting' (Turmel 2008:2). Turmel (2008) has also stressed that during this period, children were recognised as a subgroup of the general population, a classification that emerged as a result of the rise of statistical thinking and reasoning that gave origin to population studies. Children became the target of systematic scientific investigation through the development of disciplines such as child physiology, developmental linguistics and anthropometry (Steedman 1995, Smuths 2008). Growth charts and tables expressed new forms by which children's bodies were observed, recorded and monitored (Turmel 2008).

According to Turmel (2008), tables and charts, as material objects, were pivotal in the standardisation and normalisation of child development – an innovative way of conceptualising children as subjects consistently developing in time and space, following a sequence of particular stages (see Turmel, 2004; Wong, 1994). Statistical technologies and large scale surveys of children 'set the pace for the rise in norms of growth relevant to all children, norms materialised in such artefacts as graphs and charts that constituted the core basis on which developmental thinking advanced at the turn of the twentieth century' (Turmel 2004:424). Artefacts such as record forms and intelligence tests, and charts to measure growth, sleep and posture, helped render visible what the 'normal child', the normal developed child, should look like (Turmel 2008). The notion of a normal child was commensurable with the concept of 'average', a category that emerged in the nineteenth century and took root in Quetelet's and Galton's work on the normal curve and the idea that human characteristics were normally distributed; normal people were positioned near the

average, while those located at both ends of the curve deviated from the norm (Gigerenzer et al. 1990, Porter 2008). Following an actor network theory approach, Turmel has described charts, graphs and tabulations as social technologies that act as mediators/translators between different actors and settings – including researchers, laboratories, physicians/paediatricians, and parents. Growth charts, then, could be understood not only as textual inscriptions of children, but also as ‘immutable mobile[s]’ (Latour 1986), readable and reproducible devices able to travel or move while remaining stable. Turmel is interested in how objects like charts, tables, diagrams and signs contribute to the production of the child, in how objects construct subjects. Rather than focusing his analysis on paediatricians, parents, the children or the technologies of visualisation (e.g. charts), he is interested in the ‘socio-technical network of their relationships’ (Turmel 2008). Turmel’s work on the graphic visualization of children is one of the very few studies of growth charts that problematizes them as social technologies. Some of my analysis of the WHO-CGS is based on the idea that growth charts shape – and at the same time are shaped by – our understanding of children as social actors. As I will discuss later in this chapter, I do not use the concept of immutable mobiles to understand child growth charts, as most of my work shows how charts can travel across different sites not because they are immutable but because they have the faculty of being plastic and malleable.

Armstrong (1995) highlights that weight and height growth charts perhaps best capture the increasingly intensive surveillance of children’s bodies by the new medical gaze during the early twentieth century. He argues that the child was the first target of the deployment of what he calls the New Surveillance Medicine. Children’s growth and development became a matter of constant medical observation and monitoring through the establishment of antenatal care, infant welfare clinics, baby clinics, birth notification and day nurseries. In the case of growth charts, he notes (1995, 2002) that height and weight could not be judged by the traditional clinical method of nosological references, but required comparison with other children. In the context of Surveillance Medicine, the abnormal body is defined in relation to a normal population. The individual growth trajectory of a child could be classified as

normal or abnormal only when compared against the population's trajectory – such that abnormality became a relative phenomenon. Several of the studies aiming to understand children that took place in the United States during the 1920s and 1930s focused on defining what constituted a normal child, with the aim of establishing norms of child development and ranges of deviation that could be used to judge children's well-being and progress. Previous studies centred on abnormality were replaced by the study of normality, with the rationale that 'the abnormal could be identified and prevented only through better knowledge of the normal' (Smuths 2008:127).

The authors I have mentioned have analysed the development of growth charts at the beginning of the twentieth century however their work has been of great relevance as a background to understand the origin of growth charts as those developed by the WHO. While Armstrong and Turmel offer an interesting analysis of the role of growth charts in the construction of child normality, they do not discuss the particularities of the construction of growth charts, nor the politics determining who is included or excluded from studies that define normality. The question of who is included in constructing the benchmark for 'the normal' goes unasked. My research differs from previous studies not only because I look at charts developed in the twenty-first century, but also because the starting point of my analysis is the construction of those charts. The existing literature shows how visualisation technologies like growth charts have played an important role in shaping our understanding of children's bodies; but the question of how specific ideas about children have shaped the construction of standards and tools of measurement tends to be dismissed. For the case of the WHO charts, I argue that an analysis of the role of growth charts in the monitoring and classification of children requires treating the growth charts as objects of inquiry in their own right. As such, my research requires both unpacking the values and ideals surrounding children's bodies that are embedded in the construction of these charts, and tracing the ways those values are mobilised once the charts are adopted and implemented.

‘Curves to Bodies: The Life of Graphs’ by Dumit and de Laet (2014) is perhaps the only paper in the social sciences that has pursued a discussion of the WHO charts. The authors demonstrate that growth charts are performative, normative artefacts, which rely on differences of sex (charts are designed to measure boys and girls) as if they were meaningful statistical facts. In addition, they show that child growth charts, as well as calorie counting charts, are means by which statistical operations enact the normal and abnormal body. Through these examples they suggest that charts ‘*produce* the very bodies that populate the accounts which are illustrated by the graphs’, undertaking body-sculpting work as ‘these graphs shape the physical substance that we live with, in, and through’ (Dumit and de Laet 2014:73 italics in original)⁸. They also argued that the MGRS set a new standard for what a protocol is and should achieve, by developing charts based on a sample of children that the study defined *a priori* as ‘standard babies’. The WHO charts, then, are devices explicitly designed to intervene in rearing practices, taking as a point of reference criteria that the WHO charts normalise as healthy babies.

Dumit and de Laet’s (2014) work described reference samples used in the studies that generated the NCHS and WHO charts – a significant aspect in understanding children’s growth assessment. While their research constitutes a relevant exploratory description of the WHO charts, my analysis provides a deeper understanding of the characteristics of those samples, and the decision-making processes that lead to their construction. As I will show in chapter four, the construction of the WHO growth charts and the rationale behind their production is deeply intertwined with the need to standardise children’s measurement and thereby facilitate the comparison of data from different countries. My work adds insight into the politics of the measurement of children’s bodies in generating international malnutrition indicators.

⁸ As an example, they state that the WHO chart normalises the body of breastfed children. When charts are used, they can influence the material world (e.g. parents can change their rearing practices), such that children’s bodies will get closer to what the charts have classified as ‘normal’.

Even though Dumit and de Laet include in their paper two brief descriptions of cases in which children are measured, their paper does not seem to be based in empirical data, leaving absent from their argument the ways in which physicians, caregivers or children interpret and use the charts. My research resonates with the idea that charts reproduce the bodies they represent as normal, and thinking about the charts as artefacts able to shape or sculpt the body is particularly useful. However, based on my observations in consultation rooms, I argue that what is relevant in terms of growth assessment in the case of individual monitoring is the individual growth pattern, and not the achievement of what the chart shows to be an ideal body size. In this sense, my study offers an empirical landscape in which the idea that charts sculpt bodies similar those included in the reference sample can be problematized.

While the existing literature provides a useful background to the origin of growth charts targeting children, I argue that there is an empirical and theoretical gap in the understanding of charts developed to facilitate international comparison. I suggest that the literature on standards and standardisation constitutes a fertile theoretical context in which to analyse the origin and use of WHO charts. I conceptualise the WHO charts as standards that facilitate cooperation between different communities of practice, on international and national scales, in order to monitor and assess children's growth, and also to produce metrics on child malnutrition.

2.2 Standards and Standardisation

The study of standards and standardization as 'phenomena worthy of study in their own right' (Star and Lampland 2009:4) has a relatively recent trajectory within sociological theory. While the sociological analysis of standards has increased in recent years, it remains an emerging field of research. According to Timmermans and Epstein (2010), standards have been analysed primarily in terms of the ways they intersect and/or overlap with other topics of sociological study, such as quantification, classification, commodification, evaluation and regulation, only

recently becoming a topic of interest in themselves. Even in research on standards of living, human rights standards, food standards and labour standards, discussion of the concept of ‘standard’ is often missing (ibid). A similar critique has been raised by Busch (2011), who argues that standards have been the subject of discussion in health education, health care and information technology, but are rarely analysed critically in terms of what they are, what they do, and what different standards have in common.

Social research on standards and standardisation in nutrition and anthropometry shows a similar tendency. In the case of child malnutrition, the role of growth charts or other tools of measurement on the definition of what malnourishment is and who is malnourished often goes unquestioned. Sociological and anthropological studies on undernutrition have centred their attention on associated social determinants, the role of caregivers, beliefs about feeding and diet, and adherence to nutrition programs (e.g. Cassidy 1987, Chary et al. 2013, Dettwyler 1993, Panter-Brick 2008, Scheper-Hughes 1985). However, the tools of measurement, classification and standardisation behind the process of defining underweight, stunting and wasting is relatively untouched. The study of overnutrition marks one possible exception, as there is a cluster of critical research looking at the development and use of the Body Mass Index (BMI). But within the field of nutrition, the BMI might be one of the few tools of weight measurement and nutritional classification that has been examined as a standard historically situated and imbued with social value (e.g. Fletcher 2014, Nicholls 2013, Ross 2005).

Star and Lampland (2009) have pointed out that standards might have escaped from social analysis as the result of their invisibility as sociocultural projects in themselves. Like other phenomena, including quantification and formal representation, standards are often perceived as ‘outside social order’ (2009:9) – and questioning standardization is unusual precisely because it is a central feature of the social and cultural life of modern societies. Standards and standardisation are often perceived as valuable and necessary, and questions of how to standardise are more

likely than questions of why we ought to standardize in the first place (Star and Lampland 2009).

Standards are so embedded in our everyday life that they can go unnoticed, remaining hidden or invisible. They are black boxes, stabilized tools that are no longer questioned, examined or seen as problematic. Bowker and Star (2000) point out that standards become invisible through the naturalization of their use. For authors like Busch (2011) it is the possibility to appear natural, benign, merely technical and almost unrecognizable in everyday life that makes standards a manifestation of social, political and economic relations of power. Standards are powerful because of their 'ability to set the rules that others must follow, or to set the range of categories from which they may choose' (2011:28). Once naturalized, standards display what Busch calls *anonymous power*, taking on 'a life of [their] own' (Busch 2011:29) in which we forget the origin of the standard and its initial purpose, and against which it is difficult for competing standards to emerge .

Making the invisible force of standards visible is one of the few means of opening the black box of standards and standardisation (Bowker and Star 2000). Denaturalising standards, and exposing those traits that make them seem universal, omnipresent and ahistorical, allows us to understand the power dynamics involved in defining who or what is included and excluded – both in the process of designing standards, and in the outcomes of their application. Opening the black box of standardisation also helps us understand other processes of social life that are synchronised with standards, including classification and measurement. I argue that denaturalising the use of growth charts as standards by which to measure children's bodies draws out the reasons children are measured, the criteria used to define optimal growth, and the benchmarks used to define what kind of body is normal and desirable. Unpacking the politics of standardisation involved in the design and use of growth charts also triggers questions about what constitutes malnutrition, and its deployment in the development of indicators to measure development.

Besides the property of being invisible, Star and Lampland (2009) characterise standards as having four common dimensions: 1) they are nested inside one another, and therefore intertwined with other standards; 2) they are distributed unevenly across historical, social and cultural landscapes; 3) they embody ethics and values; and 4) they are relative to users and communities of practice, and are therefore contextual. I have used these characteristics in my research to understand the design of the NCHS and WHO growth charts and their use in the Colombian context. Thinking about growth charts as a socially constructed standard provides fertile terrain for questioning what kind of values around children's bodies and their health status are mobilised in the design of charts, and in their dissemination. In addition, thinking about growth charts as artefacts nested within other standards helps expand analysis to other standards and classifications schemes (e.g. malnutrition classification systems, standardised instruments of measurement, medical records, and clinical guidelines) that are intertwined with the charts.

Standards are also a form of regulation that allow co-operation in the modern world (Brunsson and Jacobsson 2000). They are tools that help to regulate and calibrate social life, stabilize knowledge, and facilitate different tasks across cultures, time and geography (Timmermans and Epstein 2010). In this regard, Bowker and Star (2000) use the concept of the 'boundary object' to understand how standards are used when different actors need to cooperate and interact. They contend that standards can inhabit multiple contexts, and that their meanings are balanced such that they can be adapted to local and universal needs. The 'boundary object' was originally proposed by Star and Griesemer (1989) as an alternative to the concept of translation developed by Latour, Callon and Law (see Latour 1987, Callon 1986). According to Star and Griesemer, the notion of translation and *interessement* gave privilege to the viewpoint of one dominant actor; instead, they propose an 'ecological analysis that does not presuppose an epistemological primacy for any viewpoint' (Star and Griesemer 1989). By studying the creation and management of boundary objects, they sought to understand how diverse actors participated and cooperated in the

heterogeneous work of building the Museum of Vertebrate Zoology at the University of California. They defined boundary objects as:

Objects which are both plastic enough to adapt to local needs and constraints of the several parties employing them, yet robust enough to maintain a common identity across sites. They are weakly structured in common use, and become strongly structured in individual-site use. They have different meanings in different social worlds but their structure is common enough to more than one world to make them recognizable (Star and Griesemer 1989:393).

In the same vein, Fujimura (1992) has proposed the concept standardized packages to understand ‘how collective action is managed *across* social worlds to achieve enough agreement at various times to get work done and to produce relatively (and temporarily) stable ‘facts’ (1992:168 *italics in the original*). Fujimura conceptualised standardised packages as a grey box that combines several boundary objects and standardised methods, which, working together, create a temporally stable interface between multiple social worlds. In the case of cancer research, the standardised package of oncogene theory allowed interaction among different laboratories, funding agencies and biotechnology supply houses, facilitating the development of molecular biological cancer research. The ‘package consisted of a scientific theory and a standardised set of technologies which succeeded in enrolling many members of multiple social worlds in constructing a new and at least temporarily stable definition of Cancer’ (Fujimura 1992:177).

These two concepts emphasise the importance of standardised tools and materials in the production of scientific knowledge as a collective action. Concepts like boundary objects and standardised packages highlight the importance of analysing the role of standards in facilitating cooperation, as well as their operationalization and the ways they are embedded simultaneously in different systems or networks. Growth charts, for example, are promoted by the WHO with the aim of facilitating the comparison of data among different countries. In many ways, the design and use of standardised

growth charts aims to establish a common ground from which to enable the interaction and cooperation of diverse actors, including international agencies, national governments, policy makers, health professionals and caregivers. While each of these actors might use and interpret the charts in a different way, having a common tool of measurement is necessary in order to implement individual growth monitoring programs and develop local, national and international statistics on malnutrition.

Standards might also be understood as what Latour (1986) has called ‘immutable mobiles’: things that can travel without alteration, remaining optically consistent in ways that are legible and interpretable to others (e.g. maps). On the model of actor network theory, and on the consequent assumption that the stabilisation of facts depends on the capacity to gain allies, inscription devices and immutable objects able to accelerate mobility and enhance immutability would favour the stability and dominance of a specific fact (Clarke and Fujimura, 1992). Even though the term ‘immutable mobiles’ has been used widely, alongside ‘inscription’, in the study of scientific charts and diagrams, in some cases – including the growth charts that I analyse – the concept is not altogether applicable. Kaiser (2005) challenged the concept of immutable objects in his book on the history of post-war theoretical physics, demonstrating that in physicists’ use, Feynman diagrams hardly remained stable in appearance, role, or meaning. Physicists and their students adapted the diagrams for different reasons; as they ‘crafted the diagrams toward different calculational ends, theoretical physicists imputed new and different meanings to the diagrams’ bare lines, all the while adopting subtle shifts in the diagrams’ pictorial forms as well’ (Kaiser 2005:285). Rather than being immutable, then, these diagrams proved to have tremendous plasticity.

My research is aligned with Kaiser’s (2005) perspective in this respect. I suggest that as objects, growth charts are not necessarily immutable; and that in fact, their design is negotiated locally, taking into account the needs of specific users. The

Colombian version of the WHO charts, for example, includes lines that represent -1 and 1 standard deviations (SD), though these lines are not graphically represented in the original WHO charts. Different charts for different age ranges are also in use. Some countries have specific charts for the range between zero and two years old, and others for the range between two and five years old. Not all charts look the same. While it is possible to claim that the main structure of the charts remains the same, given they all show a normal distribution of weight and height for age, the way each chart looks as an object is constantly modified by users.

2.2.1 Local Context and Practices

Some research on standards and standardisation, including my own, pays attention to the ways in which the standardisation of techniques, tools and procedures takes place in practice. Most of these studies emphasise that standardisation is shaped by the local context, showing that users often modify and adjust standards according to their specific needs. In her work on standardized protocols for organ donation in the United States, Hogle (1995) discusses how standards are negotiated, reinterpreted and resisted at the level of local practice. Using an ethnographic approach, she argues that the identity of the intended recipient, the identity of the donor, and the beliefs and values of the transplant teams are significant 'local-level' variables that shape how actors make use of protocols defining donor eligibility and the quality of the organ. As Hogle explains:

Coordinators do indeed follow the techniques for standardizing the process and the product. But as they do so, the status, identity, and course of potential donors are continually negotiated. Coordinators bring to the clinical setting their own set of experiences, networks of interaction, and moral judgments; they rely on these, along with protocols and technical contingencies, when they co-construct what a donor is and how and why human materials are to be used (1995:487).

The work of Casper and Clark (1998) on how the pap smear became the ‘right tool’ for cancer screening between 1940 and 1995 also considers the contingent nature of biomedical practices in exploring the standardisation of tools. In their analysis, the gendered division of labour in cytological screening, cost juggling, and local negotiations about classificatory accuracy played pivotal roles in making the pap smear a dominant technology – even though it was not the most accurate or cheapest technology available.

Jordan and Lynch (1998) explored the standardisation of techniques or tools by examining how the Polymerase Chain Reaction (PCR), a molecular biological technique, is adapted in different organisational contexts within science, medicine, industry and criminal forensics. Rather than simply exploring different ways of thinking about an artefact – assessing its interpretative flexibility – they examine the choices, interpretations, and rationales in the material design and embodied enactment of the protocols. By ‘following the technique around’, they showed that the performance of the technique is procedurally flexible (1998:784). Its implementation is continuously transformed, according to the local conditions of the lab and the idiosyncrasies of practitioners. In the case of the PCR, they note that procedural flexibility emerges in the selections of alternative materials and instruments, the scale or repetitiveness of operation, strategies to avoid high costs, and practical restrictions associated with commercial patents and government regulations (1998).

Timmermans and Berg (1997) also discuss the tensions between local practice and universality in the negotiation of standards. In analysing the universalization of standards, they point out the importance of paying attention to the processes of their incorporation into already-existing local infrastructures, procedures and practices.

To understand universality and its tensions with ‘the local’, Timmermans and Berg introduce the concept local universality⁹:

Local universality emphasizes that universality always rests on real-time work and emerges from localized processes of negotiation and pre-existing institutional, infrastructural, and material relations. ‘Universality’, here, has become a non-transcendental term – no longer implying a rupture with the ‘local’, but transforming and emerging in and through it (1997:275).

In order to explore how standardisation achieves a universal character at the same time that is able to fit local infrastructures and networks, Timmermans and Berg (1997) analyse two medical standards: an oncological protocol, as implemented in a Dutch hospital; and the Cardio Pulmonary Resuscitation (CPR) protocol, as used in two hospitals in the United States. The authors conceptualise both protocols as technoscientific scripts able to articulate the heterogeneous trajectories of the protocol’s use and its users in a process they call crystallization. Though each protocol specifies how it should be used and by whom, Timmermans and Berg (1997) show that in practice, patients and medical personnel are not *mindless* followers of the script; rather, it is the protocol that is adapted and aligned with the goals and trajectories of the patients and staff. In this sense, the protocol crystallizes an instance in which the trajectories of the patients, instruments, drugs and staff temporarily intersect.

One of the aims of my research is to explore the use of growth charts by health professionals in the context of individual growth monitoring consultations. As I will show in chapter six, the concepts of procedural flexibility and local-universality prove relevant by giving priority to the material world of standards, and the practices and decision-making processes that surround their implementation. I use these two concepts to explain how doctors, nurses and nutritionists adjust the measurement of children according to local resources and their own expertise. The work of

⁹ Authors like Pollock Williams and Procter et.al (2003) have also explored the tensions between universality and local contexts in their work on standardisation.

Timmermans and Berg (1997) in particular offers an interesting analysis of clinical guidelines and protocols. They think about them as the ‘contingent outcome of processes of negotiations between heterogeneous actors’ (1997:282) including the protocol designers, funding agencies, physicians, patients, organizational facilities, laboratory capabilities, drug companies etc. While my study does not deal with complex clinical protocols, their analysis is useful for understanding the development of guidelines to use the WHO charts at the international level and within the Colombian context.

2.2.2 Standards, Power, and Some Methodological Invitations

In the book *Sorting Things Out*, Bowker and Star (2000) are interested in the pragmatics of the invisibility of standards and classification systems. Their work focuses on what categories and standards do, and how they order human interaction. These authors contend that in order to study standards, we must think of them as both symbolic and material objects. They ‘seek to understand standards and classifications systems according to the work that they are doing and the networks within which they are embedded’ (Bowker and Star 2000:42). Bowker and Star (2000) advocate for a pragmatic methodology able to make visible the politics of science in action; in other words, the negotiations, the organizational processes and the conflicts and forms of resistance behind what appears to be a universal category or standard.

Similarly, in their research on evidence-based medicine, Timmermans and Berg (2003) propose a study of what they call the politics of standardization in practice. Like Bowker and Star (2000), they promote the study of what standards do. Standards ‘help to bring into existence new ideas, entities, values, and even subjects for medicine (what Ian Hacking refers as ‘kind making’)’ (Timmermans and Berg 2003:23) . Rather than focusing their attention on the debates around the advantages or disadvantages of standardising healthcare guidelines, they ask ‘what is being

ordered, who does the ordering, what is the difference, and how does it change medical care?’ (Timmermans and Berg 2003:21). The politics of standards, following Timmermans and Berg’s argument, should be located not only on the regulatory-political environment that gives origin to those standards, but also in the standards themselves. They argue that ‘standards are inherently political as their construction and application transform the practices in which they become embedded’ (2003:22). Timmermans and Berg’s approach to standards rests on three methodological and theoretical tenets: situated knowledges, blurred agency and emergent politics. The first tenet states that standardisation should be followed from the viewpoint of different actors, since every actor might experience the same event in a different way. The second refers to standards as exerting agency in different situations. The third one indicates that

Standards are political entities because they reorder practices and change the position of different actors. They do not do so in and of themselves, but only as part of a network in which their own properties emerge with those of the human and nonhuman actors they affect (2003:22).

Timmermans and Berg (2003) highlight the ways in which standards and standardisation create configurations of instruments and people that redefine individuals, groups or devices; and by doing so, they draw out the processes of change that might be triggered through the creation and use of standards. They investigate both the form and the content of standardisation, looking ‘at what is standardised, how it is standardised, what is included and what is excluded, what novel configurations of things and people are brought into being, and how much uniformity is actually achieved’ (2003:24).

My study of the WHO-CGS resonates with the approaches of Bowker and Star (2000) and Timmermans and Berg (2003). Throughout this research I show how growth charts used for international comparison become political tools of standardisation, not only because they are used to define optimal and healthy growth

– which influences the classification of individuals and populations – but because their design is embedded with specific values about children’s bodies and health status. Defining who is the reference population to assess normal or abnormal growth is in itself a political question. With the aim of unpacking the politics of standardisation in action, I explore who was included and excluded from becoming the benchmark to measure children’s bodies. I also explore the implications of selecting a specific growth pattern as the international standard in how malnutrition is assessed and measured. As I will discuss in detail in chapter seven, the shift from the NCHS to WHO charts enabled a new epidemiological reality in which the estimates of child malnutrition became higher.

Over the coming chapters, I also discuss how different actors used and interpreted in different ways. By exploring the creation of the WHO charts as well as their adoption and implementation in the Colombian context, I show how the interpretative flexibility of the standards varies according to the scale in which they operate. I argue that, at least in the case of standards developed by international organisations to facilitate comparison, the interpretation of the charts, as well as their material life, changes as it adapts to the needs of specific agendas that respond to international or national interests.

2.2.3 Human Standards

In an effort to characterise standards as an object of study in their own right, Timmermans and Berg (2003) suggest a classification of standards in four categories: 1) design standards, referring to those that provide structural specifications (e.g. on the properties and features of X-ray devices); 2) terminological standards, which include classification schemes such as the International Classification of Diseases; 3) performance standards, or standards that specify expected outcomes, and define the result of an action; and 4) procedural standards, which delineate a set of actions to be done in specific conditions (e.g. clinical guidelines). While some of the standards nested in growth charts might be classified as terminological standards (e.g. the classification of malnutrition) or procedural standards (e.g. growth assessment

guidelines), the charts do not fit any one of these categories neatly. I suggest adding a fifth category, human standards. Human standards, as I understand them, provide specifications, definitions or properties for the human body. They are similar to what Timmermans and Berg (2003) have called design standards, but instead of defining objects, they target humans. A similar concept has been used by Lengwiler (2009) in his work on modern life insurance; though the term is left undefined, his analysis of standards aiming to regulate and classify humans and their bodies resonates with what I mean by ‘human standards’.

Human standards overlap with and draw upon a number of other sorts of standards, but perhaps terminological standards most of all – especially when they are used to define human diseases or conditions. Pickersgill (2012), for example, explores the standardisation of antisocial personality disorder and its inclusion in the Diagnostic and Statistical Manual of Mental Disorders. Likewise, Waidzunus (2014) offers an analysis on the ex-gays movement in the United States and the standardisation of the term ‘sexual orientation’ and ‘sexual orientation identity’ by the American Psychological Association (APA). Finally, Moreira, May and Bond (2009) describe the collective production of what they call a conventional standard that describes a transitional state between normal cognitive ageing and dementia, called mild cognitive impairment. All these examples demonstrate how specific voices of authority and expertise are included or excluded from the construction of terminological standards, and show how different actors are engaged in negotiating those standards, criticizing, resisting or re-configuring them.

While the studies mentioned cover standards that are able to define a type of human standard (e.g. the sick human), for the purposes of this research, I am interested in giving priority to those studies that have explored the development of standards constructed using the human body. Authors such as Epstein (2009), Hogle (1995) and Lengwiler (2009) have explored how the human body, as the working object of biomedicine, has become a subject of standardization. Epstein (2009) suggests that in the same way that the production of generalizable knowledge in laboratories requires

the creation of ‘working objects’ able to remain stable from one laboratory to another, biomedical research requires the human body as a working object. His analysis on the use of human subjects for biomedical research in the United States and the criteria used to choose them as a reference sample is a remarkable study about human standards (Epstein 2009, 2007). Epstein’s research focused on the political criticisms made by politicians, health advocates and social movements during the 1980s regarding the overrepresentation of adult, heterosexual, middle age, white men in controlled trials for pharmaceutical drug development and clinical research. Epstein attributes the construction of what he calls the standard human for research to different factors, including gender bias on the part of male researchers – who, in several different reports, stated that women were ‘complicated’ research subjects whose ‘monthly fluctuations in hormone levels could confound the effects of the medical regimes or therapies under investigation’ (Epstein 2009:44). Researchers considered men’s bodies to have fewer variables to be controlled. Underrepresentation of other subtypes of the population was also an unintended consequence of government protectionism of population groups such as children or pregnant women. My analysis of the WHO-CGS construction echoes Epstein’s work as I unpack the processes of inclusion and exclusion that defined the reference sample used to design the growth charts.

Epstein (2009) describes three different responses in clinical research to increase representativeness after these debates. The first was to keep the idea of a single standard, but to include diverse types of people within it. The second strategy was more radical: instead of looking for standardisation, it embraces the particularities of individuals, as with pharmacogenomics or individualising therapies. The third strategy is what Epstein calls niche standardisation, the development of standards for specific subgroups of the population: a standard for women, for men, for children, for adults, for whites and so on. Epstein states that in the case of the United States, this last strategy was the primary response to the underrepresentation of women, children, ethnic minorities and the elderly in randomized clinical trials. Congress, working with several agencies of the Department of Health and Human Services, designed several measures to encourage the inclusion of diverse population groups in

biomedical research and drug development. Epstein describes this process in terms of an 'inclusion and difference paradigm' which defines 'changes in research policies, ideologies, and practices and the accompanying creation of bureaucratic offices, procedures, and monitoring systems' (2007:6) that took place in the United States in order to dethrone the 'standard human'. Epstein uses this concept to highlight two main processes: the inclusion of new sub-groups of the population in clinical research, and the study of 'differences across groups in terms of treatment effects, disease progression, or biological processes' (2007:6).

By contrast, the development of the WHO growth charts constitutes an example of the first strategy described by Epstein: the inclusion of diverse peoples into a single standard. Unlike the NCHS charts, which were based mainly on the measurements of formula-fed, white children, the MRGR included breastfed children from different ethnic backgrounds. As I show in chapter four, other groups of children were included in order to develop a universal standard able to represent the standard child under five years old. Epstein's work describes the transition from one standard human to several standards, my work, on the other hand, shows the transition from the average child to the standard child. In the case of growth charts, the tendency was to move from several growth charts (a set for each country or each ethnic group) to a universal standard that could homogenise children's bodies so they can be comparable across the globe. The work of Epstein, aligned with Busch (2011), Timmermans and Berg (2003) and Bowker and Star (2000), is an invitation to pursue a deeper understanding of the complex processes of inclusion and exclusion, of values, things and people involved in the production of standards.

Human standards can also be used to define what constitutes a productive, functional and healthy body. Treas' work on the standardised use of chronological age to determine eligibility for public pension benefits shows how age has been deployed successfully to classify, segment and stratify individuals within administrative and bureaucratic processes implemented by the state. Another example related to age has also been explored by Moreira (2015) in his analysis of aging biomarkers, designed

to measure biological age instead of chronological age as an index of the functional ability of an individual. Instead of being a standard used to segment and homogenise the life course of individuals and populations, biological age is oriented towards personalised and individualised management of the life course. None of these authors explicitly describe age as a human standard, but their work illustrates one way in which standards seek to define a productive, functional and healthy body.

The body has also come to be defined, understood, and standardised in important ways by statistical thinking, which figures prominently in what I have called human standards. Lengwiler's (2009) analysis of modern life insurance traces the development of a range of statistical calculations used to define the 'standard human', and specifically to distinguish between standard and substandard lives. The first category referred to those insurance clients that had normal health risks; the second referred to those with 'ailments or risk deemed extraordinary and elevated' (2009:99). Originally, insurance companies would exclude those classified as substandard from getting policies. However, during the twentieth century, insurance schemes that included more policyholders became available. This inclusivity was made possible through the calculation and assignment of value to substantial risks. Czerniawski (2007) offers another example of the role of the life insurance industry in the classification of who is average. She describes the evolution of the height and weight table in the United States between 1836 and 1942, and its use to determine the acceptance or denial of an applicant for life insurance. But the tables charting average weight and height were based on the data of policyholders, and since most of them were men, data about women was absent. It was only in 1908 that an insurance company developed a table charting average height and weight for women. The development of these tables also influenced the construction of categories like average weight, overweight and obese. In fact it was in the context of the insurance industry in the early twentieth century that research on the association between height, body weight and mortality took place (Fletcher 2014).

The body mass index (BMI) constitutes another example of a human standard that is based on statistical thinking. The BMI, just as the child growth charts, are measurement tools used to classify and monitor the nutritional status of individuals and populations. Since they both represent the measurements of a reference sample, they are tools to define who is has a normal or abnormal weight. In this regard, Fletcher's examines how the BMI became the accepted standard for measuring obesity in the United States and the United Kingdom. She states that standardisation of the definition of obesity, and of the cut off points used to measuring it, played a pivotal role in framing obesity as an epidemic. Likewise, Nicholls (2013) points out that the use of the BMI as a universal standard to measure obesity obscures the difference between fat and mass within weight categories, since the BMI measures not just fat, but is also correlated with bone density and mass. Nicholls also notes that the BMI is a population-level measure appropriate in public health surveillance and screening, but not sensitive enough for individual use. The generalised use of the BMI as a standard to classify bodies as overweight or obese, like growth charts, has been an important tool to screen individuals and populations as well as to facilitate international comparison.

While there are many other forms of measurement and classification applied to the human body (e.g. IQ measurement, phrenology, racial classification), I have focused here on authors that explicitly engage with the work of authors that analyse classifications or artefacts that aim to standardise the human body. The WHO growth charts can be understood as what I have called a human standard for four main reasons. First, as all growth charts, they are tools of visualisation of the human body; second, they have been promoted by the WHO as being able to show how children should grow; third by being a normative point of reference for growth, growth charts have an active role in shaping children's bodies; fourth, they are artefacts designed to measure and monitor children's bodies at the individual and population level.

2.2.4 Standardisation and Early Childhood

Growth charts differ significantly from the standards I have discussed thus far in that they target a specific kind of human: the child under five years old. The assessment of children's growth during this specific period of life is tangled up with a particular way of understanding and valuing children's bodies and health. In order to understand the rationales that promote the standardisation of assessments for children's growth and malnutrition, it is necessary to understand how 'early childhood' has been defined and portrayed internationally, and enacted in early childhood policies during the late twentieth and early twenty-first centuries. Armstrong (2002, 1983), Turmel (2008) and Steedman (1995) have noted that the development of growth charts at the beginning of the twentieth century was deeply connected with a new understanding of children as social actors; I argue that the development of growth charts for international comparison is also shaped by a specific way of understanding the child during the first five years of life in the fields of social policy, economics, education and health. An analysis of the standardisation of children's growth, then, requires an understanding of the dominant narratives around early childhood. In this section, I discuss some of the literature that I have built upon to understand what sort of human is monitored, classified and standardised through the development and use of growth charts.

One of the key narratives that justify the standardisation of instruments to assess the nutritional status of children asserts that adequate nutrition during the first years of life is essential to develop human capital in the future. The following quote from a WHO report offers a clear example of this narrative, frequently used by international organisations:

Adequate nutrition is essential in early childhood to ensure healthy growth, proper organ formation and function, a strong immune system, and neurological and cognitive development. Economic growth and human development require well-nourished populations who can learn new skills, think critically and contribute to their communities. Child malnutrition

impacts cognitive function and contributes to poverty through impeding individuals' ability to lead productive lives (UNICEF, WHO and World Bank 2012:1).

Rather than taking these kinds of statements as given or unproblematic, I am interested in following a critical approach to the category of early childhood, recognising the social, historical and political factors that shape this particular way of understanding children's bodies and wellbeing. I draw upon the work of scholars in childhood studies in order to understand the way children and childhood are portrayed in WHO documents, in Colombian policy, and in the narratives of policy makers and health professionals involved in the regulation and use of anthropometry to assess children's growth. Childhood studies and the 'new' sociology of childhood emphasise three key elements relevant to my research: the social construction of childhood; the need to understand children in the present, and not only in the process of becoming adults; and the recognition of children as social actors and legitimate right-holders, rather than passive and dependant actors (Tisdall and Punch 2012). My work is aligned with the arguments of authors like Qvortrup (2009, 1994), Mayall (2002, 1998) and James and Prout (1997), who have criticised theories in which children are described as *human becomings*¹⁰ (unfinished and incomplete actors who need to be prepare for adulthood) rather than as *human beings* (actors in their own right and in the present). This distinction is particularly useful for understanding children in the context of child-oriented policy, economics and public/global health, arenas in which children often are represented as a futuristic project: the next generation, or future human capital (Qvortrup 2009).

Authors like and Monaghan (2012), Penn (2012), and Tag (2012) state that early childhood has increasingly become a global issue: a target for observation, comparison and monitoring in national settings, as well as in the international arena. Tag (2012) situates the 1990s as a period in which the demand for international

¹⁰ One critique of this perspective has been offered by Lee (2001), who problematizes the division between adults as human beings and children as human becomings. For Lee, during the twenty-first century, the connection between adulthood and stability is fictional. Adults, children and young people are in permanent quests as human becomings.

action on behalf of children during their early years was institutionalised as an issue of global concern¹¹. The inclusion of early childhood in the global agenda was became evident in the growing development of programs, services and plans of action for the education, welfare and health of young children in national settings, as well as in the agendas of international organizations such as UNICEF, UNESCO and World Bank – which, especially after 2000, made early childhood a key topic of conferences, reports and resolutions (e.g. The Convention of the Rights of the Child of 2005, the UN World Conference on Early Childhood Care and Education of 2010, Special Report by the General Secretary of the United Nations on Child Rights and Early Childhood).

Penn (2011) and Monaghan (2012) have pointed out that international organizations justified their interest in early childhood and advocated for nation states to pay attention to this topic by mobilising the idea that investment during this period of life is an effective and cost-efficient means of guaranteeing human capital in the future. Much of this rationale is based on theories of human capital developed by James Heckman, who argues that the return of the investment on interventions during early childhood is higher than during other stages of life, such as adolescence or adulthood (Penn 2011). Arguments about the cost-effectiveness of interventions during early life also rely heavily on findings about brain development, including how influential this period of time is on physical and mental health, the learning of skills, and the behaviour of an individual throughout life (Penn 2011).

This quote from the WHO webpage is a good example of how brain development during early childhood is framed in the discourse of international organisations

¹¹ I am talking explicitly about early childhood, and not about childhood in general. According to James and Proud (1997), a global interest in children/childhood as a category can be traced back to the launch of the International Year of the Child in 1979, after which ‘the world’s children’ began to emerge in the official discourse of agencies such as UNICEF and the WHO.

Research shows that a child's brain develops faster in the first 2-3 years than at any other time in life. These early years are also a critical period of adaptability and responsiveness to interventions. When young children are deprived of nutrition, stimulation, and protection, the damaging effects can produce long-term detriments for families and communities (WHO 2017).

The emphasis on developing human capital in the discourse of agencies like the World Bank has been analysed by Mahon (2010) as an example of a shift from the traditional neoliberal agenda of structural adjustment, towards a social investment paradigm in which 'Keynesian programs aiming at stimulating consumption are replaced by a focus on investment in human capital development' (Mahon 2010:173). According to Monaghan (2012), the epistemological framework of this model is a functionalist one, in which children are described in terms of what they represent in the future as a generation. Moreover, Penn (2012) states that early investment is a financial strategy based on a narrative of competitiveness and individualism, which is expected to 'produce individuals who, at the very least, will not incur extra societal costs through their failures and at best will be employable and have earning power in adult life' (2012:80).

According to Qvortrup, the notion that children are in the process of becoming has also connected with how governments justify the investment in children's welfare in terms of the returns of the investment in the future. Qvortrup (2009) suggests that investment in childhood is justifiable in itself, and does not need instrumentalising arguments. Children have the right to claim societal resources, independently of their profitability and outcome. In a similar vein, Ben-Arieh (Ben-Arieh 2000) argues that prioritising the production of successful adults has an impact on the way children's wellbeing is measured and monitored; treating children as a form of human capital has focused attention on the measurement of *negative* indicators, including deficiencies in achievements, problem behaviours and negative circumstances (e.g. trends of dying, distress, disability and discomfort). The measurement of the quality of children's everyday life in terms of *positive indicators*, which describe the

competencies, skills, behaviours, and qualities that foster children's development throughout childhood (e.g. success in school, supporting family and leading an healthy life style), are rendered secondary (Ben-Arieh and Goerge 2001).

As I will show throughout this dissertation the standardisation of children's growth measurement can best understood by taking into account how children's bodies under five years old are valued in public health, medicine and economics.

2.3 Conclusion

Just as Casper and Clark (1998) pointed out in their analysis of the pap smear, apparently simple and widely used technologies have been understudied in the field of science, technology and medicine studies. Child growth charts, like many other standards, are artefacts we take for granted. At first, they might look like simple Cartesian coordinate forms for the variables of weight, height or age (height/weight-for-age, weight-for-height); but it is their very simplicity, and the ways they have been naturalised and normalised in medical practice that makes them complex artefacts. Like many other standards, child growth charts appear deceptively ahistorical, objective and universal – the amount of work required to design them and set them in circulation is invisible. By comparing the NCHS charts with those generated by the WHO, this dissertation aims to make visible the complex negotiations behind the creation of a human standard, as well as the challenges involved in their adoption and implementation.

Chapter 3. Ways and Means: Methods and Research Design

This study focuses on the construction, adoption, and implementation of the WHO-CGS in Colombia. As well as describing how an international standard is integrated into the existing practices and infrastructure of a country, I explore the transition from one standard to another: from the NCHS to the WHO-CGS. This transition offers an ideal opportunity to make evident the kind of work that is required to destabilize an existing standard and to replace it with a new one. I show how standards retain properties that allow them to perform as if they were simultaneously universal and tailored to local needs.

In order to understand the work the standards do and the networks within which they are embedded (Bowker and Star 2000), my research was guided by the ‘biography’ of the charts (Van der Geest, Reynolds Whyte and Hardon 1996). Following a biographical approach involves collecting data about the different stages in the ‘life cycle’ of the charts: their creation, adoption, and actual use in medical practice in Colombia. Of course, artefacts and standards do not follow one exclusive and linear sequence of stages; but with this study, I sought to follow one of their possible trajectories.

In order to reconstruct the ‘life cycle’ of an international standard adopted in a local context, such is the case of the WHO charts in Colombia, I followed a multi-sided approach. My research design was influenced by Marcus’s call for multi-sited ethnography as a method to ‘examine cultural meanings, objects and identities in diffuse time-space’ (Marcus 1995:96). Following people, connections, associations or relationships that are not spatially continuous is one of the key elements of this method. The need to move from single-sited research to multifocal studies in the

context of STS research has also been highlighted by Williams and Pollock (2011), who advocate following technologies through space and time ‘encompassing actors and interactions in both immediate settings and broader contexts’ instead of concentrating in one location, one time (2011:15). Mol’s (2002) study on atherosclerosis, Laet and Mol’s (2000) research on the Zimbabwe Bush Pump, and Jordan and Lynch’s (1998) analysis of the PCR (a molecular technique to study DNA) all offer models of the multi-sited approach, seeking to ‘explore the ways that knowledge moves and is transformed in diverse sites of practice’ (Hine 2007:661).

Following a multi-sited approach allowed me to reconstruct the biography of the WHO charts, from their creation with the MGRS (1997-2003) to their implementation in the Colombian context in 2010. Following the life of the charts across the sites in which they are produced and used helped me to understand the conditions of their production, how they are mobilised, and what their effects are in the world (Dumit and de Laet 2014).

This chapter is divided in four sections covering the data collection, ethical considerations, the data analysis and the limitations of my study.

3.1 Data Collection

My data collection involved three interconnected stages of research. In the first one, I focused on understanding the design of the WHO-CGS, and the reasons given by the WHO for replacing the NCHS charts. The second stage of data collection involved understanding the processes by which the WHO charts were adopted in Colombia. Finally, the third stage was oriented around analysing the use of the WHO charts in practice, in the national program on child growth and development. Most of my data collection took place in Colombia between October of 2013 and July 2014 and July and November of 2015. I also conducted archival work for two months at the archive

of the WHO in Geneva. In the coming subsections I describe in detail each stage of data collection.

3.1.1 First Stage of Data Collection: The Transition between the NCHS charts and the WHO-CGS

This stage of data collection targeted two aims of my research. The first one was to analyse the reasons that led the WHO to develop the WHO-CGS, after promoting the NCHS charts for almost forty years. The second aim was to track how the WHO promoted growth charts as a standardised tool for assessing children's growth and measuring malnutrition, thereby facilitating international comparison. I conducted a documentary analysis of reports and guidelines produced by the WHO related to child growth charts and nutritional anthropometry (see Appendix A, for list of the key documents I used).

In order to examine the creation of the WHO-CGS, I collected and analysed several reports, guidelines and scientific papers produced by the WHO explaining the technical characteristics of the MGRS and the process of developing the WHO-CGS. Some of these documents were scientific articles written by the researchers of the MGRS, and published in journals like *Acta Paediatrica*, the *Food and Nutrition Bulletin* and the *Bulletin of the World Health Organization*. I also included in my analysis some key documents promoted by the WHO as guidelines for training health practitioners in the use of the WHO charts. Those guidelines included information about the MGRS and the development of the WHO-CGS, as well as instructions on how to use them for nutritional assessment. Most of these documents were produced between 2006 and 2009.

To understand the origins of the WHO-CGS, and the context in which they were produced, I also tracked documents that could explain why the NCHS charts had to be replaced and why developing new charts became a priority of the WHO. The

period I explored is between 1994 – the year in which the WHO published the first report questioning the NCHS charts as a tool to assess exclusively breastfed children – and 2008, just two years after the launch of the WHO-CGS. Most of these documents were found online at the WHO Institutional Repository for Information Sharing (IRIS).

Finally, to track how child growth charts were promoted as standardised tools to monitor children's growth and nutritional status, I explored a diverse set of documents including WHO reports, abstracts of conferences and minutes on nutritional anthropometry and childhood. For this purpose, I conducted archive work for two months at the WHO archive in Geneva. I only explored the centralized files, which are divided in four chronological groups. From the first (1946-1950) and second (1950-1955) group, I looked at the folders classified under the category 'food and nutrition' and 'maternal and child health'¹². For the files classified as being from the third (1955-1983) and fourth (1998 to the present) group, I requests documents available under the key words: child nutrition, child malnutrition (underweight, wasting, overweight, obesity, kwashiorkor), growth and development in children, growth and development in early childhood, anthropometry, auxology, physical growth, optimal growth, child growth references, growth charts for international use, NCHS references, and MGRS. Given the number of documents available in each category, I decided to restrict my search to those documents that:

- *Made evident debates or discussions on the development of child growth charts.*
- *Discussed the relevance of growth charts and anthropometry to assessing children's growth.*
- *Provided information on the use of growth charts to generate data for international comparison.*

¹² When I went to the WHO archive, documents from the first and second generation were organised by topics in one catalogue. Documents from the third and fourth generation were organised in a digital catalogue and it was possible to search for documents using key words.

Several of the documents that I found in the archive were final versions of reports or guidelines. I found very few examples of minutes, correspondence or drafts of reports on the specific topic of child growth assessment and anthropometry. I did find reports and abstracts of conferences on anthropometry covering growth charts, especially in the documents of the third fond. However, several documents that appear in the database that could have been of relevance for this research are listed under the status, 'destroyed'.

3.1.2 Second Stage of Data Collection: The Adoption of the WHO-CGS in Colombia

After being launched in 2006, several countries adopted the WHO-CGS as a standardised tool to assess children's growth during early childhood. In 2012, the WHO sent a questionnaire to 219 countries asking for progress reports on the implementation of the new standards. By April of 2011, 125 countries had adopted the new charts, twenty-five were considering their adoption, and thirty had not adopted them, most of these located in Europe. The countries that had adopted the standards represented 75% of the world's under-five year old population, while those who had not represented just 7% (de Onis et al. 2012).

In order to follow one possible biographical trajectory of the WHO-CGS, I decided to analyse the adoption of the charts within the Colombian context. I have been following the adoption and implementation of the WHO charts in Colombia since 2009, when I worked as an anthropologist at the nutrition research unit of the INS.

The main aims of research for this layer of data collection were:

- *To characterise the rationales behind the decision to adopt the WHO-CGS in Colombia, after almost three decades of using the NCHS growth curves;*

- *To analyse how the WHO-CGS were transformed, re-designed and re-signified in the process of their adoption in Colombia; and*
- *To analyse how the WHO-CGS were inserted into the national health policies for early childhood.*

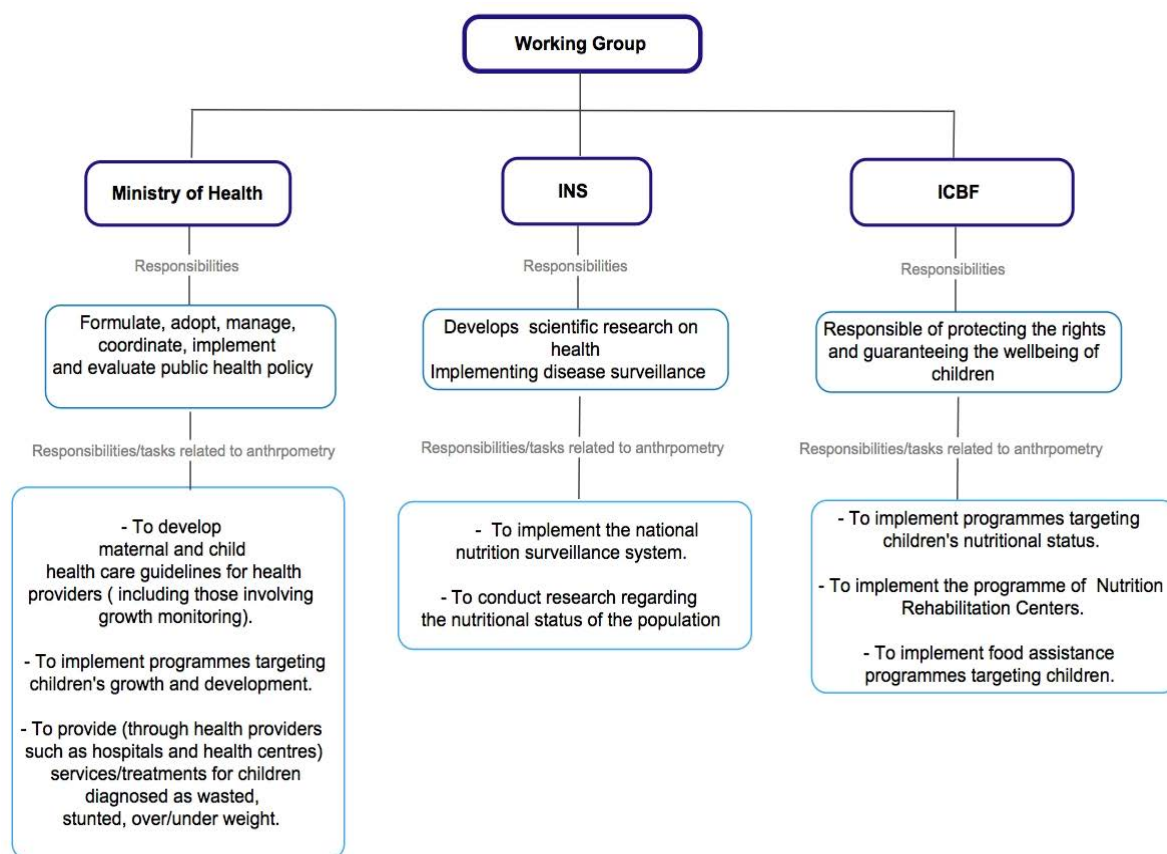
The Colombian government formally adopted the WHO-CGS in 2010 through a legal document supported by the Ministry of Health called Resolution 2121. This document made the use of the WHO-CGS mandatory, forcing all the institutions involved in the health system to shift to the new charts. Before 2010, Colombia did not have any kind of regulation or standardised guideline on how to measure children's growth. Health practitioners could choose the reference charts of their preference. Moreover, there were no common agreements on the cut-off points or terminologies by which to classify a child as malnourished. Resolution 2121 was the first document designed to standardise the use of anthropometry to assess children's growth in the country.

In order to understand the reasons that supported the adoption of the WHO-CGS through the Resolution 2121, I explored the context under which this document was written as well as the negotiations behind its development. Even though it was the Ministry of Health the national body that promoted the Resolution, the content of this document was the result of a long process of negotiations and discussions among different actors responsible for or directly involved in child health care.

In 2008, the Ministry of Health created a working group responsible for assessing whether the country should adopt the standards, and if so, how. The working group was composed of representatives from the Ministry of Health, the INS and the ICBF. The Ministry of Health included representatives from the INS and the ICBF because both institutes were responsible for the implementation of national programmes in which nutritional anthropometry was pivotal. The INS, for example, implements the national nutrition surveillance system; and the ICBF is responsible for improving the

nutritional status of children at risk of or suffering from malnutrition, through food assistance programmes and nutrition rehabilitation centres. Figure 2 describes some of the responsibilities of each organisation, and how each agency uses anthropometry to monitor children's growth.

Figure 2. Composition of the working group and organisational responsibilities



The working group also created what they called an 'extended committee'. The extended committee was expected to include experts in the field of nutrition, anthropometry and child growth, who could provide different opinions regarding the adoption of the WHO-CGS. Some of the actors invited to participate included scholars from departments of Nutrition and Medicine in different universities (e.g. Universidad Javeriana, Universidad Nacional de Colombia, Universidad de Caldas); members of some local secretaries of health; and representatives of the Association of Medicine, the Association of Paediatrics and the Association of Endocrinology, the Pan American Health Organization (PAHO) and the Food and Agriculture

Organization (FAO). The working group was in charge of leading the discussions with the extended committee, and putting together the recommendations and potential challenges identified by the experts.

This committee was expected to cooperate in the decision-making process related to the adoption and implementation of the WHO-CGS. The extended committee met approximately six times over a year and a half, between 2008 and 2009. Each meeting was organised as a long workshop revolving around specific topics: some of them included malnutrition terminology, cut-off points and characteristics of the instruments of anthropometric measurement. Each workshop included up to 15 or 20 people. After almost two years of negotiations and meetings, Resolution 2121 was readied and released to the public for its implementation.

In total, I conducted three interviews with the members of the working group, and 25 interviews involving members of the working group and the extended committee together. By the time of my fieldwork, most of my interviewees were still working with the same national bodies they had worked with in 2008. The first interviewees, two nutritionist working at the INS, referred me to some of their colleagues who they knew participated in the extended committee, and I continued the data collection using a snowball referral technique. The duration of the interviews was between 60 and 90 minutes; 26 of them were recorded and fully transcribed. Though not all of the extended committee members attended all the workshops, 12 of the 25 interviewees reported attending at least three of the six meetings. All interviews were conducted between October 2013 and July 2014.

These interviews form the backbone of my research on the construction of Resolution 2121. I had unrestricted access to the archive of the Subdivision of Nutritional Health at the Ministry of Health, but minutes and reports from meetings of the working group and extended committee were missing. I asked several of my

interviewees if they kept digital copies of these files, and while some of them had them, they decided not to share them, as they were not final and approved versions. Only one person shared the draft of the minutes of two of the extended committee workshops. Given the fact that there is not a formal record of the meetings of the extended committee, it is not possible to reconstruct with precision the details of the discussions that took place in the workshops, nor to determine who attended which workshops or which institutions were more or less active in the discussions.

The network of experts on nutrition and anthropometry involved in policy making at the national level is relatively small (approximately 40 people). The majority of participants in my research knew each other. They could be described as a small but strong community that shares similar interests, academic training and working spaces. Several of the interviewees had worked together in the past on projects, plans or strategies regarding nutrition, food security, nutritional surveillance or policymaking. On average, the members of the working group and the extended committee had between 10 and 25 years of professional experience in the field. The most common academic background in this community was in nutrition and dietetics (n=18) followed by medicine (n=7). Women between 35 and 60 years old dominated the field; in fact, only seven of the 28 interviewees were men.

The interviews did not follow a standardised questionnaire. However, in all cases I explored five key topics:

- *General perceptions on the WHO-CGS compared to other charts designed to measure children under five years old.*
- *The criteria used in Colombia to adopt the WHO-CGS.*
- *The process of adapting the WHO charts to the Colombian context (e.g. setting agreements on cut off points, terminology, design of the charts).*
- *Opinions on the consequences of creating Resolution 2121 of 2010 (e.g. positive and negative aspects, mistakes, limitations).*

3.1.3 Third Stage of Data Collection: The Use of the WHO-CGS in Practice

Once I collected most of the interviews described above, I decided to follow the use of charts in the consultation room. By observing the use of the WHO-CGS in practice, I sought to:

- *Explore health professionals' perceptions regarding the limitations, advantages and challenges of adopting the WHO-CGS.*
- *Observe how growth monitoring took place in practice, and how data about children's growth was collected, recorded and used to classify the child as having normal or abnormal growth.*

Child growth charts are used in diverse settings, including health centres, hospitals, centres of nutritional rehabilitation, and food assistance programs. I decided to focus my research on the use of growth charts in the child well-visit¹³ scheme. In Colombia, the scheme is known as the Growth and Development Program (henceforth, G&DP). The Ministry of Health created the G&DP during the early 90s to promote an integrated approach to child health centred on the wellbeing of the child, instead of focusing exclusively on treating or preventing diseases. The program follows the guidelines of the strategy for Integrated Management of Childhood Illness (IMCI) promoted by the WHO since 1992. Some of the G&DP tasks include providing health education to parents and caregivers, assessing gross and fine motor skills, and providing vaccination.

The G&DP is a national program, and all children under ten years old should have free access to it. According to the Technical Standard for the Early Detection of Changes in Growth and Development for Children Under 10 Years Old document

¹³ A well – visits are preventive appointments with the doctor or the nurse to screen for diseases, assess risk of diseases, monitor vaccination, promote breastfeeding and follow up children's growth and development.

(2002),¹⁴ every child in Colombia should attend the G&DP once during the first month of life, and once every three months after that until they are ten years old. The first visit of the program must be done with a paediatrician, but the rest of the visits can be done with a general practitioner or nurse depending on the availability of staff. According to the National Survey of Health and Demography (ENS 2010), 76% of children under five years old in Colombia are inscribed in the program, and the average number of visits a child has per year is 2.6.

The guidelines of the program indicate that children's weight and height should be measured in all the appointments. These measurements allow following up the child's growth, in order to establish as early as possible whether the child is growing normally or is at risk of any kind of malnutrition. Given that measuring children's growth is a routine practice within the G&DP, the program provided an ideal scenario for gathering information about the politics of standardisation in action what (Timmermans and Berg 1997).

The design and implementation of this stage of my research was particularly challenging. I began planning my fieldwork around January 2014, just five months before the presidential elections in Colombia. The country was deeply divided between those who supported Juan Manuel Santos for a second electoral period, and those who supported Ivan Zuluaga, the leader of the opposition party. The election was centred on one key issue: whether or not to continue peace talks with the Fuerzas Armadas Revolucionarias de Colombia [Revolutionary Armed Forces of Colombia] (FARC), the world's oldest guerrilla force. In the middle of this tense political context, a state of emergency was declared in one of the most vulnerable departments¹⁵ of the country, La Guajira, as the consequence of a prolonged drought that left the people living there with limited access to drinkable water. Given the fragility of the infrastructure that provided basic health services and access to food

¹⁴ This document provides the guidelines for health promotion and disease prevention in Colombia for every child under ten years old.

¹⁵ Colombia is divided in 32 departments. Each department has several cities and municipalities.

and water in the area, the indicators of malnutrition in this area increased dramatically. The national newspapers reported that approximately 37,000 children were malnourished, and that the mortality rate for children under five years old was 45 per 1000 live births (Revista Semana 2014). The emergence of a nutritional emergency during an election triggered several scandals regarding corruption, health inequality, forced displacement, poverty, the armed conflict in the region, and the lack of good policies and governmental institutions to guarantee decent living conditions for the population. Journalists, NGOs, governmental bodies and international agencies saturated the field reporting on the emergency, and making visible the structural problems in the department after years of being ‘forgotten’ by the state.

The combination of the election, the persistent reporting of scandals in the news, and the fact that the peace negotiations were at risk, created a tense and very sensitive atmosphere for data collection. I sent my proposal to several health providers and health insurance companies that implemented the G&DP, but most of them ignored my request, while others said they would consider my proposal and never came back to me. In an informal conversation with a doctor who was helping me access a health insurance company, I was told that the topic of nutritional assessment and early childhood, had become too sensitive and politicised, and that having a social researcher in the field collecting qualitative data was not a priority. Since I was not collecting epidemiological data or developing clinical research, my role as a researcher was not only confusing and unnecessary, but also potentially threatening.

After two months of constant rejections, I decided that my strategy of gaining access to health providers by contacting their scientific committees first was not efficient. As an alternative strategy, I began searching for doctors, nurses and nutritionists who were implementing the G&DP as part of their jobs, and who were willing to give me an interview about their experience with the WHO-CGS. Following this approach, I conducted three interviews with paediatricians in Bogotá, one with a nurse and three with nutritionists. These interviews became relevant as exploratory fieldwork. On

average I spent between 20 to 30 minutes with each interviewee, roughly the same amount of time they book for a private appointment with a patient. Though I could not observe how they were using the growth charts in practice, they showed me the charts that they were using as well as the instruments that they had in the consultation room to measure children. Based on this experience, I developed a checklist of aspects for observation in the consultation room that would give me an idea of how growth monitoring takes place in practice. This list acted as a reminder of key elements I needed to observe in the consultation rooms in which growth assessment takes place. It included the printed forms of the charts, the characteristics of the available instruments of measurement in the consultation room, the procedure used to measure the child and the nutritional classification system used in the diagnosis of malnutrition. In addition to improving my skills in observing anthropometric assessments and being able to understand the instruments and techniques of measurement, I received a three hour informal training on anthropometry by one of the nutritionists responsible for the laboratory of anthropometry of the INS.

Based on my experience with these six interviews, I decided to adjust my research design. Instead of doing extended ethnographic observation, the method that was making my access to data particularly difficult, I began asking for clearance to talk to professionals implementing the G&DP, and if possible to observe some anthropometric assessments. One of the interviewees I meet in Bogotá put me in touch with the director of a first degree of complexity¹⁶ hospital located in La Guajira. Soon after I sent my proposal, I was invited for a short visit.

I travelled to Guajira in March 2014. The hospital was located in a small town in the north of the department. I will keep both the name of the hospital and the town where it is located anonymous. My visit to the hospital lasted three weeks, and included

¹⁶ Hospitals in Colombia are classified in three levels. The first level only provides primary health care that can be administered by a general practitioner. The second level hospitals offer some specialised services and have labs for basic tests. The third level corresponds to the hospitals that can attend the most complex medical procedures.

visits to a health centre managed by the hospital in a marginal and isolated village 65 km away as well. After a couple of days in fieldwork, it became clear that neither the hospital nor the health centre were using the WHO charts, but had continued using the NCHS charts. During the three weeks of my visit, I was able to do interviews with the doctor and the nurse who were in charge of the G&DP in the hospital, and with the nurse working in the health centre. I also interviewed the nutritionist of the hospital, who took care of the cases of children who were diagnosed with malnutrition, or at risk of being malnourished.

During my time in La Guajira, I observed anthropometric assessments conducted by the doctor and the nurse. In both cases, and with previous consent from the parents or caregivers, I was allowed to stay in the room in silence and to observe the appointment. In between consults or during breaks, I was able to ask questions to clarify what I had observed. In most of the cases, the consultation did not last more than 20 minutes. Depending on the age of the child, the appointment included vaccination or the assessment of developmental milestones. All consultations I observed included the measurement of the child. In total, I observed 100 anthropometric assessments. I will discuss the ethical considerations of this approach later in this section.

Even though the hospital was not using the WHO charts, collecting data in this particular context helped show how health practitioners perceived and used growth charts in settings characterised by the lack of material and human resources. In addition, it was a perfect example to illustrate the complexity and challenges associated with the adoption of an implementation of a standard in practice.

In order to include other points of reference regarding the use of the WHO-CGS in my research, I travelled to Barranquilla and Cartagena, two of the main cities of the Caribbean region. In each city, I visited two different health centres: one targeting low-income patients, and another targeting middle and high-income patients. In

Barranquilla, I contacted the Nursing department of the Universidad del Norte, and after I explained my project, they offered me the option of going to one of the health centres where their students of medicine and nursing were practicing primary health care. I used this opportunity to gain access to one of the health centres offering services to vulnerable and poor communities. One doctor and two nurses agreed to let me stay in the consultation room with the previous consent of the parents of the patient. I spent two days in this centre talking with the health professionals and observing their practices while measuring children. In total, I was able to observe 20 anthropometric assessments.

The second health centre I visited was located in a wealthy area of the city. I arranged access with the nurse in charge of the G&DP. Here, groups of 10 to 15 children with their caregivers were asked to meet in a big room for educational talks, or to learn activities to help stimulate children's development. While one nurse was leading the workshop, another nurse was measuring the children. The centre offered one full day per week for appointments to follow up children's growth. I observed the activities of the workshop as well as the measurement of 20 children. I conducted fieldwork in this centre for two days.

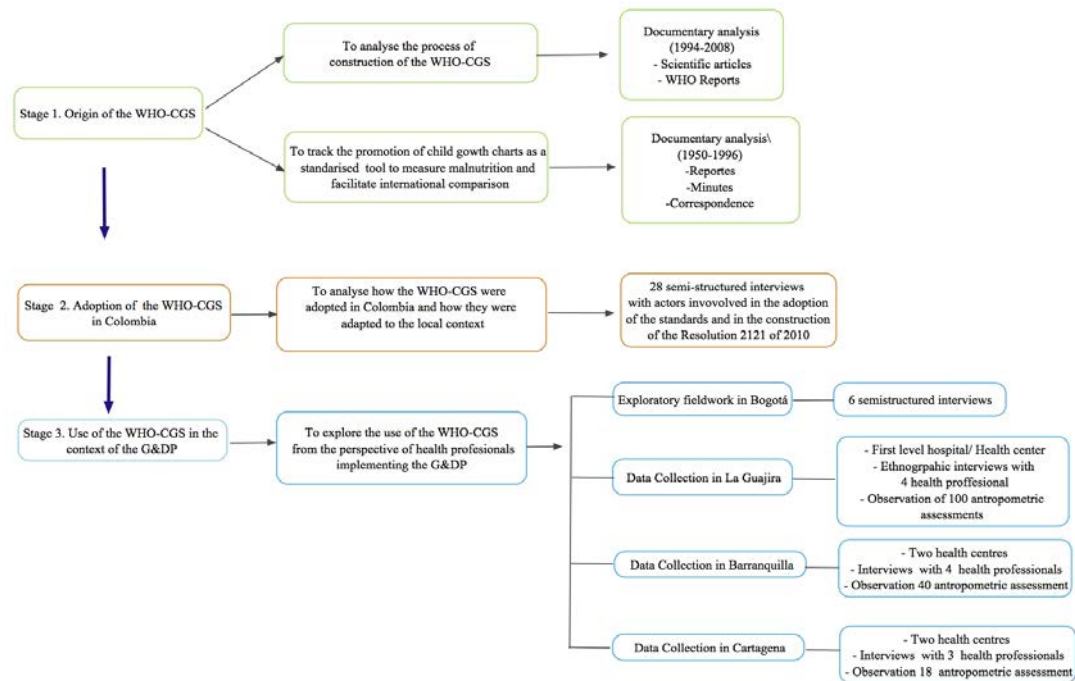
In Cartagena, I followed a similar strategy to the one I used in Barranquilla. The first health centre I visited was located in a low-income area of the city. There, I spent one day with the nurse in charge of the G&DP, who let me stay with her observing the appointments of children who came exclusively to be measured. In this centre, I observed another 10 anthropometric assessments.

The last health centre I visited was owned by a health insurance company. The centre provided its services mainly to patients inscribed in the 'complementary health package' of the insurer, a form of private health service. This facility was strikingly different from the other places I visited. The building was new and modern, and the waiting rooms were not crowded. In addition, the consultation rooms were equipped

with modern computers, the data of the patients was recorded in a digital form, and the instruments of measurement to measure children followed all the recommendations of the Resolution 2121 (the metric tape, the scale and the stadiometre). I gained access to the centre through one of the paediatricians working in the health insurance company, who put me in contact with the nurse leading the G&DP. She agreed to let me spend one day with her. The nurse also put me in touch with a doctor working in the program, who also let me spend a morning with her. I spent two days in the centre and I observed 8 anthropometric assessments.

In total I spent one month in each city, building a network of actors that could help me gain a comprehensive understanding of how children's growth monitoring takes place in practice. Most of my writing about the use of WHO charts is concentrated in my observations from the health centres. However, the process of data collection in La Guajira, Barranquilla and Cartagena also included interviews and informal conversations with actors who, like the staff working in health centres, were actively involved in the monitoring of children's nutritional status. For example, besides my visits to the health centres, I interviewed policy makers (n=3) and civil servants (n=5) working in the local secretaries of health, researchers on child nutrition in the Caribbean region (n=3) and nutritionists (n=7) working in the implementation of the ICBF food assistance programs for children. Finally, I visited three Centros de Desarrollo Integral [Centre for the Comprehensive Development of the Child] (CDI), two of them in Barranquilla and one in Cartagena. CDIs are free day care nurseries for children under five years old, created by the national government as part of its policy on early childhood. These nurseries target children from low socio-economic backgrounds, and are designed to provide qualified care as well as access to a healthy diet. Children spend eight hours in the Centre, five days of the week, and they receive lunch as well as a morning and afternoon snack. Given that one of the requirements to have access to the centre is to bring a photocopy of the growth chart given to the child in the G&DP, I considered them relevant to my research. These centres also follow up children's growth by measuring their weight and height every two months. In each of them, I interviewed the nutritionist (n=3) in charge of keeping track of the nutritional status of the children.

Figure 3. Data collection summary



3.2 Ethical Considerations

Before each interview, I sent my interviewees an information sheet by email, explaining the purpose of my research. I also made explicit that the content of the interview would be kept confidential, and that I was going to use it only for academic purposes. In all cases, I asked permission to record the audio of the interview; in two cases I was asked just to take notes. All participants confirmed at the beginning of the recording their consent to participate in this study. Twelve interviewees were working for governmental bodies – including the Ministry of Health, INS and the ICBF – at the time of the interview. In those cases, I was aware of the possibility that interviewees might feel that they were obliged to speak on behalf of their organizations, and that their responses ought to be coherent with official accounts (Green and Thorogood 2007). I explicitly asked whether they felt comfortable

sharing their personal point of view, or whether they preferred to talk to me in the role of civil servants or employees of the government. All interviewees agreed to use the interview as a space to share what they remembered about the adoption of the WHO charts from their own point of view, with the disclaimer that they were not representing the official standpoint of the organizations where they worked then or where they were working at the time of the interview. Consequently, in each case we agreed that I would not use their names, but pseudonyms. Given that talking about the growth charts implied talking about malnutrition as well as poverty, social inequality, food security and governance, this agreement was an important means of creating a safe space to talk about the role of the state and the national government in the nutritional status of children.

During the third stage of the data collection – my observation of individual growth assessments- before each interview I explained the purpose of my research, and I made sure to provide the interviewee with an information sheet about my project (see Appendix B). Just as in the interviews I conducted with experts and civil servants, I made clear that the information collected in the interview was confidential, that interviewees could stop the interview at any time, and that the information was going to be used exclusively for academic purposes.

In the case of the hospital and the health centre in La Guajira, I agreed I would not disclose the location or name of the institution. I refer to the hospital using the name of the department, La Guajira, instead. I have also anonymised the name of the health centres that I visited in Barranquilla and Cartagena.

In order to spend time in the health centres, I first received permission from the nurse in charge of the program. In all cases, it was agreed I was going to stay in the health centre for a short visit, and that my interviews and observations would be exclusively related to growth monitoring practices. I was introduced to the doctors and nurses and then I asked if I could observe their work for some hours; in all cases they agree

to let me stay in the room. The conditions of my observation triggered two main ethical challenges. The first one related to the parents', consent and the second one to the confidentiality of the medical information that could be disclosed during the consultation.

I agreed with the doctors and nurses that I would spend either the morning of the afternoon with them, and that they could choose which patients I could observe. In addition, I could only be in the consultation room if the child was attending for a well-being visit, and if the child was not consulting for a disease that could imply the disclosure of sensitive information. In terms of consent, it was the nurse or doctor who asked for parent's verbal consent to let me stay in the room. I was aware that the power dynamic between doctor/nurse and patient could make parents feel coerced into providing a positive answer. For this reason, I decided that I would leave the room as soon as I could identify any sign of discomfort from the health professional, the parents or the child. I also decided that I would leave the room if the parents needed to talk about sensitive topics related with the health of the child.

I never felt conflicted about consent in Barranquilla or Cartagena. In La Guajira, on the other hand, consent was particularly challenging, given that most of the patients were indigenous children from the *wayuu* community. Many of the parents were not fluent in Spanish, and neither the doctor nor the nurses I was with were fluent in *wayuunaiki*, the local dialect. In those cases, the power dynamics in the room were deeply intertwined with variables of race and class. In some cases, I was not sure whether parents fully understood why I was in the room. I decided that as soon as parents were in the room, I would introduce myself and I would confirm with them directly whether I could stay in the room to observe. While language barriers made it difficult to ensure parents fully understood my research or what I was observing, I did everything I could to make sure they did not feel my presence was invasive or uncomfortable. In La Guajira, the ethical dilemmas I faced went well beyond following the ethics guidelines to avoid risk. Instead, they were about 'how to deal with conflict, disagreement and ambivalence' (Edwards and Mauthner 2005:27), and

how to establish a relationship of respect, care and empathy with the actors I was interacting with.

During the consultations, I agreed with the doctors and nurses that I would remain silent during the appointment, and that I was not going to interview the parents before, during, or after the appointment. In addition, given that some of the children's medical information could be discussed during the appointment, I agreed that all personal information relating to the child or her parents would be kept confidential, and that I would not record or take notes about any indicators of patient identity, such as name, address, or ID number. However, I did collect data about the process of measurement, and the nutritional assessment of the child.

This layer of data collection was the most challenging of all my fieldwork in Colombia. In La Guajira in particular, I was constantly rethinking and reflecting on the routes I used to have access to the data I was collecting, and the power dynamics involved in access and consent. I am also aware of the impact of those choices in my interpretation of the use of growth charts in practice, and on the politics of measurement and standardisation in the Colombian case – as I will explain at the end of this chapter.

3.3 Data Analysis

I conducted an inductive analysis of my data, following some of the techniques developed for grounded theory, especially related to coding and memo writing (Strauss and Corbin 1998). In the case of the documents, I first selected and read all the documents of relevance for my research. I then selected a group of forty documents that were particularly relevant, as they were discussing processes of standardization and growth monitoring in children. In the case of my interviews with members of the working group and the extended committee that participated in the

adoption of the WHO-CGS and with health professionals I meet during my fieldwork in health facilities, I listened to all the audio recordings of the interviews, and made brief summaries of the key topics of each conversation. For the second stage of analysis I fully transcribed the 26 interviews of interviewees who had given me consent to record. For the third layer of analysis, most of the data I collected in the health centers was recorded in detailed fieldwork notes.

The documents I chose for detailed analysis, the interview transcriptions and my notes were all coded using the qualitative software Nvivo. The process of coding followed two stages: in the first one, I created descriptive codes that helped me to understand relevant technical aspects of the design of WHO growth charts, the transition from the NCHS to the WHO charts, and the process of adoption and adaptation of the new charts in the Colombian context. During this process, I concentrated my attention on understanding the cluster of data coming from each stage of data collection.

In the second stage of coding, I went through all the data I collected again, this time searching for connections and tensions between the layers of data collection. As an example, I found that exclusive breastfeeding, brain development during early childhood, and height as an indicator of economic development were key transversal topics. In other words, they were categories of analysis that could tie together different narratives on growth monitoring, malnutrition measurement, and the standardisation of tools and procedures.

I also used the technique of memo writing. Memos are written records of analysis that help the researcher to link the analytic interpretations with empirical data (Charmaz 2006). Writing memos was also useful to keep track of the decisions I made while coding, which helped me to ‘make and keep the process of analysis transparent, and maintain a self-reflexive stance’ (Burck 2005:245). The use of

memos was particularly useful in keeping track of new questions or categories that emerged in my interviews and that I wanted to follow up.

3.4 Limitations

This study has two main limitations. The first one is related to a lack of access to minutes or reports of the meetings and workshops of the working group and extended committee. Most of my data relies on the interviews I conducted with nutritionists and doctors who participated in some of these meetings between 2008 and 2009, five years before the interviews. The conditions of the data collection made it particularly difficult to identify and follow up how decisions about the adoption of the WHO-CHS were made, and what kinds of negotiations, tensions or controversies took place during the workshops and meetings. Most of the data I used to analyse the adoption, adaptation and implementation of the WHO charts in Colombia were based on the document Resolution 2121 and on the interviews I conducted with doctors and nutritionists invited to be part of the extended committee. Even though all the interviewees were willing to help me reconstruct the memory of these meetings and workshops, in several cases I was not able to reconstruct the decision-making process behind the final outcomes of the workshops, nor the role of different actors or institutions involved in those decisions.

It is also important to mention, as I described in the previous section, that I agreed to keep all interviewees' identities confidential and to use pseudonyms. However, when I began writing up my research results, I noticed that the use of pseudonyms was insufficient to protect the identity of the participants; with even basic information regarding their professional background, expertise, or working experience, it was possible to identify several interviewees. Given that the network of professionals involved in public nutrition and anthropometry that participated in these discussions is very small, I chose to limit the information I used about the participants in my writing. This aspect, along with the lack of minutes or reports, limited my ability to

provide a detailed account of the role of specific actors in the construction of Resolution 2121.

The second limitation I want to point out is related to the fact that I could not get clearance to conduct ethnographic work with health practitioners. My analysis in this regard is informed by a series of observations collected in a relatively short period of time. Nonetheless, the information I collected was enough to make evident some of the challenges involved in the standardisation of tools and techniques of measurement. In addition, the data I was able to collect in consultation rooms gave me enough information to understand the material world of the growth charts. Observing different settings also made explicit how diverse the world of standards in practice can be (e.g. diversity of charts, scales, measurement tapes). However, being unable to spend long periods of time in the places I visited limited my understanding of the organizational and institutional dynamics that made the adoption of the WHO-CGS either easier or more difficult. Given that I was not allowed to interview parents or caregivers, I was also unable to add an additional layer of data collection in which I could follow the lives of the charts in the hands of the final user. As I will describe in the empirical chapters that follow, growth charts are an important tool not only in following up children's growth, but also in mobilising benefits and access to free day-care nurseries. Following the standard into the domestic domain – or at least examining how parents perceive and use the charts – is a topic I would like to explore in further research.

Chapter 4. The Search for the Standard Child: Growth Charts for International Comparison

Child growth charts are recognized in the fields of medical practice and public health as some of the fastest and cheapest tools for monitoring children's growth and nutritional status at both individual and population levels (Duggan 2010). The development and use of growth charts designed to assess children's growth has a long tradition that can be followed back to beginning of the twentieth century. It was during this period that several weight and height charts and tables were developed and widely circulated in the context of antenatal care, infant welfare clinics, baby clinics, and day nurseries (Armstrong 1995, Turmel 2008). In the post-war period, and with the foundation of diverse international organisations into dominant institutions like the WHO and UNICEF, growth charts acquired a new role. Besides being used by health professionals in individual cases, the use of anthropometric measurement began to be promoted by the WHO as a crucial tool for assessing the scope and severity of cases of malnutrition across different countries. Particularly since the 1960s, child growth charts have become a primary means of facilitating the international comparison of malnutrition rates. As I will show in this chapter, the WHO has mainly promoted three sets of charts: the Harvard charts (1966-1976), the NCHS charts (1976-2006), and the WHO-CGS (2006-present).

According to the WHO, the WHO-CGS are the first set of charts able to describe how children *should* grow, instead of describing – like all previous charts – how the average child in a specific setting *does* grow. WHO-CGS are also the first charts designed for the specific purpose of facilitating international comparison. The Harvard and the NCHS charts were originally created to measure children from the United States. By unpacking the history and conditions of production of the charts promoted by the WHO, I will show the processes of inclusion and exclusion involved in the design of human standards seeking to define the standard human – or, in this case, the standard child (Epstein 2007). Busch (2011), Star and Lampland (2009), and Bowker and Star (2000) have noted that standards remain invisible not

only because of the naturalisation of their use, but also because they effectively hide the negotiations and sheer amount of work required to make them look like ahistorical, stable and unproblematic tools to organise the world. By analysing the characteristics of the ‘who’ behind a normal distribution, and by problematizing issues of over- or underrepresentation in human standards, it is possible to make visible the ways in which growth charts are socially shaped artefacts.

In this chapter, I will centre my analysis on the processes by which the WHO-CGS became the tool that epitomized the WHO’s efforts to standardise growth measurement at the international level. As a first step in the process of unpacking the biography of the WHO charts, and following Star and Lampland’s (2009) invitation to open the black box of standards and standardisation, I will contextualise and the construction of the WHO-CGS in relation to the charts previously promoted by the WHO. The chapter is divided into three sections. Based on the existing literature on the history of anthropometry, the first section comprises a brief historical background of the development of child growth charts at the beginning of the twentieth century. The second section concentrates on the period between the 1950s and 1960s, and describes how the inclusion of protein-energy malnutrition in the international agenda mobilised the development of standardised tools to measure the nutritional status of children across different population groups. The third section describes why the Harvard and NCHS charts were promoted by the WHO as charts for international comparison, and under on what criteria they later stopped being the ‘the right tool for the job’ (Casper and Clarke 1998). In this final section, I also discuss the development of the WHO-CGS, and how they were designed to become a universal growth standard applicable to children under five years old.

4.1 Brief Historical Background of the Development of Growth Charts

The development of child growth charts can be traced back to the work of Adolphe Jacques Quetelet in the nineteenth century, when he produced the first systematic

cross-sectional anthropometric survey of children (Martorell 1981). Quetelet created the first examples of growth tables for children, and an equation for the growth curve for height. In addition, he was the first to introduce the Normal Curve of Laplace and Gauss to establish normality in terms of average height and weight (Tanner 2010).

While several studies looking at children's growth took place in Europe after the groundbreaking work of Quetelet, it was only at the end of nineteenth century that the study of children's growth and development bloomed (Tanner 2010, Ulijaszek and Komlos 2010, Lowrey and Watson 1973). The implementation of growth studies and the production of growth charts and tables during this period was characterised by the use of statistical techniques, and by the inclusion of large samples of children (Martorell 1981, Young 1979). The large sample sizes were made possible, in part, by the advent of public schooling, which facilitated access to a large and homogeneous population of children for study (Young 1979). One of the first studies that deployed the statistical techniques of Francis Galton was conducted by Henry Pickering Bowditch, who directed the first large-scale anthropometrical study of a population of children in Boston during the 1870s (Lowrey and Watson 1973). Bowditch collected the ages, heights, weights, birthplaces, nationalities and parents' occupations of 24,000 schoolchildren and based on this information published several reports comparing the growth of America and British children. He also developed extensive tables and graphs charting height- and weight-for-age, and was one of the first to use percentiles in analysing children's growth (Martorell 1981). The studies made by Franz Boas are also highlighted by Tanner (2010) and Martorell (1981) as another key example of the development of longitudinal studies of large numbers of children during the nineteenth century. During the 1890s, Boas collected data from 90,000 children between 5 and 18 years old from six cities of the United States, and produced a set of growth charts based on population-derived statistics –

which, according to Tanner, laid the foundation for modern growth reference standards (Tanner 1998a)¹⁷.

During the first half of the twentieth century, interest in children's physical growth and development increased significantly. Several authors, including Tanner (2010), Young (1979), Lowrey and Watson (1973) have noted that increasing attention to children's growth – mainly in the United States – was closely related to a change in the approach to children in the field of paediatrics, preventive medicine and education.

According to Turmel (2008), the development of growth charts at the end of nineteenth century responded to the need for theories and technologies seeking to frame children as a subpopulation and as a subject for scientific research. During this period, the production of growth charts and tables, record forms and intelligence tests expressed new forms in which children's bodies were observed, recorded and monitored (Turmel 2008). Children moved from having no special or separate status, to primary targets of social reforms that acknowledged that society had an obligation to improve their life conditions. This newfound obligation included the 'preservation of life and health, freedom from premature toil, [the] education of children and care of dependent children' (Takanishi 1978:13).

This shift in the way of understanding children contributed to, and developed alongside, a fertile environment for the development of research centres for the study of children's growth¹⁸. Most of these centres were created in the United States with

¹⁷ For a detailed account of the history of child growth studies during the nineteenth century, including Bowditch and Boas, refer to the work of Tanner (2010) and Young (1979).

¹⁸ The uptick in growth studies was also evident in the creation of specialised journals, including *Growth: A Journal for the Study of Development and Increase or Child Development*, and the increase of publications on this topic (Lowrey & Watson 1973). A literature review undertaken by Scammon (1927) on children's growth, for example, reported 63 publications on the topic between 1800 and 1850, 647 for the period of 1850 to 1900, and nearly 3,000 between 1900 and 1925.

the purpose of implementing longitudinal studies that could follow large samples of children for several years (Lowrey and Watson 1973). Some of those studies included the University of Iowa Child Welfare Study (1914), conducted by the Iowa Child Welfare Research Station; the Harvard Growth Study (1922), undertaken by the Child Health Division of the Harvard School of Public Health; the Berkley Growth Study (1928), by the University of California Institute of Child Welfare; and the Fels Longitudinal Study (1929), conducted by the Fels Research Institute for the Study of Human Development. The Fels Study is one of the longest studies ever done in the United States (Ulijaszek, Johnstone and Preece 1998)¹⁹.

Longitudinal studies were also developed in Europe after World War II, including the Oxford Child Health Survey (1943) and the Harpenden Growth Study (1948) (Tanner 2010). Most of these studies generated growth charts that were widely distributed in paediatric textbooks, like the Nelson Paediatric Textbook. The development of longitudinal studies and cross sectional studies of growth during the mid-twentieth century also took place in the context of national growth surveys, developed by countries like the Netherlands, the United States, the United Kingdom and Cuba to monitor children's growth (Tanner 2010). Most of these surveys compare how populations were growing over time, as well as enabling comparisons between groups of children that shared common social conditions. Several of the longitudinal studies made in the United States were developed with the aim of determining both the effects of the Great Depression on children's health, and the influence of programs to mitigate them, as it was stated in the White House Conference on Child Health and Protection of 1933 (Roche 1992).

The development of growth studies was also a crucial factor in the consolidation of the idea that children's growth and morphology could change as a response to their

¹⁹ The Fels study followed the physical growth and psychological development of children from three generations, over 62 years. The study began in 1929 with approximately 600 participants; 350 members of the second generation participated, offspring of a Fels parent; and 90 participants were drawn from the third generation, grandchildren of the first generation. For more details about the Fels study see Roche (1992)

environment or living conditions. The acceptance of plasticity in child growth set the scene for the beginning of the ‘present era of epidemiology that uses statistically-derived growth standards based on large-scale data collection in the surveillance, screening, and monitoring of populations towards improved social welfare’ (Ulijaszek and Komlos 2010:188). Even during the nineteenth century, there were social reformers interested in the relationship between height and poor working conditions, including Louis-René Villermé in France or Edwin Chadwick in England (e.g. children working in factories; (see Tanner 2010). However, for authors like Ulijaszek and Komlos (2010), it was not until the work of Franz Boas during the 1920s that the possibility of improving the physical characteristics of ‘inferior working stock’ by improving the environmental circumstances in which they lived emerged²⁰. Boas conducted surveys on the physical characteristics of immigrants and their descendants in the United States. With this data, he was able to show that American-born Bohemians and Hebrews were taller than their foreign-born counterparts. Boas also contended that the period of time between the arrival of immigrant women in the United States, and the time when they gave birth, had an influence in the weight and height of the child. Studies observing changes in growth between generations were conducted across the world during the twentieth century, showing positive and negative secular trends in several contexts (Ulijaszek and Komlos 2010).

Nowadays, the anthropometric assessment of children continues to be promoted in the discourse of global health, nutrition, medicine and economics as a useful tool to collect information – not only about the nutritional status of a child, but also, by inference, about the health status of the population and its living conditions. Since environmental factors such as diet, nutrition, disease, psychosocial stress, food contaminants and pollution are directly related to socioeconomic variables, the

²⁰ According to Ulijaszek and Komlos, the measurement of height in order to reject or accept a man in the army or navy, or as a slave, as well as the measurement of children in factories, followed a eugenic rationale in which ‘individuals and groups of poor physical quality might reproduce a cycle of inferior ‘stock’, not fit for the purpose of the Empire or enterprise’ (2010:187). This perspective differs from studies conducted during the beginning of the twentieth century, in which it was accepted that physical morphology can change if living conditions improve.

measurement of children's bodies became a 'sensitive marker of the quality of life' of a society (Ulijaszek and Komlos 2010:88); and anthropometric practice became a powerful political economic instrument of social welfare (Ulijaszek and Komlos 2010). In a similar line of thought, Rogers (2002) noted that child growth became an indicator of wellbeing because it is the result of the sum of diverse variables, including food intake, energy expenditure and morbidity. Taking this into account, from the 1970s, agencies such as the World Bank used height as a proxy of national wellbeing, and the change of height over time as a criterion for the success of economic aid (Tanner 1998b).

4.2 Acknowledging Malnutrition in the International Agenda

With the rise of international agencies in the second half of the twentieth century, the use of anthropometric assessment found a new role: facilitating international comparison. After the Second World War and the dissolution of the League of Nations, several agencies were created with the aim of maintaining peace, promoting social progress, and improving the living standards of the world population. One of the many targets of the new United Nations – and especially of the WHO and the Food and Agriculture Organization (FAO) ²¹ – was linked to the levels of malnutrition that several populations were facing across the world. In this section, I will show how the anthropometric measurement of children provided one key means of addressing this crisis, by enabling the international assessment of nutritional status among preschool children in particular.

Soon after the WHO was established in 1948, it began working with the FAO on the development of a research agenda on nutrition, a topic of concern for both agencies. Founded in 1945, the FAO was committed to 'ensure not only that all peoples are

²¹ The preamble of FAO's constitution in 1945 states that 'The Organization shall collect, analyse, interpret and disseminate information relating to nutrition, food and agriculture. In this Constitution, the term 'agriculture' and its derivatives include fisheries, marine products, forestry and primary forestry products (Phillips 1981:9).

freed from the danger of starvation and famine but that they obtain the kind of diet essential for health' (FAO 1946). For this purpose, in 1949 they created a committee called The Joint FAO/WHO Expert Committee on Nutrition²² as an advisory body to both agencies. This was the 'first inter-organizational attempt to contemplate and plunge into malnutrition and hunger in the developing world' (Ruxin 1996:77). The WHO was supposed to focus on the relationship between nutrition and the maintenance of health; and the FAO was expected to focus on the production, distribution and consumption of food as a necessary part of good nutrition for populations (WHO 1950).

Even though it was clear that malnutrition was a major global matter, there was a lack of statistical and epidemiological knowledge about the magnitude of the problem. One of the first attempts to measure global nutritional conditions was the implementation of the FAO First World Food Survey in 1946²³. Its aim was to establish a baseline quantification of the food supply of various countries. In the introduction of the survey publication, the FAO stated that:

It is well known that there is much starvation and malnutrition in the world [yet] vague knowledge that this situation exists is not enough; facts and figures are needed if the nations are to attempt to do away with famine and malnutrition (cited in FAO 1995:8).

The FAO Food Survey provided information about food intake and average calorie supply. During the 1940s, malnutrition was mainly measured in terms of energy and calorie requirements; food energy conversions and calorie values in common foods were an important subject of research, and a key element in assessing malnutrition at the population level. Measuring calorie availability and calorie supply per person, the survey report confirmed widespread hunger and malnutrition throughout the world,

²² The Joint FAO/WHO committee met annually until 1974.

²³ The food balance sheets of seventy countries were included in the survey. A food balance sheet contains the pattern of a country's food supply, and they have been used since 1939 in League of Nations studies. Today, FAO food balance sheets cover production, trade feed and seed, waste, and food availability (FAO 2016).

‘with more than half the world’s population subsisting on less than 2250 calories per day’ (Gibson 2012:217).

During the early 1950s, the lack of protein intake began to be studied as a form of malnutrition even more widespread than other forms of malnutrition (e.g. micronutrients malnutrition; (Gibson 2012). In 1952, the FAO implemented the Second World Food Survey, and this time it provided estimates of caloric and protein distribution. The indicators of malnutrition were even higher if the consumption of protein was taken into account. The results of the survey showed that over two-thirds of the world’s population was undernourished (Gibson 2012).

Protein malnutrition was first associated with kwashiorkor, a disease nowadays considered a severe form of protein-energy-malnutrition caused by a deficiency in dietary protein (Castiglia 1996). Jamaican physician Cecille Williams introduced the term Kwashiorkor to the scientific community in a paper published in the *Lancet* in 1935, where she described her experiences with 20 cases²⁴. In this article, she reported a common disease in Ghana, among children between one and four years old who had been weaned early and fed entirely on gruel made from maize. Williams described the disease as characterised by:

... oedema, chiefly of the hands and feet, followed by wasting; diarrhoea; irritability; sores, chiefly of the mucous membranes; and desquamation of areas of the skin in a manner and distribution which is constant and unique.

The disease attacks children of either sex, between one and four years old. It appears to be due to some dietetic deficiency and to be uniformly fatal unless treated early (Williams 1933:423).

During the next 15 years, it became clear that the same disease described by Williams was widespread in different African and Latin American countries. However, earlier reports had used a variety of names to describe the condition,

²⁴ For a detailed historical account of kwashiorkor see Carperter (1994) and Ruxin (1996).

including infantile pellagra, sugar baby, nutritional oedema, hypoproteinosi, malignant malnutrition, and fatty liver disease, among others (WHO 1953). Kwashiorkor and protein malnutrition were treated as synonymous at first (Ruxin 1996); and for this reason, after the second survey of the FAO, kwashiorkor was described in the scientific literature and in the reports of FAO as ‘one of, if not the most serious and widespread, nutritional disorder in the world at the time’ (Gibson 2012:219).

Along with endemic goitre and pellagra (both diseases related with vitamin deficiencies), the study of kwashiorkor became one of the main topics of concern and discussion at the Joint FAO/WHO Committee. According to the committee reports of 1950 and 1953, kwashiorkor was a nutritional priority, having been identified as ‘one of the most widespread nutritional disorders in tropical and sub-tropical areas’ (WHO 1950:15). By 1955, the priority given to kwashiorkor in the WHO reports was reduced and displaced by the introduction of the term ‘protein-energy-malnutrition’. Documents written after this period reduced their emphasis on the prevalence of kwashiorkor, and instead called for the need to estimate how severe the presence of protein-energy-malnutrition was across the globe. As before, the collection of quantitative data on as wide a scale as possible became seen as necessary to assess the dimension of the problem. In this regard, the fourth report of the Joint FAO/WHO Committee stated that:

While much is known about the clinical manifestations of protein malnutrition in children, precise information about its extent as a public health problem is still meagre. However, in many parts of the world, particularly in the tropics, large numbers of infants and children showing signs and symptoms known to be associated with protein malnutrition come under clinical observation. This can reasonably be taken as an indication that protein deficiency is widespread in the general population (WHO 1955:11).

The call for measurement and quantification was accompanied by questions around the appropriate tools by which to make these measurements. Along with nutritional surveys, the use of anthropometry was recommended for assessing the nutritional

status of specific populations. Though the Joint FAO/WHO Committee argued that the use of body weight in relation to height was relevant for assessing nutritional status, there were no standardised techniques or procedures for doing so. The report of the second committee meeting in 1951 indicated that there were ‘no generally accepted norms for the evaluation of such measurements, nor, indeed, generally accepted standard methods of making measurements themselves’ (WHO 1951:63). The report also points out the lack of systematically analysed information looking at anthropometrical differences between races and climatic environments. As a conclusion, the Committee recommended that the FAO and WHO ‘should study the problems involved in the development of anthropometric norms and standardised techniques of anthropometric measurements’ (WHO 1951:64).

Subsequent reports of the Joint FAO/WHO Committee continued making recommendations for the development of a standardised system to record and interpret nutritional data (WHO 1978). As part of the agreements and recommendations made in its fourth (WHO 1955) and fifth meetings (WHO 1958), in 1962 the WHO convened a new committee: the Expert Committee on Medical Assessment of Nutritional Status²⁵. In 1963, the Committee released a report designed as a guide for professionals with medical training undertaking the assessment of the nutritional status of populations. It provided a detailed discussion regarding nutrition surveys, as well as an overview of all types of nutritional assessment: anthropometric, clinical, and biochemical.

Noting the shared concern of the WHO/FAO Committee, the report emphasised the urgency of standardised procedures, techniques and measurements for nutritional assessment, particularly in the context of nutrition surveys²⁶. Standardisation was

²⁵ The members of the committee were six highly recognised researchers in the field: Dr. Arroyave from the INCAP in Guatemala, Professor J.F Brock from the University of Cape Town, Dr. D.B Jelliffe from the University College of East Africa, Dr. Raoult from the Ecole d’Application er Centre d’Instruction et de Recherches du Service de Santé de Troupes de Marine and Dr. P.S Venkatachalam from the Indian Council of Medical Research.

²⁶ Nutritional assessment procedures were first described for use in nutrition surveys on national scales. Before the WHO 1963 report, only the Health Organization of the League of Nations had effort to standardise methods for nutritional surveys, in 1932 (Gibson 2005).

framed as necessary to reaching uniformity and comparability among studies coming from different parts of the world at different times. While the report described in detail the characteristics of existing nutrition surveys, the Medical Committee recommended that the WHO develop a standard guide with instruction about the design and implementation of future nutrition surveys. This recommendation was soon materialised in a WHO Monograph called 'The Assessment of the Nutritional Status of the Community'. The author of this publication was Derrick Jelliffe (1966), an expert in tropical paediatrics and infant nutrition, and at the time, the director of the Caribbean Nutrition Institute in Jamaica. This work is considered a milestone in the history of nutritional assessment, given its influence on many subsequent publications (Cowell, Gilbride and Simko 1995).

Jelliffe's work was directed to medical doctors, nutritionists and public health nurses faced 'with the practical problems of attempting the assessment of the nutritional state of a community in a less developed tropical country' (1996:8). He described clinical, anthropometric, biochemical and dietary assessment procedures that could be employed in developing regions of the world where human and technical resources might be limited. The manual describes specific procedures to assess young children, schoolchildren, pregnant and lactating women and adults. Jelliffe also clearly described the aim of nutritional assessment:

to map out the magnitude and geographical distribution of malnutrition as a public health problem, to discover and analyse the ecological factors that are directly or indirectly responsible, and, where possible, to suggest appropriate corrective measures, preferably capable of being applied with continuing community participation (Jelliffe 1966:7).

In addition, highlighted the importance of collecting numerical data to create a baseline from which to track the impact of action taken to improve nutrition, and

After that the Interdepartmental Committee on Nutrition for National Defense (ICNND) produced a manual for conducting nutrition surveys. This manual is considered one of the first guidelines that promoted standardised procedures (Gibson 2005).

thereby generate evidence to raise funding for malnutrition prevention. In the introduction of the report, Jelliffe states:

Factual evidence of the incidence of malnutrition in the community, and its often complex factors, is needed in order to make the public, and especially the fund-controlling administrators and politicians, realize the extent of the problem, and so ensure financial support for such a preventive programmes as may be required (Jelliffe 1966:7).

The drive to measure protein-energy-malnutrition in the WHO and FAO agenda came together with the necessity of standardising anthropometric techniques and procedures to assess growth, particularly in infants and preschool children. It was when protein-energy-malnutrition was discovered and researched that anthropometric assessment gained visibility as a tool of measurement potentially relevant for international comparison.

Since the 1960s, growth assessment has been consolidated as a tool to evaluate the nutritional status of children, as well as an instrument to provide an indirect measurement of the quality of life of a population (de Onis et al. 1993). The anthropometric assessment of growth is still considered ‘the single measurement that best defines the health and nutrition status of children, because disturbances in health and nutrition, regardless of their etiology, invariably affect child growth’ (de Onis et al. 1993:703). But it is also expected to provide information about the present nutritional status of a community as well as its nutritional history, and is still internationally recommended as a way to assess malnutrition at population level (de Onis and Blössner 2003).

During the 1970s, several nutrition surveys were conducted across the globe, and the WHO continued its efforts in standardising nutritional assessment. Ongoing discussions in this regard focused on the selection of growth charts for international comparison. The use of anthropometry and the promotion of growth monitoring, especially in the late 1970s, also needs to be understood within international health

reasoning. In 1978 the Alma-Ata Declaration set the principles for the Primary Health Care movement. According to Cueto (2004), some of the key elements of the declaration include it promoting the use of affordable and appropriate medical technologies that could meet the needs of developing countries. It also disapproved of the overspecialization of health professionals and the top-down nature of health campaigns; instead it promoted the training of lay health personnel and community participation. Finally, it promoted the concept of health as an instrument for socioeconomic development. In a context of the Cold War, several international donors such as the Rockefeller Foundation saw the Primary Health Care initiative as idealistic and unrealistic (Brown, Cueto and Fee 2006). In 1979 the conference “Health and Population in Development” took place in Bellagio. Heavily influenced by the World Bank and the United States policies, this conference focused on the development of an alternative concept denominated Selective Primary Health Care (SPHC). This alternative movement emphasized the cost-effectiveness of vertical programs which had measurable results, a limited scope and was easy to monitor and evaluate (Brown, Cueto and Fee 2006). With the main support of UNICEF, SPHC was translated into an initiative called GOBI, which promoted four main actions that were expected to improve children’s health and reduce child mortality in developing countries: growth monitoring, oral rehydration, breastfeeding and immunization. During the 1980’s growth monitoring using anthropometric tools was promoted by several key players in international health such as UNICEF, the WHO, the World Bank and the Rockefeller Foundation, as a key element of the *child survival revolution* initiative. Within this new framework to approach children’s health, fighting child mortality became an “instrument of development” (UNICEF 1996:60). The recognition that the investment in nutrition and health could accelerate economic growth became part of the international discourse around child malnutrition in developing countries.

Within this broader context the WHO continued its efforts to promote child growth monitoring as well as continued searching for a standard that could estimate the magnitude of protein-caloric malnutrition in different populations across the globe. As I will show in the coming sections of this chapter, the promotion of growth charts

for international comparison between the 1970s and 2006, the year that the WHO launched the WHO-CGS, reflects how a standard is rooted in a specific social and historical trajectory. By exploring the characteristics of the growth charts that have been promoted by the WHO as well as the reasons why they were chosen, I will show how the WHO-CGS turned into an ideal tool to assess under and over nutrition across the globe.

4.3 Developing Charts for International Comparison

The anthropometric assessment of malnutrition requires the use of growth charts and tables able to provide reference data for weight and height according to sex and age. To judge a child's weight and height, the child must be compared against a reference sample. It is in the act of comparison against the reference population that nutritional classification is possible. A child can only be classified as being under/overweight, wasted or stunted in so far the measurement of weight and height is compared against the mean of a reference population of the same age and sex. In this context, the question of who should be the benchmark of comparison acquires particular relevance. Growth charts, like any other standard, have the quality of looking stable and ahistorical. At first sight, all growth charts might look the same: they all provide reference values for height and weight, and in that sense might seem immutable. However, as I will show in the coming sections – by identifying who was chosen to be the reference sample, and unpacking the criteria of their selection – not all normal distributions are equal. Growth charts are artefacts within which specific notions about children's bodies, and about who represents the best example of optimal growth, are embedded.

4.3.1 Growth Charts for International Comparison (1950s-1970s)

During the 1950s, discussion about growth charts was focused mainly on the recommendation of collecting growth metrics from healthy populations at the local level, so they could be used as a reference. During its fourth meeting in 1954, for

example, the Joint FAO/WHO Committee emphasised the importance of collecting, with reliable measures for height and weight, averages from ‘healthy people of both sexes and of different ages and occupational groups within countries’ (WHO 1955:45). The topic was addressed again during the Committee’s sixth meeting in 1961; this time, the focus was on preschool children in under-developed countries, a population that showed high prevalence of protein-energy-malnutrition. According to the Committee, the best way to assess children in local settings was to measure children against charts developed locally, and based on data from well-fed young children in the same country (WHO 1962). The Committee recommended the use of standardised forms to record graphically the weights of preschool children. Priority was given to weight, but the committee also recommended the collection of data on length and height if the instruments and conditions to do so were available (e.g. access to a straight, vertical surface such as a wall or pillar).

In 1963, the WHO Expert Committee on the Medical Assessment of Nutritional Status continued to insist on using local charts to interpret anthropometric nutrition surveys, advocating standards ‘constructed from the measurements of apparently healthy subjects of the same ethnic group’ (WHO 1963:14). In case local charts were not available, they recommended the use of Meredith’s standards (1949). Developed during the 1940s, Meredith’s standards were based on the height and weight of a small and unrepresentative sample of children of high socioeconomic status in Iowa City (de Onis and Yip 1996).

Jelliffe (1966) also emphasised the importance of using and developing local charts. According to him, they constituted a more realistic goal of growth, as they reflected patterns associated with a specific environment and particular ethnic and genetic background. In his report, he states:

It should be the ultimate aim of nutritionists to prepare and use local standards for different ethnic groups with potentially different patterns of growth. To cite an extreme instance, height standards for the pygmies of Rwanda are obviously inappropriate for their extremely tall nilo-hamitic neighbours, the Tutsi.

Body proportions appear to vary in different groups of peoples. This is partly genetic, possibly being related in some instances to climatic adaptation, as exemplified by the contrasting shape and size of the Arctic-dwelling Eskimo and the tall, slender Dinka of equatorial Africa.

However, physique is also related with nutrition, as has been demonstrated by the increase in height as well as weight of second- and third-generation Japanese Americans in California compared with their ancestral stock in Japan (Jelliffe 1966:54).

Even though Jelliffe argued for the use of local charts, he also noted that it was often difficult in developing tropical countries. He noticed that the risk of using existing charts was that it was difficult to guarantee that they had been made with data from well-fed, healthy children, with precisely-known ages. Local growth charts were frequently constructed with data coming from 'lower socio-economic groups, who are usually undernourished from six months of age and continuously exposed to a succession of infective and parasitic diseases' (Jelliffe 1966:55). If the reference population is already malnourished the identification of children at risk or in early stages of malnutrition could easily overlap with the range of normality of the chart.

Given the difficulties associated with local charts, Jelliffe recommended the use of the Harvard charts (Stuart and Stevenson 1950). These charts were derived from a study made in Boston from 1930 to 1956 by the Harvard School of Public Health, in which approximately 3,600 Caucasian children were measured (Tanner 2010). According to Jelliffe, the advantages of using these charts were that they were based on a longitudinal study, that they were available in Nelson's Textbook of Pediatrics²⁷, and that they were widely used by paediatricians in different countries (Jelliffe 1966). Jelliffe included in the monograph a simplified combined-sexes table with reference measurements derived from the Harvard study for weight-for-age and length/height-for age.

²⁷ Nelson's Textbook is perhaps the most popular textbook of pediatrics in the world. It was first edited in 1959 and is now in its 20th edition.

The Harvard charts were not only recommended when local standards were not available: the WHO also suggested their use as an international reference to facilitate global comparison. During the eighth Joint FAO/WHO Committee meeting held in 1970, the promotion of standardised procedures for measuring malnutrition continued to be emphasised as the only way to estimate the prevalence of protein-caloric-malnutrition. The report stated that even though new literature analysing 80 nutrition surveys in 39 countries from 1966 to 1969 had been published, estimates about protein-caloric-malnutrition were still incomplete and insufficient (WHO 1970). In this context, the Harvard charts were promoted as a tool to facilitate measurement standardisation, and therefore international comparison. They were intended to be temporary, while the FAO and the WHO could examine the ‘feasibility of development and adopting international standards’ (WHO 1970:43).

Seven years later, following the Joint FAO/WHO Committee’s recommendations, another committee of the WHO was set up to discuss methods for the collection and analysis of height and weight for nutritional monitoring or surveillance programmes of children under the age of ten years (Waterlow et al. 1977). The team was led by John Waterlow (1916-2010), a British physiologist expert in childhood malnutrition, and then head of the Nutrition Department of the London School of Hygiene and Tropical Medicine. Their recommendations were published in a paper that sought to suggest ideal methods for cross-sectional surveys in order to generate international comparison (Waterlow et al. 1977).

The first recommendation of the committee was related to the reference population for measurement comparison. The committee described seven criteria for an ideal reference population:

- 1) Measurements should relate to a well-nourished population.
- 2) The sample should include at least 200 individuals in each age and sex group.
- 3) The sample should be cross-sectional, since the comparisons that will be made are of a cross-sectional nature.

- 4) Sampling procedures had to be reproducible.
- 5) Measurement should be carefully made by people trained in anthropometric techniques, using equipment of well tested design and calibrated at frequent intervals.
- 6) The measurement made on the sample should include all the variables that will be used in the evaluation of nutritional status.
- 7) The data from which reference graphs and tables are prepared should be available for anyone wishing to use them, and the procedures used for smoothing curves and preparing tables should be adequately described and documented (Waterlow et al. 1977:490).

Out of the studies done by the end of the 1970s, only three satisfied the criteria suggested by Waterlow et.al: one based on Dutch children done by Van Wieringen (1972), another based on British children made by Tanner, Whitehouse and Takaishi (1966), and a third one developed by the NCHS and the CDC based on children in the United States (NCHS 1977). Though none of these studies met the full set of criteria established by the expert group, the NCHS growth reference was chosen by Waterlow and the other experts working with him, as the most suitable to be used as an international growth reference (Waterlow et al. 1977). Some of the criteria used in selecting the NCHS charts included that the sample contained between 300 and 1600 children in each yearly age group, the data tabulations were available and the study description was published (Waterlow et al., 1977).

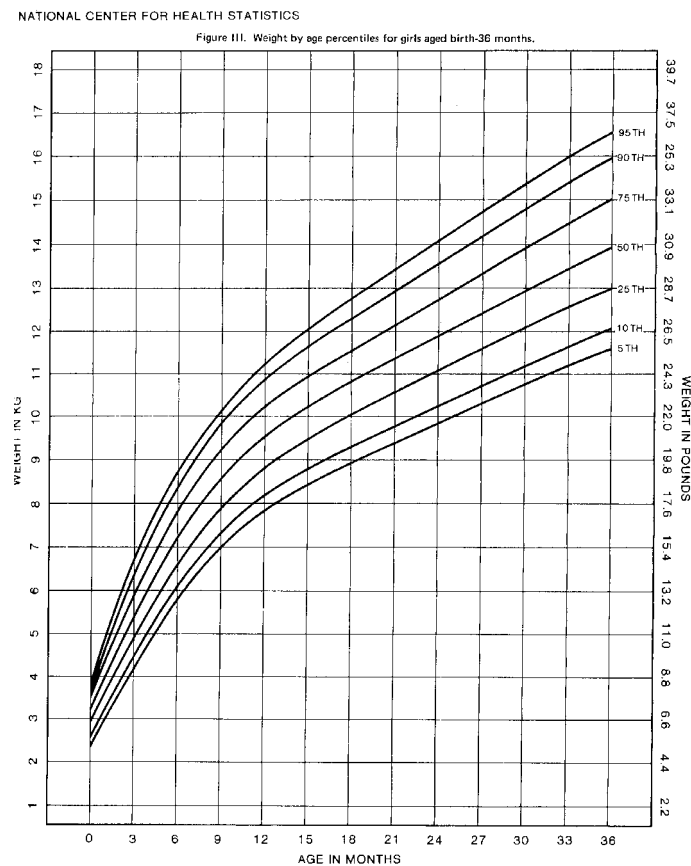
The NCHS charts were constructed following a recommendation from the US National Academy of Sciences, who argued that the Harvard and Meredith charts – the two most commonly used charts in the United States – were based on a small and homogenous sample, and therefore were not representative of the United States population (de Onis and Yip 1996). In addition, according to George Owen (1978), the team head of the Fels longitudinal study at the time, the Iowa growth charts were not clear about the actual number of infants and children in the sample, and the methods used to construct the growth curves were difficult to discern. Owen (1978) also noted that both the Harvard and Meredith studies measured length up to age six

years (with the child lying horizontal); this practice was considered problematic, given that in the clinical setting children of more than two years of age were generally measured in terms of height (with the child standing up), requiring new growth charts based on stature were necessary.

The NCHS curves were developed using two different data sets. The first one included measurements from 867 children who were followed longitudinally, from birth to three years old. This data was collected between 1929 and 1975, during the Fels Longitudinal Study. The second data set included information on 20,000 individuals from two to eighteen years old. Its original source was the cross-sectional US Health Examinations Surveys²⁸ of the National Center for Health Statistics, conducted between 1963 and 1974 (NCHS 1977). In total, a set of fourteen charts were produced: four for girls and four for boys aged from birth to three years; and another three for each sex from 2 until 18 years old (NCHS 1977) (see figure 4).

²⁸ Data from the Fels study was included given that the US Health Examinations Surveys did not have information for children under two years old; therefore two data sets were needed to create curves beginning from birth (NCHS. 1977).

Figure 4. Example of a NCHS chart. Weight-for-Age percentile for girls from birth to 36 months



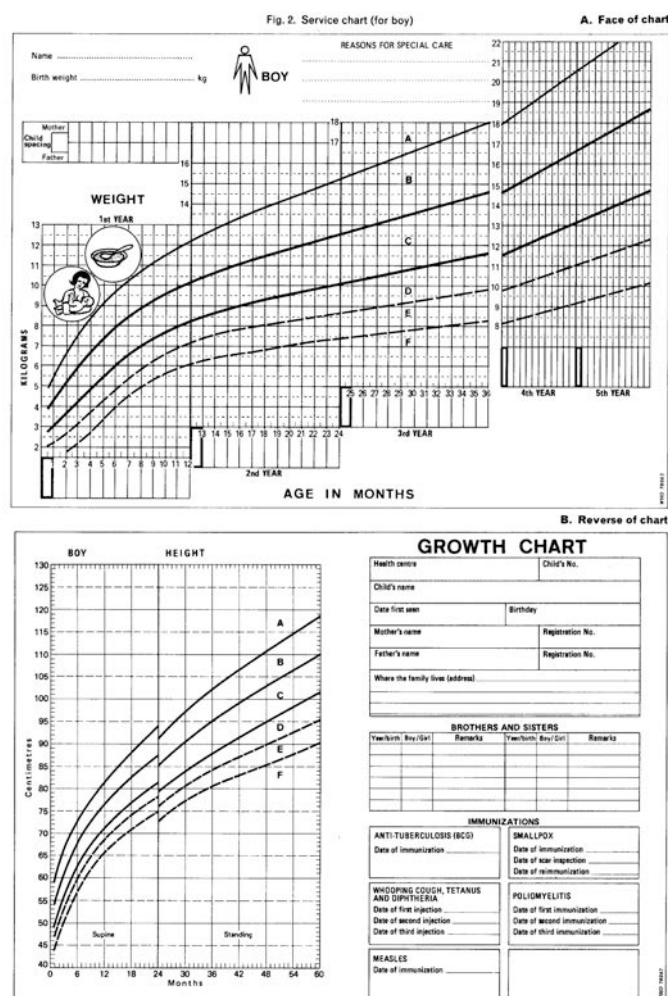
Source NCHS (1977:54)

The NCHS charts were suggested by Waterlow in 1977, but it was only in 1978, in a document called ‘A Growth Chart for International Use in Maternal and Child Health Care’ (WHO 1978), that they were formally endorsed by the WHO. In the document, the WHO states that in comparison with data sets coming from France, Mexico, Netherlands, Sweden, Switzerland and the United Kingdom, the charts of the United States had best met the requirements for international comparison.

Based on the reference values of the NCHS charts, the WHO developed a health card that included the growth charts and space for recording additional information pertaining to the child: identification and registration numbers, birth date and

weight, chronological age, and history of sibling health, as well as advice on immunisation procedures, infant feeding guidelines and child spacing practices (See figure 5). While the actual curve was based on the NCHS charts, the form suggested that it was based on a chart called the Road-to-Health. David Morel, a lecturer at the Institute of Child Health at University of London, had designed this chart for implementation in Nigeria²⁹.

Figure 5. Example of the new growth charts proposed in 1978. Weight-for-age for boys.



Source (WHO 1978:27)

²⁹ See Morel (1973)

During the 1950s and 1960s, basic agreements about the nomenclature, classification and measurement of protein-energy-malnutrition emerged in the documents of the WHO. During the 1970s, as more and more nutrition surveys became available, protein-caloric-malnutrition emerged as a pressing global health issue; forms of malnutrition like kwashiorkor proved not to be isolated events, but a trend in many tropical countries. The recognition of a significant number of cases of child malnutrition in different countries made the development of tools able to estimate the prevalence of malnutrition worldwide all the more urgent. The WHO determined that one growth chart had to be used as the benchmark; only then could comparison between local data sets be made. One reference chart for all children under five presupposed that the chosen reference population showed the best and most representative growth pattern, and therefore that other populations could compare their growth against that pattern.

With the endorsement of the NCHS charts in the late 1970s, the WHO identified that reference population as middle-class white children in the United States, and promoted a specific set of growth charts built around it. But the majority of these children were formula-fed children, a fact that had a direct impact on the arc of the curves at certain ages. Thus, the feeding practices and living conditions that influence children's body size quietly started to become an unmarked standard of reference too.

4.3.2 Can All Children Be Measured Using the Same Charts? Growth Charts and Growth Potential (1980s)

During the late 1970s and into the 1980s, most of the debates the possibility of having just one set of charts for international comparison were shaped by the question of the extent to which growth was dependent on ethnic and genetic background, and how much it depended on the environment. If growth was strongly influenced by genetics and ethnicity, each country had to have its own charts. This

hypothesis would also contradict the possibility of having one international standard for comparison able to make children's bodies commensurable. Jelliffe and Gurney framed this problem in terms of heritability versus ecosensitivity:

Physical growth, both of the body frame and total body weight, depends upon many interacting influences which include genetic and environmental ones, particularly nutrition. The major and, as yet, unsolved difficulty is to differentiate precisely between genetic and environmental influences: "heritability" and "ecosensitivity" (Jelliffe and Gurney 1974).

In the case of growth charts for preschool children, the discussion about nature and nurture in human growth revolved around the question of whether growth charts for children developed in Europe and North America were universally applicable to other countries – particularly those that were less privileged and underdeveloped (Lancet 1984). If they were applicable, local standards would not be relevant anymore, and one standard for all would be enough.

Those that supported the need for local standards grounded their argument in the idea that *both* ethnic and genetic background and adaptation to the environment had an important influence in growth. Therefore, it would be meaningless to have just one growth standard for all populations of children (Goldstein and Tanner 1980, Eveleth and Tanner 1976). Furthermore, if children with different ethnic and genetic backgrounds grew differently, then charts constructed in developed countries – like the Harvard and NCHS charts – would set unrealistic targets for developing countries (Goldstein and Tanner 1980).

Researchers who suggested that ethnic influences on children's growth were insignificant compared with the role of environment and socioeconomic factors were on the opposite side of those promoting local charts³⁰ (Eksmyr, 1970; McKay, Lim,

³⁰ Other authors exploring economically privileged children's growth were published during the early 1970s; see for example Eksmyr (1970) and McKay et al. (1971). Habicht's paper, however, was welcomed as particularly innovative because it compared different samples. It

Notaney, & Dugdale, 1971). They contended that any reference developed from a healthy population from Europe and North America could be used to assess children's growth in non-industrialized countries. One of the main papers supporting this argument was published in the *Lancet* in 1974 by a group of researchers from the Institute of Nutrition of Central America and Panamá (Habicht et al. 1974). Two of them, Jean-Pierre Habicht and Reynaldo Martorell, would later become advisors to the WHO on the development of the WHO-CGS.

Their study compared thirteen samples of preschool children between one and seven years, all considered well-nourished. Six of the samples were classified as coming from developed countries, while the other seven came from developing countries (table 1). By choosing samples from different countries, they suggested that different ethnicities could be distinguished and compared. As can be seen in the second column of the table 1, the samples were not only divided between developed and developing countries, but also in terms of ethnicity. Some of the samples list an explicit racial/ethnic characterisation, as in the case with Ladinos, and white and black Americans. The other samples used were classified in terms nationalities (e.g. Thai, Colombian, Guatemalan and Indian). The classification of the samples based on ethnicity or nationality conveyed an underlying assumption: they were opposite to the privileged white child.

According to Habicht et al. (1974), one of the main results of the research was that children from different ethnic backgrounds, socioeconomic strata, and geographic areas seemed to grow uniformly in length and weight during the first 3-6 months of life. It was only after six months that children from developing countries began to lag behind children from developed countries, particularly in the case of rural children in India and Guatemalan Indian samples. At the same time, the sample of children from the high socioeconomic stratum in Colombia compared well with those from other developing countries (Habicht et al. 1974).

became a near-mandatory reference in publications discussing preschool growth and ethnicity thereafter.

The comparison of samples also showed that children from different ethnic backgrounds in developed countries and children from high socioeconomic backgrounds in developing countries were of similar heights. In the case of samples from developed countries, it was found that black children grew similarly to other well-off, and presumably well-nourished children. Though the sample was classified as *lower-class American Negro*, in the paper the authors explain that the sample could still be classified in the developed countries sample, given that their annual income was higher than the income of lower socioeconomic groups in developing countries. In addition the *American Negro* sample was considered to be in a ‘much more favourable position than the poor of undeveloped countries in terms of nutrient purchasing power’ (Habicht et al. 1974:611). These two findings led to the conclusion that ‘among well-nourished children, ethnic differences in stature at preschool ages are relatively small’ (Habicht et al. 1974:612). The average variation between the smallest and largest population was 3% in height and 6% in weight, whereas the difference between the *well-to-do* children and poor populations after 12 months were 12% for height and 30% for weight (Habicht et al. 1974).

Table 1. Description of the samples included in Habicht et al. (1974) study

DATA			
Series	Description	Age-range (mo.)	Origin
<i>Developed countries:</i>			
Nelson ⁷	Middle-class, American, White	0-84	Boston and Iowa
Hansman ⁸	Middle-class, American, White	0-84	Denver
Tanner et al. ⁹	Middle-class, British	0-84	London
Roche ¹⁰	Middle-class, Australian	24-84	Melbourne
Verghese et al. ¹¹	Lower-class, American, Negro	3-84	Washington, D.C.
Terada and Hoshi ¹²	Middle-class, Japanese	3-36	Toyko
<i>Developing countries:</i>			
Swaminathan et al. ¹³ Shrivastva et al. ¹⁴	Rural India	0-60	Hyderabad and Jabalpur
Currimbhoy ¹⁵	Urban, lower-class, India	0-84	Bombay
Luna-Jaspe et al. ¹⁶	Urban, lower-class, Colombia	0-72	Bogotá
Smith and Hauck ¹⁷	Thailand villages	3-48	Thailand
Morley et al. ¹⁸	West African villages	0-60	West Africa
Mata et al. ¹⁹	Rural Guatemalan Indians	0-60	Guatemala
Yarbrough et al. ²⁰	Rural Guatemalan Ladinos	0-84	Guatemala

Source Habicht et al. (1974:611)31.

³¹ Reprinted from The Lancet, 1(7858) Habicht, J P ; Martorell, R ; Yarbrough, C ; Malina, R M ; Klein, R E. Height and weight standards for preschool children. How relevant are ethnic differences in growth potential? Pp. 611-4. Copyright (1974), with permission from Elsevier.

The idea that growth retardation in a given population was related mainly to nutrition and disease, and not to ethnicity, led the authors to conclude that any standard drawn from well-to-do children would be sufficient for the assessment of children from economically deprived populations (Habicht et al. 1974). Other researchers, however, like Eveleth and Tanner (1976), contested this conclusion. In their book on human growth variation, they argued that local charts were needed since children do not grow the same everywhere. In the introduction of the book, they noted that:

In regard to standards for individuals, it used to be said that the growth of all healthy populations, at least up to age five was about the same and so one universal standard would do for all (Habicht *et al.*, 1974). The data in this book make it plain that this is a misconception, based on an inadequate sample of populations. It simply will not do to use an American or a British standard to judge the growth of Japanese or Hong Kong infants or children [...] Both the size, and the tempo are different (see Chapter 9) [...] Clearly what is needed – and what is very actively in progress – is for countries, or at least broad regions, to generate their own standards (Eveleth and Tanner 1976:15).

Authors like Harvey Goldstein also criticised Habicht's argument. In a note to the editor in *The Lancet*, Goldstein argued stating that:

The poorer child, whatever his genetic endowment, has a growth pattern related to his environment, and the adaptation which he makes to this environment, although at a lower level than the child from the better-off environment, may be in fact optimal. It would be absurd to classify an average healthy pygmy as "growth retarded" by well-off standards, even if we believe that pygmies are shorter because of environmental rather than genetic factors (Goldstein 1974:1052).

Goldstein and Tanner (1980) developed this argument in a paper published in *The Lancet* six years later. They described the use of international standards based in a single economically privileged population as inappropriate and invalid. Instead, they suggested that comparison references should be based on privileged-group standards – in other words, standards based on economically privileged groups for each

country. In case of not having local standards, it was suggested to adopt the charts of a similar region/population, instead of using an international reference. The argument was based on the idea that comparison should be made against privileged children of the same area, exposed to the same environment.

In a given country it may be reasonable to assume that all individuals have a common gene pool. There are some individuals, who constitute an economically privileged group within that society and whose standards of nutrition, medical care, and so on, are better than those of the rest of the population. The environment of these individuals is said to be “optimal”. These individuals, therefore, should constitute the standardising group (Goldstein and Tanner 1980:583).

Goldstein and Tanner point out individuals’ adaptability to environment, noting that in a poor environment a child who is small could have ‘an advantage over faster growing children in terms of morbidity and mortality’ (1980:583). The authors agreed with the idea that children growing in poor environments were at a disadvantage compared with children growing in well-off environments; but they suggested that drawing upon local standards would also facilitate finding and providing attention to those children more at risk within their own populations.

Habichet’s and Goldstein’s papers both triggered discussion around what optimal growth is, and who represents it. In the case of Goldstein’s approach, optimal growth is related with adaptation to the environment, and in that sense is variable. In Habichet’s case, there is a biological pattern that all healthy children share. The WHO promotion of a growth reference for international comparison during mid 1970s found support in Habichet and colleagues’ arguments, which were later reinforced by other researchers with similar findings (e.g. Graitcer and Gentry 1981), as well as by leading scholars in the field of nutrition assessment such as Jelliffe (1974) and Waterlow (1980).

The notion of growth potential became intertwined with notions of development and wealth. Even when researchers demonstrated that children privileged children from

developing countries had a similar growth pattern to children in the United States or Europe, growth charts using white children from the north as reference points were often, if not always, used as the benchmark of comparison. This tendency is the more striking considering that Habich's study had shown that other children of the world had similar growth patterns to those of children living in industrialised countries; charts developed in developing countries could have been equally eligible. The notion of optimal growth has nonetheless remained geographically located in north. Growth charts developed in the 'developing world' were systematically excluded from being the norm for international comparison.

Notably, the Fels study data-set which was used to provide information on children between 0 and 2 years old was based on white children from Ohio. For at least thirty years, only white middle class children counted in measuring growth. The other data-set used to develop the NCHS charts, which corresponds to the US Health Examination Survey, might have included children from diverse ethnic backgrounds, but the diversity of the sample is unclear. In a report on the NCHS, the authors note that the growth study followed the recommendations of the USA National Institute of Child Health and Human Development, which claimed that 'one set of data for all races would be sufficient for practical purposes, despite the small but actual differences in body measurements noted among racial groupings' (NCHS 1977:1). This specific recommendation was developed under the assumption that ethnic background in the United States was not relevant for the construction of growth charts, given that white and black populations grew similarly:

Although appreciable anthropometric differences have been demonstrated among certain ethnic groups living under similar environmental conditions in other parts of the world, the use of one standard in the United States for height and weight is unlikely to cause serious errors. Most of the population is white or black, between whom genetic differences in the potential for height and weight appear minimal (Roche and McKigney 1976:63).

Once the NCHS charts were chosen for international comparison, not only did the growth of a specific sample of mainly (if not all) white children from the United

States became the benchmark to assess growth globally; all the environmental and behavioural practices influencing children's growth in the United States became indirectly normalised in the charts. Those practices may well have included variables related with the beginning of the obesity trend in the United States. The risk of using growth charts based on industrialised countries was raised from the outset, by Jelliffe and Gurney (1974). These authors stated their concern about the fact that industrialized countries were changing their growth patterns towards overnutrition. Choosing them as reference population could also lead to choosing an overnourished population with risks of obesity as the norm. In a similar regard, Waterlow pointed out that even though children of all ethnic groups could have the same growth potential as European and North American children, there was no evidence to claim it represented the optimum, 'or that it is advantageous for children to be so heavy and so tall, even when the environment is favourable' (Waterlow 1980:717).

The debate on growth potential, optimal growth and ethnic background continued through the 1990s. In fact, this debate was one of the key elements underpinning research on the MGRS. In the next section, I will discuss how the WHO-CGS were able to generate evidence to claim that all children have the same growth potential until five years, and that one standard to measure every child under five was possible.

4.3.3 In Search of the Standard Child: WHO-CGS Development

4.3.3.1 Destabilizing the NCHS/WHO reference curves' accuracy

It was not until 1993 that growth charts and the use of anthropometric measurements for nutritional assessment were again a major topic of discussion within the WHO. Between 1991 and 1992, the WHO organised seven working groups to review the latest knowledge and key issues regarding the use of anthropometry in every life stage: for pregnant and lactating women, new-born infants, infants and children, adolescents, adults, and adults older than 60 years (WHO 1995). The

recommendations and conclusions of every sub-committee were discussed in 1993, when the WHO Expert Committee on Physical Status met in Geneva. The recommendations were later published as a WHO technical report called Physical Status: the Use and Interpretation of Anthropometry (WHO 1995).

One of the groups, the Working Group on Infant Growth, focused its attention on reviewing the growth patterns of infants and young children who had been exclusively breastfed for at least four months, and complementarily breastfed for up to two years – as the WHO had recommended since 1979 (WHO 1979). The growth pattern of breastfed children had not been discussed in the previous WHO nutrition reports.

The Working Group began their assessment of breastfeeding and growth by examining the growth patterns of breastfed infants using seven different datasets coming from Canada, Denmark, Sweden, Finland, the United Kingdom, and two from United States. These studies were chosen because they could provide information on at least 20 infants fed with exclusive breastfeeding, who were measured at least every two months, and whose socioeconomic condition was documented. Three key topics were analysed: growth patterns of breastfed infants in different geographical areas, the impact of breastfeeding duration and infant formula supplementation on growth, and the magnitude of discrepancy between the growth of breastfed infants and the NCHS reference (WHO 1994). The Working Group also analysed the growth patterns of a subset of 226 infants who were exclusively breastfed for at least four months, and who continued to be breastfed until they were one year old. Based on this sample, growth charts and tables for weight-for-age, length-for-age, and weight-for-length and head circumference-for-age were developed, and compared against the NCHS references (WHO 1994).

After studying the growth patterns of breastfed infants, several limitations of the NCHS were identified. The first one was that the NCH sample was 'limited to

Caucasian infants from predominantly middle-class families' (WHO 1994:10). Therefore, the curves had a relatively homogeneous reference population in terms of ethnic, genetic, geographic and socioeconomic background. The breastfed data set chosen by the Working Group also included only Caucasian populations from North America and Northern Europe, again making it difficult to measure variability related with racial or ethnic backgrounds, particularly concerning parental stature (WHO 1994).

The Working Group also questioned the characteristics of the data sets of children between 0 and 2 years old used in the construction of the NCHS charts. As we have seen, the Fels study data-set included children that were mainly formula fed. In addition, only very few were breastfed more than three months. This limitation became a major concern given that the growth patterns of exclusively breastfed infants differed so sharply from the NCHS growth references. The document produced by the Working Group on Infant Growth explained that:

The first component of the analysis demonstrates that while growth patterns of breast-fed infants were quite similar among different European and North American populations, they differed markedly from the current NCHS-WHO reference. Breast-fed infants grew more rapidly in the first 2 months and less rapidly from 3-12 months when compared with the current NCHS-WHO reference. In the second year of life the same infants tended to gain weight more rapidly than suggested by the current NCHS-WHO reference as the 24-month average weight was close to this reference's median (WHO 1994:37)³².

The z-score patterns of infants in the breastfed set relative to the NCHS reference charts showed that the mean weight-for-age declined continuously from 2 to 12 months, reaching -0.6SD at 12 months. According to the WHO Working Group, the decline during complementary feeding could be related to the characteristics of the

³² In this particular document the Working Group refers to the NCHS charts promoted by the WHO as the NCHS-WHO charts.

sample of the NCHS, or to specific weaning practices, or to physiological effects linked to continued breastfeeding in the population studied.

As part of the Working Group study, different groups of breastfed children and formula fed children were measured against the NCHS and the breastfed charts. Data sets from low socioeconomic breastfed infants from India and Peru were chosen to be included as test populations. Using the NCHS reference, a diagnosis of slacking in weight gain occurred on average at three months of age; but the same diagnosis would only emerge at approximately five months, if the breastfed pooled data set curves were used (WHO 1994). Using the NCHS charts, children that were exclusively breastfed could be mistakenly diagnosed as being underweight (WHO 1994). In this regard, as de Onis, along with other members of the WHO working group, indicated:

The negative deviations are large enough to lead health workers to make faulty decisions regarding the adequate growth of breastfed infants, and thus to mistakenly advise mothers to supplement unnecessarily or to stop breastfeeding altogether (de Onis, Garza and Habicht 1997:1).

The curves derived from the breastfed data set also showed that in malnourished populations, using the breastfed pooled data set would have classified a larger percentage of infants under six months as underweight or stunted, as compared to the NCHS reference (WHO 1994). Data sets for formula fed children from Europe and the United States were also measured against the breastfed pooled data set; in this case, infants were more likely to be classified as high in weight-for-length at 10-12 months of age (WHO 1994).

The findings of the study led to the conclusion that children who were exclusively breastfed 'grew less rapidly than, and deviate significantly from, the NCHS reference' (de Onis et al., 1997:1). The fact that breastfed children had an apparently poor growth performance when measured by the NCHS reference curves (Garza and

de Onis, 2004) provided important evidence that the NCHS curves were inadequate to measure breastfed children – and, therefore, inappropriate for measuring children that were fed according to WHO recommendations. The Working Group concluded that by ‘using a growth reference based on infants following WHO feeding recommendations, the potential risks to formula-fed infants are likely to be much lower than those faced by breast-fed infants whose management is based on the current NCHS-WHO reference’(WHO 1994:42). In other words, keeping the NCHS could lead to unnecessary interventions with breastfed infants who were showing normal growth patterns.

On the basis of this analysis, the WHO Expert Committee recommended the development of new reference charts for infants. The new charts had to be based on a reference population of children fed according to the WHO feeding recommendations. The Committee emphasised that the reference population ought to include children from different ethnic and geographic backgrounds, coming from both developed and developing countries, with the aim of improving estimates of the variability in growth (WHO 1995). The sample ought also to be chosen from a population of infants who were living in healthy environments that promoted the achievement of growth potential (WHO 1995). The recommendations of the working group suggested, for the first time, the need to construct curves for international comparison based on a reference population that followed what the WHO considered ideal nutritional practices.

4.3.3.2 WHO-CGS Development: Defining Right Growth and the Right Tool of Measurement.

In response to the Working Group recommendations, the WHO conducted a study between 1997 and 2003 called the Multicentre Growth Reference Study (MGRS). The study’s aim was ‘constructing a set of growth curves suitable for assessing the growth and nutritional status of both population groups and individual children of

preschool age' (WHO 1999:1). Until this moment, the WHO had adopted the Harvard and the NCHS charts, in both cases these references had been developed and used in United States. The MGRS was the first research that the WHO implemented in order to develop their own, global, growth charts.

The MGRS collected its data through a longitudinal study in which children's growth was followed from birth until two years old; and through a cross-sectional survey that targeted children from 18 to 71 months (table 4.1 describes the main characteristics of each component). The study was conducted in six countries (Pelotas-Brazil, Accra-Ghana, South Delhi-India, Oslo-Norway, Muscat-Oman and Davis-USA), making the collection of data on children from different ethnic and geographic backgrounds possible (de Onis et al. 2004b). The study also included sampling criteria consistent with what the WHO promoted as ideal conditions for reaching optimal growth. Some of the eligibility criteria included:

- Living in environmental and economic conditions that supported unconstrained physiologic growth.
- Mother's willingness to follow the WHO feeding recommendations, which included exclusive or predominant breastfeeding for at least four months, introduction of complementary foods at six months, and partial breastfeeding for at least twelve months.
- Non-smoking mother.
- Gestational age between 37 completed weeks and 42 weeks.
- Having a single birth.
- Absence of significant morbidity in the newborn.

Table 2. Characteristics of the Multicentre Growth Reference Study

Characteristics of the study	Longitudinal component	Cross-sectional component
Sample size	1743	6697
Recruitment Strategy	Infants were recruited in hospitals and clinics and mothers were screened for participation in the study within the first 24 hours after birth (WHO 2006c).	Brazil, India and the USA: children were recruited through a door-to-door survey of selected study areas. Norway and Oman: children were identified through a national or health registry. Ghana: children were recruited from crèches and nursery schools.
Data Gathering	Mothers and new-borns were visited at home a total of 21 times on weeks 1, 2, 3 and 6. They were also visited monthly from 2-12 months and bimonthly in the second year (WHO 2006d).	Children from 18 to 71 months were measured once except in Brazil and the USA where a mixed-longitudinal design was used to measure children two or three times at three-month intervals (WHO 2006d).

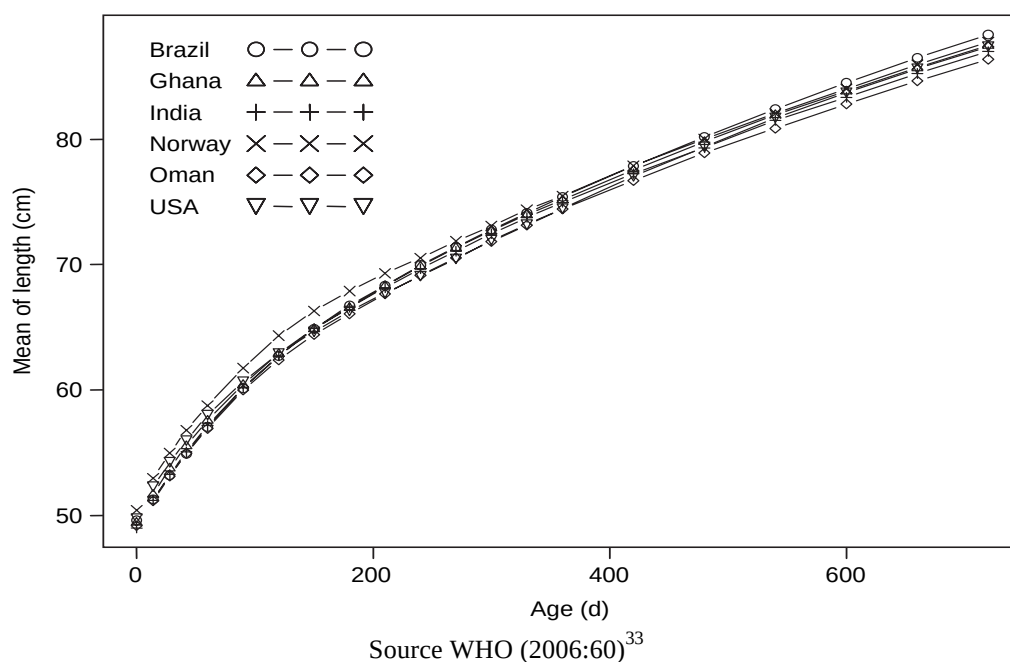
By excluding formula-fed infants, the growth pattern of breastfed children was normalised in the charts. Including breastfed children as a reference population also established consistency with the infant feeding guidelines of the WHO (WHO 2006b). The MGRS sample allowed the WHO to generate a tool of measurement that reinforced the idea that breastfeeding is a ‘biological norm’, and therefore both the healthier and the *right* way to feed infants (de Onis 2006).

The collection of data on children from different countries, as well as different

ethnic, cultural and geographic backgrounds, ensured that the study was more systematically diverse than many of its predecessors. The analysis of the MGRS showed that children from diverse ethnic groups grow very similarly during the first five years of life, if their physiological needs are met, and if they live in environments where it is possible to have ‘healthy development’ (de Onis 2006). This statement was validated by comparing the linear growth (height) of participants from each country. The use of height was selected based on two arguments: it remains stable even in conditions of excessive energy intake (in contrast with weight); and environmental factors that can affect height, such as diet and infection, were controlled in the study (WHO 2006a)

The conclusions of the multicentre study suggested that there were minimal differences between sub-samples, and that the small difference found in height were associated with the parents’ statures and not with other factors (see Figure 6 for a graphic representation of growth between sub-samples). According to de Onis et al, the ‘variability of growth was due overwhelmingly to differences among individuals (70% of the total variance) and only minimally to differences among sites (3% of the total variance)’ (2006:60). As an example, they suggest that the ‘tendency towards smaller child size in Oman may be attributable to the shorter heights of mothers, since maternal height influences birth-weight and thus postnatal growth. Health conditions in Oman have improved in recent decades, and it is likely that the secular trend in adult stature will be sustained with continued economic development’ (de Onis 2006:61).

Figure 6 Mean length (cm) from birth through 2 years old in days for each of the six sites



Using the results on linear growth, the WHO was able to develop epidemiological evidence showing that all the children of the world have the same growth potential if their needs are met. This conclusion conveyed two main implications. The first was that the charts derived from the MGRS could be applied universally; they showed a common growth pattern among children with different ethnic backgrounds, so there was no need to have local charts. The second was that if differences in growth during early childhood are not biological or genetic, then the WHO charts could be used not only to compare children's growth across countries, but also to assess policy making and child health advocacy efforts.

The WHO Growth Standards, derived from a world-wide sample of children and based on the reality that environmental differences, rather than genetics, are the principal determinant of disparities in physical growth, is an important step towards achieving the right of every child to grow and be healthy (WHO 2006a:1).

³³ Reprinted from Acta Paediatrica 95 De Onis, Mercedes Assessment of differences in linear growth among populations in the WHO Multicentre Growth Reference Study. Pp. 56-65 Copyright (2006), with permission from John Wiley and Sons.

The new charts, then, represented the desirable normal growth curve of a child under five years old, regardless of ethnic and genetic background. According to the WHO these charts were able to indicate how children *should grow* and not *how the average child grows* in a particular time and place, as was the case in the existing reference curves (Garza and De Onis 2004).

The WHO also noted that the new charts had been designed following a prescriptive approach, instead of the descriptive approach that characterised past studies. As such, they claimed that they were able to construct a standard of growth, rather than a reference growth chart. The WHO Expert Committee described the difference between a reference and a standard on nutrition in 1995 as follows:

A reference is defined as a tool for grouping and analysing data and provides a common basis for comparing populations; no inferences should be made about the meaning of observed differences. A *standard*, in the other hand, embraces the notion of a norm or desirable target, and thus involves a value judgement (WHO 1995:29 italics in the original).

Garza and de Onis describe this achievement as follows:

...the implemented design [of the MGRS study] advanced beyond the construction of a device for grouping and analyzing data (a reference) for the purpose of enabling value-free comparisons, to the explicit recognition of the need for standards (or as close to them as possible), i.e., devices that enable value judgments by incorporating norms or targets in their construction (2004:10).

The development of the WHO-CGS can be understood as a form of regulatory science (see Jasanoff 2005), in which particular values regarding children's growth, exclusive breastfeeding and complementary feeding framed the way the scientific evidence was generated and interpreted. The assumption that breastfeeding is imperative for children's health, for example, underpinned the main inclusion criteria

for the MGRS study. Those values associated with breastfeeding and normal growth are reinforced and reproduced in all the social spheres where the standards become stable – including in nutritional surveillance systems, as I will show in the coming chapters.

The normative approach of the new standards was also associated with the idea that it enables the early identification of unhealthy trends, making it possible to intervene at early stages. An example of this can be found in an article produced by the MGRS team, which states that ‘the current obesity epidemic in the United States would have been detectable earlier if a prescriptive international reference had been available 20 years ago’ (Garza and de Onis 2004:10). The availability of the standard is promoted as a tool to prevent and manage nutritional trends that are labelled as risky.

The idea of moving from a reference chart to a standard also expresses a new way of understanding and defining what the body of a healthy child should look like. Particularly since the studies of Adolphe Quetelet and Francis Galton, the category ‘normal child growth’ has overlapped with the notion of average growth (Turmel 2008). In other words, the normal child was the average child: the one that could fit, in terms of statistical thinking, into the ‘normal distribution’ of growth. Growth indicators that assess and monitor children’s growth traditionally have been based on similar foundations: they focus on how average children grow. In the case of the WHO-CGS, normality overlaps with optimal growth and biological potential. Normality in this case is associated not with the average growth of average children, but with the average growth of ‘standard children’ – children that were growing in ideal environments. The new WHO-CGS thus challenged the notion of normality as average, and transformed it into a value- and context-free concept that can be measured.

4.4 Final remarks

Growth charts have been used since the beginning of twentieth century as tools to observe and monitor children. However, it was only in the context of an emerging international agenda that the development of universal standards to measure children became a priority. The development of a single standard became necessary as a tool to allow comparability between studies around the world. Several nutrition surveys were conducted through the 1970s, but without a shared tool of measurement it was difficult to generate indicators about the nutritional status of preschool children that could describe the global population. For almost thirty years, the NCHS charts were recommended by the WHO as the best reference charts for international comparison, making white formula fed children from the United States the reference population to measure children across the globe. During the late 1990s, a universal standard able to overcome the underrepresentation of breastfed children from different ethnic, cultural and geographic backgrounds became necessary. It was only with the development of the MGRS that more diversity was incorporated in the reference sample, while still offering a single, universal standard applicable to all children under five.

The creation of child growth charts that could be promoted as universal was possible mainly because the MGRS included a sample that followed criteria that the WHO had defined *a priori* as ideal. In order to create growth standards, the WHO first agreed upon the characteristics that defined the standard child; and they then measured children that fit those specific criteria (e.g the longitudinal study would only include the cases of children who were exclusively breastfed for at least four months). It was based on that specific sample that the WHO developed the new charts. The WHO-CGS are prescriptive tools because the criteria the MGRS used to select the reference sample presupposed the conclusion of the study. As has been argued by Dumit and de Laet, the MGRS ‘literately produces –and stabilizes- the practices that it assumes’ (Dumit and de Laet 2014:82). Since the MGRS only followed children whose bodies had been shaped by the specific recommended

practices of the study, the MGRS ‘produced’ the bodies needed for the study’s aims. The WHO-CGS, in other words, can be understood as the outcome of a self-fulfilling prophecy. Since the work of Quetelet, the concept of the normal child had been conflated with the concept of the average child (Turmel 2008). But with the introduction of the WHO-CGS charts, the average was replaced with the idea of optimal growth. This transition represents a critical juncture in the history of the anthropometric measurement of children.

The development of growth charts is shaped by specific assumptions about optimal growth, growth potential and normal growth. More than objective and stable direct representations of growth as a biological reality, growth charts are the product of a process of *co-production* in which natural and social orders are being produced together (Jasanoff 2004).

Given that the MGRS studied the growth pattern of an ‘ideal population’, and that the study did not show significant differences between sites/countries, the WHO was able to claim that the WHO-CGS charts were able to show not only the ideal pattern of growth, but the correct way of growing. Previous charts described how the average child in a specific reference sample grew. In that sense, they could only be used to describe whether a child was growing above or below the mean. The WHO-CGS charts, by contrast, were made to establish judgments of value as they, according to the WHO, showed how children should grow (e.g. is the child growing right or not?)³⁴.

The construction of the ‘standard child’, and the development of growth charts to render it visible, are telling examples of the standardization of human characteristics to facilitate comparison and generalizations in biomedical research, as well as in arenas like global health and development. Exploring the development of the WHO-

³⁴ It is interesting to note that the question ‘Are we growing right?’ is used in some of the posters the WHO uses to promote the WHO-CGS.

CGS tracks an effort to develop a standard human able to function as a working object to allow cooperation between different communities of practice (Epstein 2009). The development of a growth standard based on ‘standard children’ facilitates the standardisation of a malnutrition measurement on an international scale. It also simplifies the assessment and follow up of international strategies for development that use categories like stunting and underweight to measure the progress of initiatives such as the Millennium Development Goals or the Sustainable Development Goals. The development of a universal standard to assess children’s growth could be understood as a good example of how standards facilitate the development of new forms in which global health initiatives are monitored and audited. As Adams (2016b) and Castaneda and Moreira (in press) have discussed, in the context of global health new counting practices are created. As opposed to the initiatives of international health, global health is characterised by the production of ‘technologies of counting that form global knowledge’ (Adams 2016a:6). Counting efforts and the production of metrics not only guide health aid but also new forms of global governance based on indicators (Merry 2016). The production of a standard such as the WHO-CGS, which suggests the possibility of measuring growth in prescriptive ways, also suggests the possibility of measuring malnutrition in a politically neutral form. The production of malnutrition estimates would be based on a standard that seems apolitical, ahistorical and therefore able to create data beyond the borders and local context of each nation-state.

In this chapter, I have shown why and how the WHO has promoted child growth charts as charts for international comparison. I also have indicated the importance of unpacking how growth charts have been designed in order to make evident processes of inclusion and exclusion inherent to the standardisation of growth measurement. I have also analysed the transition from a descriptive to a prescriptive approach to the measurement of growth among children under five years old and how this process challenged previous debates on how to measure average growth and optimal growth.

Now that I have discussed the creation of the WHO-CGS in the next chapter I will show how the new charts were adopted and adapted to the Colombian context in 2010. By looking at the adoption and integration of the WHO-CGS into the existing Colombian national health policy I will show how standards are boundary objects able to facilitate communication and cooperation between actors with different needs.

Chapter 5. Making the WHO Standards Local: Adopting and Adapting

Standards are a form of regulation that allows co-operation in the modern world (Brunsson and Jacobsson 2000). They are tools able to ‘help regulate and calibrate social life’, stabilise knowledge and facilitate different tasks across time and geography (Timmermans and Epstein 2010:70). The WHO-CGS, in particular, were developed with the aim of consolidating a unique way of assessing children’s growth that could be used transnationally. As I have shown in the previous chapter, the WHO has promoted the WHO-CGS as a standard able to define how children under five years old should grow, regardless of their genetic, ethnic or geographical background. As such, the WHO claims that its charts are ideal for comparing children’s growth across the globe. Standardising child growth charts was expected to have a positive impact on how children’s growth was assessed at the individual and population level. The homogenisation of child growth measurement could facilitate the comparison of data coming from diverse surveys and nutrition surveillance systems, just as it would facilitate cooperation between diverse actors directly involved with children’s health care – including general practitioners, nurses, paediatricians, nutritionists and parents.

In the international arena, the WHO is what Brunston and Jacobson (2000) would describe as a standardizer, a standard setter. Standardisers often produce standards, but, unlike the nation-state, they cannot claim hierarchical authority, nor can they impose sanctions on potential adopters. In that sense, standards are ‘presented as voluntary and standardizers often have to expend considerable effort convincing other people that it is in their interest, either now or in the long term, to accept the standards’ (Brunsson and Jacobsson 2000:2). The WHO has been particularly successful in positioning the new WHO_CGS charts as an internationally recognised standard. After only five years of being launched in 2006, 125 countries reported

shifting to the WHO-CGS. According to the WHO, those countries represented 75% of the world's under five year old population (de Onis et al. 2012).

Standards are boundary objects stable enough to allow cooperation across time and space, but at the same time plastic enough that they can be adjusted to local needs (Star and Griesemer 1989). According to Bowker and Star (2000), standards can inhabit multiple contexts, and their meanings are balanced such that they can adapt to simultaneously local and universal needs. International standards do not travel across time and space remaining immutable; in fact, they are constantly re-interpreted and adapted, and thereby incorporated into already-existing local infrastructures, procedures and practices (Timmermans and Berg 1997). To understand how the WHO-CGS were adopted to the Colombian context, and how they are able to maintain their universal character while they fit local infrastructures and networks, I use Timmermans and Berg's concept of local universality, which

...emphasizes that universality always rests on real-time work and emerges from localized processes of negotiation and pre-existing institutional, infrastructural, and material relations. 'Universality', here, has become a non-transcendental term – no longer implying a rupture with the 'local', but transforming and emerging in and through it (1997:275).

Likewise, Bowker and Star have highlighted that universality is the result of negotiations, organisational processes and conflicts that are often forgotten or become invisible once the standard or classification is in place. The practical politics of the decisions that make a standard or a classification work are dismissed, or 'literally buried in archives (when records are kept at all) or built into software or the sizes and compositions of things' (Bowker and Star 2000:64). Keeping in mind the recommendations of Timmermans and Berg (1997) as well as Bowker and Star (2000) regarding the importance of understanding how standardisation takes place in practice, in this chapter I will show the processes by which the charts were adopted in Colombia. Following the biographical approach I have chosen for my analysis of the WHO-CGS, in this chapter I move one level down: from the international arena

to the arena of national policy and regulation. Taking Colombia as a case study, I will unpack who was involved in the decision to adopt the new charts, and what criteria were used to support this decision. In addition, I will illustrate how standards can remain universal at the same time that they are adapted to the particularities of the Colombian context.

5.1 Adoption of the WHO-CGS in Colombia.

In 2010, the Colombian Ministry of Health published a legal document called Resolution 2121 of 2010, to announce the adoption of the WHO-CGS as the official growth charts for measuring children's growth in the country. As a document, Resolution 2121 had two main goals. The first was to make mandatory the use of the WHO-CHS in the context of clinical practice, public health and food security programs and interventions. The second was to standardise the terminology, techniques of anthropometric measurement, and cut-off points used to determine cases of under- and over-nutrition.

Before this document was released, Colombia did not have regulations or normative guidelines regarding anthropometric assessment. Practitioners were able to choose the growth charts they preferred, and they were not legally obliged to follow any standardised guideline for individual growth assessments. At the population level, the country had a long tradition of using the NCHS charts to analyse the data from national surveys on nutrition. The Knowledge, Attitudes and Practices National Health Survey 1986-1989 conducted by the INS, and later the ENDS)³⁵ of 1995 and 2000, as well as the ENSIN of 2005, measured children under five years old against the NCHS growth charts. Unlike other countries like Argentina, Cuba or Venezuela, Colombia did not develop its own child growth curves. It used NCHS charts because they were promoted by the WHO for international comparison.

³⁵ National Survey of Demography and Health

The WHO-CGS were published by the WHO in 2006, but it was only in 2008 that the Ministry of Health, the INS and the ICBF began a series of discussions around the adoption of the new charts. These three national bodies set up a working group to assess whether the charts should be adopted and how. The working group included at least one representative of each institution; the working group called together an 'extended committee', an external group of experts on child nutrition and anthropometry, whose role was to provide technical guidance regarding the adoption of the new charts. The extended committee involved a wide variety of stakeholders, including representatives of health secretariats, scholars from different universities of the country (e.g. Universidad Nacional, Universidad Javeriana and Universidad de Antioquia), the Colombian Paediatrics Society, the Colombian Endocrinology Association, and the FAO. The extended committee also included the participation of two international experts: Dr Chessa Lutter, a regional advisor at Pan American Health Organization (PAHO), and an expert on maternal and child nutrition; and Dr Eduardo Atalah, a highly recognised Chilean researcher in the field of nutrition and anthropometry.

The extended committee met approximately six times over the period of a year and a half. Each meeting was organised as a workshop in which 15 to 20 people participated. The question of how to implement the WHO-CGS in Colombia was framed within a broader discussion: how should the nutritional assessment of children be done, and how should child malnutrition be measured and quantified. One of the outcomes of the workshops, besides the formal adoption of the WHO-CGS, was to standardise nutritional assessment of children and young people (from 0 until 18 years old) through anthropometry. It involved reaching an agreement on the language and terminology used to talk about nutritional classification, and to define the minimum requirements and characteristics of the instruments used for anthropometric assessment; and it required consensus on the techniques to employ in order to guarantee the reliability and accuracy of data collection. Resolution 2121 was the outcome of these negotiations between the working group and the extended committee. The resolution not only legally formalised the adoption of the WHO-CGS by the Colombian government, but also captured the outcome of a long process

of negotiation between governmental and non-governmental actors around the standardisation of growth measurement and malnutrition classification.

As described in the methodology chapter, there are very few documents that record the discussions that took place in the committee³⁶ meetings between 2008 and 2010. Instead of documents, this chapter is based on interviews I conducted with key actors who participated in both the working group and the extended committee, and who actively contributed to the production of Resolution 2121. It is divided into two sections. In the first one, I describe the key reasons that justified the adoption of the WHO charts. The second section focuses on the adaptation process, how the charts were transformed and adapted to the Colombian context.

5.2 The WHO-CGS as the Right Tool for the Job.

Most of my interviewees described the adoption of the WHO charts for children under five years old as a necessary procedure. None of the people I talked to remembered having heated debates or any hesitation about the adoption of the new charts. The question of adopting the standard or not did not seem to require major consideration. During my interviews, all participants stated that the adoption of the WHO charts was a natural choice, a ‘no-brainer’, as one of them said. One of the reasons that the idea of adopting the new charts was so obvious was based on the argument that the WHO charts were the best available tool to measure children's growth during early childhood. During my interviews, it was constantly emphasised that there was no other study in the world that had followed up the growth of breastfed children in different countries, or that could replicate or improve the inclusion criteria used in the MGRS. The WHO charts were frequently described to me as the gold standard to measure children under five years old. In all interviews with participants of the working group and extended committee, I was told that the new charts were standards, and not reference charts. The demarcation work

³⁶ I refer to both the working group and the extended committee.

undertaken by the WHO to distinguish the new charts from all previous curves was strongly evident in the narratives of stakeholders and experts involved in both committees. Luisa, a nutritionist who participated in the working group described the WHO-CGS as follows:

The WHO is offering us a standard, the new charts can tell us how children should grow. The NCHS charts were describing the average children in the USA population. These [referring to the WHO-CGS] are standards. That means that they show the growth pattern of children under five living in ideal conditions that do not constrain growth. This is a very complex study with a longitudinal follow up and a cross-sectional survey. So far this is the best in the market (Luisa, Bogotá 2013).

The idea that the WHO charts were standards instead of reference charts, was, perhaps, one of the key reasons that made the adoption an undoubted choice, at least to the participants of the working group and extended committee. ‘Why would you have a reference chart when you can have a standard?’ a policymaker asked me rhetorically once while she was describing why the WHO charts were better than the NCHS charts. For her, as for many other informants, a prescriptive measuring tool could help the government produce more accurate information about children’s health status, as well as improving children’s growth assessment in clinical practice.

The notion that the WHO charts were just the right tool for the job was justified by three main arguments: a) that breastfed children were the reference population sample; b) that the NCHS charts did not represent the Colombian population and its multi-ethnic background well enough; and c) that it was a necessary transition to be able to follow up the achievement of international targets such as the Millennium Development Goals (MDGs).

a) Matching Breastfeeding Policy.

As I mentioned in the first chapter, one of the normative positions that the WHO was able to establish with the MRGS was that breastfeeding is the biological norm for feeding infants. The growth pattern that is represented in the charts is the pattern of children exclusively breastfed for at least four months. This particular characteristic of the WHO charts was described by the working group and extended committee as a key reason for adopting the standard in Colombia. The charts were the perfect instruments of measurement because they were aligned with the existing policies, programs and plans promoting breastfeeding in the country. A policymaker participating in the working group said:

If you want to promote breastfeeding you should have measuring tools that are consistent with what you promote. The WHO charts can tell us how exclusively breastfeeding children look like, how they grow. The WHO charts should set our benchmarks, not formula-fed based. (Catalina, Bogotá 2014).

Adopting the WHO charts also implied normalising the growth pattern of breastfed children. Just as the WHO had described in many peer-reviewed papers and guidelines, this was expected to prevent exclusively breastfed children from being mistakenly classified as having inadequate growth. Policymakers and experts who participated in the committees used this argument as a strong reason to adopt the WHO charts. Recognising the body of a breastfed child as the standard was described as a pivotal action in preventing practitioners from recommending formula to children who might have a healthy growth pattern.

In a way, the WHO-CGS were adopted because they could be used as a measuring tool that could be integrated easily into existing governmental initiatives that promoted exclusive breastfeeding and that discouraged formula feeding, including the Ten Year Plan for Breastfeeding (2010-2020) and the National Policy on Food

Security-Conpes 113. These initiatives had been aligned with the discourse of international organisations such the United Nations Population Fund (UNFPA), the Inter-American Development Bank (IDB), UNICEF, and, as we have seen, the WHO, which since the 1990s had promoted breastfeeding as the optimum method of infant feeding (Meyer and De Oliveira 2003).

The Colombian government has been actively promoting breastfeeding since the 1960s. However, it was during the 1990s that the country began to create stronger plans and programs advocating breastfeeding. In 1992, for example, Colombia adopted the International Code of Marketing of Breast Milk Substitutes³⁷, proposed by the WHO in 1981 (WHO 1981). In 1998, the government created a ten-year plan for the promotion, protection and support of breastfeeding. This plan was adjusted and updated for another ten years in 2010. Despite these policy initiatives, the rates of breastfeeding have not increased significantly in the last decades (a trend also seen internationally). Since 1990, when the first national health survey, the ENDS, took place, breastfeeding practices have been measured every five years in Colombia. While the exclusive breastfeeding average rate increased from 1.1 months in 1995 to 1.8 in 2010, the rate is still low, especially considering that the current WHO recommendation is six months. Likewise, the rate for overall months of continued breastfeeding showed an increase from 12.7 months in 1990 to 14.9 months in 2010 – still much lower than the recommended 24 months.

Achieving exclusive and continued breastfeeding are main targets in maternal and child health care in Colombia. Within this context, the WHO-CGS were integrated into an existing infrastructure where the characteristics of the sample used to develop the charts were already considered and promoted as ideal. In other words, the WHO charts were perceived as the most appropriate reference tool to measure existing national policies on breastfeeding.

³⁷ The International Code of Marketing of Breast Milk Substitutes is a set of recommendations to regulate the marketing of breast-milk substitutes, feeding bottles and teats. It was designed by the WHO in 1981 to protect infant and young child feeding from the aggressive marketing of human milk substitutes (WHO 1981).

b) Matching Ethnic Diversity

Committee members also linked the necessity of adopting the WHO-CGS to perceived benefits in measuring the Colombian population against international standards. In all my interviews, WHO charts were described as better measurement tools than the NCHS charts because they were based on information from children in different geographic and ethnic backgrounds, and not only children from the United States. The narratives used to describe the benefits of having a more diverse sample of children often raised issues related to the politics of representation and notions of race.

When I interviewed Martha, a nutritionist working in this field for more than 30 years, we talked about her training in anthropometry when she was at university during the 1980s. She began describing how the reference population for growth charts was a subject of debate in classes and with some peers. Martha reflected on the fact that, during the late 1970s, the ideal scenario had been for countries to have their own growth charts (as we have seen). Since Colombia did not have its own, the majority of practitioners used the NCHS charts. However, according to Martha, there were many nutritionists and medical doctors who were reluctant to use the United States charts, and instead used the Cuban charts, which they thought were better able to represent Latin American children. As Martha described it:

Of course we had training in how to measure, and we learned about percentiles and how to interpret the charts. The charts were and still are pretty much the same, what changes is the population of reference. That is what is tricky. The Cuban charts represented the Cuban, and in the same way there were many countries that had charts that represented their own population. I remember the discussion with my colleagues, some of them would say “No way, I am not using the NCHS because we are not North Americans we are Latin Americans, we are different. Latinos we grow differently.” The idea that race had an impact in growth was present there. We didn’t have a study saying that race didn’t matter until the Multicentre study [the MGRS]. Some

people, many paediatricians in their practice, used the Cuban charts, they felt they identified with them more than with the American charts. They used to say the Cuban charts were closer to us (Martha, Bogotá 2013).

The idea that the NCHS charts did not accurately represent the Colombian population was addressed in many other interviews and informal conversations with participants of the committees, as well as in many of my encounters with doctors, nurses and nutritionists during fieldwork. One frequent comment, often framed as a personal point of view more than as a scientific statement, was that Colombian children would look shorter and thinner if they were measured against the NCHS charts. Alejandra, a nutritionist I interviewed a couple of times, framed it this way:

We all know that we [Colombians] are shorter than Americans. Is it clear that our population will look shorter and malnourished if we compare our children against white children from the United States...Well maybe we are short but maybe the standard was making it worse. Of course children there are bigger, even water in the United States has extra nutrients... and calories [laughter]. I prefer the WHO charts. Children from different countries including Brazil are part of this Multicentre study, is the best study right now. In practice is best to have a standard based on this kind of sample. When you explain to patients and health professionals in rural areas or to indigenous communities that the NCHS charts were based on and for the American population, they immediately associate the charts with gringos³⁸[laughter], white and tall, not with them. In some cases, this might become a problem, if a child has low height or weight, then the person doing the measurement might underestimate the result by assuming that if the reference sample is USA then the child might not be that short or thin (Alejandra, Bogotá 2013).

Alejandra's account illustrates several issues related to the politics of representation. Saying that the standards were making the Colombian population shorter suggests the acceptance that Colombians are short naturally, and that measuring growth against the NCHS charts accentuates this biological feature. It also stresses that children from the United States are taller and heavier as a result of their diet. The WHO charts, on the contrary, are described as having a diverse reference population.

³⁸ 'Gringo' is a word used in Latin America to refer to white people from the United States. Depending of the context, it can be derogatory.

Alejandra mentions that Brazil was included as if this would make the sample also acceptable for South America. That the inclusion of Brazil as something that made the WHO sample more likeable and reliable for Latin American countries was mentioned several times in other informal conversations.

During my fieldwork, the inclusion of several countries in the MGRS was cited constantly as a positive aspect of the WHO charts, as they represented more than one reference population. Lucia, a senior lecturer in nutrition, described with an air of relief how satisfied she was about not having to use the NCHS charts any longer. After explaining to me all the evidence that made the WHO charts an ideal tool of measurement (e.g. the statistical model, the data collection process), she added she felt glad that the United States was no longer the reference population. When I asked about that comment she, said that it was time for the WHO to develop ‘a more democratic set of charts’. She went on to reflect explicitly on the political nature of her argument:

Look, the NCHS charts were good tools too. What is important is how you collect the data and how you follow up the information, how consistent you are. However, the fact that the NCHS charts represented just one country and that this country was the United States, at least for me, is problematic. We have known for decades about the obesity trend there. The United States chart was not the best available chart to be promoted; why did they not choose the Cuban chart, or the Danish one. This is a problem of power. I prefer the WHO charts, I feel it is a more democratic sample, it represents many and not just a few (Lucia, Bogotá 2014).

The notion that the NCHS charts represented few children, while the WHO-CGS was an initiative for the inclusion of diversity in growth research, was a common topic in my interviews. The fact that the MGRS has been able to select an ideal reference sample and then develop charts based on a longitudinal and a cross-sectional study was described as unique in the history of anthropometry. The diversity of the sample was one of the key elements that interviewees described as a source of legitimacy for the standard. The ‘universality’ of the standard was a leading reason that the

adoption of the charts was considered the right choice. Dr Pedraza, a paediatrician invited as an expert to the extended committee, noted:

White children from the USA could no longer be the gold standard for children's growth, especially if you have an option and that option includes children with different ethnic backgrounds. If you have two options, one representing few and another representing many, then why would you continue using those that include just white children? The new charts are standards. They can tell us how children should grow. We don't have to think about race anymore. We know now that children from different ethnic backgrounds have the same potential of growth if we take care of them. We have evidence now (Dr Pedraza, Bogotá 2014).

Many interviewees also identified the 'universality' of the WHO charts as beneficial for the Colombian context, given the presence of indigenous communities. According to the National Indigenous Organization of Colombia (ONIC), there are 102 indigenous communities in the country, representing 4% of the national population. In terms of their nutritional status, the ENSIN 2010 reported higher prevalence of stunting (chronic and severe) among the sampled indigenous children (29.5% and 9.4%, respectively) than among Afro-Colombian children (10.6% and 2.4%, respectively) and children classified as *others* (12.6% and 2.4%, respectively). The same survey reported that the prevalence of underweight was twice as high in indigenous children as in the rest of the population at the national level (7.5% and 3.4% respectively (Ministerio de la Protección Social et al. 2011).

In my twenty-eight interviews with participants of the committees, twenty highlighted the importance of the new charts for a multiethnic country like Colombia. Two main arguments were common in those interviews. The first was related to the idea that the WHO-CGS followed a prescriptive approach, in which genetics or ethnic background were not considered to be variables with a significant impact on growth during early childhood – meaning that measuring indigenous children would be easier with the new charts. In this regard, Elsa, a nutritionist with a long career in public health and experience in policy-making stated that:

Colombia is a multiethnic and pluricultural country. For decades some professionals have tried to suggest that our ancestry matters when we measure growth. Now, with the WHO-CGS that is not a problem anymore. We can say we are using a standard that shows how all children should grow. The WHO charts make everything easier (Elsa, Bogotá 2014).

The second involved the idea that a growth standard could be used as a political tool to demonstrate the conditions of discrimination, social inequality and food insecurity that indigenous communities face in Colombia. If the WHO-CGS represented an optimal growth pattern for all children under five years old, the statistics for stunted, wasting and underweight in indigenous children could be explained just in terms of living conditions, and not in terms of inherent biological features associated with ethnicity. The WHO-CGS, in this particular case, was perceived as a ‘value-free standard’ that could prove that differences in growth between indigenous and non-indigenous children were associated with social determinants of health.

Inés, a nutritionist working in one of the national bodies of the country, explained to me that the idea that indigenous people are short is still a strong and persistent way in which Colombian society thinks about how indigenous people look. She emphasized that even though there is a strong body of evidence showing that growth during early childhood is highly influenced by the environment and living conditions, and not so much by genetics or ethnicity, the assumption that indigenous children are naturally short is frequently triggered in clinical practice. According to her, ‘stunted indigenous children are often perceived by health professionals as having normal growth. Instead of associating low height with malnutrition, growth failure is frequently underestimated and framed as a biological feature among indigenous communities’ (Inés, Bogotá 2013). In a similar line of thought, Janet, a lecturer in nutrition at a University in Bogota, argued that the MGRS had provided enough evidence to prove that indigenous children could be measured against the WHO charts. She noted that the process of adopting the WHO charts provided a good opportunity to insist on the idea that being stunted during early childhood is in most

of the cases a result of deprived living conditions, and not a direct outcome of the child's ancestry.

There are still people that think that indigenous children and adults are short. Well not only short, but also dirty and not very intelligent. That is how discrimination works. You can still find places where you talk to the nurse or the doctor and they still think that children are small because they are indigenous: "Ohh he is small because is Yupa, [an indigenous community]". With this standard it is easier to explain to the health professionals who work in those areas of the country that ethnicity is not an excuse to have a child with low height. A child is short if you don't provide clean water, a good diet. If you don't have good health services and the child is not vaccinated. If a child is stunted it is not because he is indigenous. The WHO charts explain this with scientific evidence. All children have the same potential of growth (Janet, Bogotá 2014).

Adopting the WHO-CGS became useful for overcoming different types of bias associated with the NCHS charts. For the participants of the committee, children that were exclusively breastfed could be better assessed with the WHO-CGS, and children that were not white could be measured against a reference population characterized by ethnic diversity. In addition, the adoption of the WHO-CGS triggered a political issue of great relevance. If all children can be measured against the same standard, and the variable that influences growth the most is the environment, then the stunting of children could only be explained through social and cultural variables. With this reasoning, the use of the WHO-CGS to measure malnutrition could provide scientific and bias-free data about the impact of inequality, poverty and food insecurity on children's growth.

It is important to clarify that the impact of poor living conditions on children's growth is not a recent discovery. As we have seen, this discussion can be traced back to the ninetieth century. What is innovative about the development and adoption of the WHO charts is the development of a tool of measurement that turns off the variables of genetics and ethnicity. By doing so, the standard is able to homogenise children's bodies and make comparability possible. What is measured with the

WHO-CGS is the impact of external/environmental variables on children's growth. The measurement of growth using these charts situates responsibility for children's growth and development on controllable variables external to the biology of the child. Responsibility is located in parents and caregivers, especially mothers, as direct providers of care; as well as on the state, which is responsible for structural variables associated with equality, food security, and access to health care, among many others.

c) Matching International Indicators

A final reason my interviewees gave for adopting the new charts was that diverse agencies of the United Nations, as well as international organisations like the World Bank, the IDB and the International Monetary Fund, had also migrated from the NCHS charts to the WHO-CGS to produce malnutrition metrics. The World Bank, for example, migrated to the WHO charts to assess the prevalence of stunting among children under five years old as an indicator of the effectiveness of aid. Adopting the new charts was consistent with the trend in the international context³⁹. The Colombian example illustrates how standards are integrated and nested within other standards, and within a specific infrastructure (Star and Lampland 2009). If powerful actors migrate standards, and decisions and practices derived from a specific standard also change (e.g production of international statistics, assessments of international loans, production of rankings of development), then other actors with comparatively marginal power might be expected to migrate too. Carmen, a nutritionist doing policy-oriented research in nutrition and food security for the last twenty years, explained how Colombia had to migrate to match international agencies that cooperate with the country. She described an element of power associated with the fact that those agencies might provide loans to the country, or might assess the performance of the country in terms of development.

³⁹ Chapter 7 discusses in detail the reasons that international comparison was relevant for policy makers.

NN: Do you think there was pressure from the WHO or any other agency to adopt the new charts?

Carmen: We are a developing country. We ask for international loans all the time. We cannot just pretend we don't care about the international trend. Even though international agencies cannot oblige the country to migrate, deciding not to change the standards becomes impossible. Saying no to the standard is a privilege that a country like Colombia does not have. If everybody is publishing using the WHO standards and the performance of the country is going to be measured using the WHO charts you are left without many choices. Well, and to be fair, these charts are better tools to measure our children. This was a change to improve our practices.

NN: What do you mean by “a privilege”?

Carmen: I mean that only very powerful countries are able to say: “look I will do this my own way because I can”. Countries like Colombia, that are still trying to activate the economy, that are trying to change inequality, that require international loans and international trust, we are not in the position of measuring children on our terms. But as I told you before, in this case, I think it is not a big deal, the standard is better than the one we were using (Carmen, Bogotá 2013).

The majority of my interviewees commented on the fact that the MDGs were using the WHO charts to assess the prevalence of underweight children under five. The measurement of underweight was used to track Colombia's progress in achieving the first millennium goal, regarding the eradication of hunger and poverty. This goal had as one of its targets ‘to halve, between 1990 and 2015, the proportion of people who suffer from hunger’ (United Nations 2015:20). Colombia endorsed the MDGs in 2000 and set a national target of reducing the rate of underweight in children under five years old, from 10% in 1990⁴⁰ to 3% in 2015 (Ministerio de Relaciones Exteriores et al. 2005). Since the MDGs measured underweight using the WHO charts and Colombia had committed to this initiative, the adoption of the WHO-CGS seemed a necessary choice.⁴¹ Alejandra, the nutritionist, explained:

⁴⁰ The data for the baseline of 1990 was taken from the National Survey of Knowledge, Attitude and behaviours in Health, as well as from the WHO report called Malnutrition in infants and young children in Latin America and the Caribbean: Achieving the Millennium Development Goals.

⁴¹ In Chapter 7 I present a detailed discussion on the transition between charts, and how that implied adjusting the national goals set in 2000 to achieve the MDGs.

The Millennium Goals began using the WHO charts to measure underweight. We could have kept the NCHS charts and later on analysed the data that we needed for the United Nations with the WHO standard. In fact, we could have just reported using our data, and they could have analysed the information using the new charts. However, we thought it was best just to be consistent with the Millennium Goals, and to measure our internal goals using the same standard that was going to be used to compare the data internationally. Also, generating our own data using WHO charts makes it easier to compare our efforts to reduce malnutrition with the rest of the region (Alejandra, Bogotá 2013).

The WHO-CGS were adopted, ultimately, because the standards were consistent with Colombian goals in at least three main ways: they helped strengthen the breastfeeding policy, helped address the multi-ethnic background of the Colombian population, and enabled the state to align itself with international organisations and their strategies and agendas. As my interviewees' commentary shows, the narratives of the WHO were transformed and reinterpreted to suit Colombia's context and needs. The WHO-CGS could be defined as a tool of measurement that created a sense of equality for Colombians. The idea that the WHO was shifting from a standard that represented mainly formula fed white children from the United States to a standard able to represent breastfed children from different backgrounds made the adoption of the WHO charts highly desirable.

Having examined the reasons behind the adoption of the WHO-CGS, in the following section, I show how the standards were adapted to make the charts work in the context of Colombia.

5.3 Adapting the charts.

As we have seen, the WHO-CGS was adopted in June 2010 through Resolution 2121. Early in my fieldwork, this Resolution became a sort of compass to help me understand the processes of adapting the charts to the Colombian context.

Given the apparent benefits of adopting the WHO-CGS, the committees agreed that the best way to make health professionals and health providers use the new charts was to regulate the anthropometric measurement of children with a legal mechanism. They felt the development of a resolution could create the legal conditions to standardise measurement practices, and the ways in which malnutrition in particular was reported and recorded. For some of the interviewees, the development of the Resolution was an effort to promote and ensure order in the way growth monitoring was conducted in the country. In some cases, they described the health system as chaotic, or described Colombians as disorganised or unable to follow recommendations without a legal sanction. By making the use of these charts mandatory, doctors would not have any other option but to adjust. Zoe, a nutritionist working as a civil servant for the national government, observed: ‘With a resolution, if a doctor wants to use the NCHS charts or any other chart we can say: Sorry, you cannot, end of the discussion’ (Zoe, Bogotá 2014).

While I was looking for legal documents like Resolution 2121 and trying to track other documents addressing anthropometric measurement, I found that in general, the guidelines that promoted preventive programs – such as the Growth and Development Program – only established that children’s growth should be assessed. They did not recommend standards or anthropometric indicators. In 2000, for example, the government published Resolution 412 of 2000, which regulates the preventive actions the health system should take to prevent diseases or to detect them in an early stage. As a result of this resolution, several guidelines were developed for different diseases and groups of age. One of them was guide 412, for the early detection of growth and development deficiencies in children under ten years old. Resolution 412 defined all the clinical and preventive recommendations that doctors should follow when they attend to children under ten years old. For children under five years old, the guide includes information about the minimum number of visits for check-ups with the general GP and paediatrician, as well as basic information about the vaccinations scheme, breastfeeding, complementary feeding, visual

screening and growth and development assessment. The guideline explained how children should be measured and explains how often well-visits should occur; but it did not mention any specification about which growth charts should be used, or what cut-off points to apply.

The members of the committees saw an important gap in the existing guidelines and recommendations regarding growth assessment, and a problem in how children were measured in practice. Doctors, nurses and nutritionists providing services to children in preventive programs such as the Growth and Development Programme used the charts that the health insurance or the health facility they worked for would print for them. While the NCHS charts were the most common, the design, size, percentile range and age groups could vary from one insurance company to another. In addition, not all insurance companies were measuring the same anthropometric indicators or cut-off points, or using the same malnutrition classification system. Especially in the context of private practice, laboratories such as Abbod or Nestle provided doctors with pads of printed charts as presents. The ICBF, on the other hand, used to have its own printed charts to follow children's growth within their programmes, targeting children's nutritional status.

In the eyes of the working groups, the heterogeneity and incompatibility of tools of measurement, along with the lack of common agreement regarding the interpretation of the charts, was making the quantification of malnutrition at the population level a huge challenge. They felt that by improving standardisation, malnutrition measurement would become more clear and efficient; and it would therefore be possible to better understand the characteristics of individual cases, and to have better evidence identifying the groups of children that were most vulnerable and required more attention.

Making the WHO chart mandatory was expected to have a direct impact at the individual level in clinical practice. However, its most significant effect was

expected to be on nutritional surveillance processes, and therefore on the quantification of malnutrition as a public health concern. While standardising measurement could have positive outcomes in clinical practice and at the individual level, the efforts to standardise procedures were strongly motivated by the need to produce more accurate ‘numbers’, to improve the quality of the statistics in the country. Leonor, a nutritionist and an expert in public health and nutrition surveillance, described the importance of malnutrition statistics thus:

To measure correctly is of great importance for identifying where to focus our efforts. The resources, I mean financial and human, are limited and we need to prioritise our efforts. If we generate good statistics we will improve our actions. Think about Bogotá, the city has worked for more than 15 years with its surveillance system, now they can target their initiatives and they can follow up progress. In addition, with good statistics, it is easier to follow up the status of specific areas of the city. Being able to trust in the statistics we generate is really important for the country and we know for a fact, that right now only few cities really know their epidemiological profile. In general, I cannot tell you right now how many children are stunted and where they are. We still have a lot to do to be able to measure malnutrition. The only reliable data we really have as a country is the one coming from the ENS and the ENSIN (Leonor Bogotá, 2014).

As Janet mentioned earlier, data regarding malnutrition in children under five is relatively scarce in the country. At the national level, information on the prevalence of underweight, stunting and wasting in children under five is only available through the ENSIN survey. This is the only dataset available to determine the prevalence of malnutrition in the country, and information is collected only every five years. Data about malnutrition in children is also available in some departments through their local nutritional surveillance systems – including in Antioquia, Cundinamarca and Bogotá. These three local systems were developed during the 1990s, with the aim of determining vulnerable groups of population, and focusing public health measures on generating data that could be used to evaluate the impact of municipality programs targeting the nutritional status of children. In those cases, data is continuously updated. In terms of epidemiological surveillance, at the national level only low-

weight-for-birth and child mortality caused by undernutrition are notified and monitored by the INS through the national nutrition surveillance system.

For the committee, the development of the Resolution and the standardisation of the charts, malnutrition measurements and classifications, was an opportunity to advance the production of reliable information that could not only improve public health actions, but also assess the impact of national policies on food security and early childhood. The lack of common agreement on how malnutrition was assessed and how it should be registered on the child health card,⁴² or in other medical health records kept within the health system, was a major problem in terms of measuring or quantifying cases of malnutrition in children under five.

In this context, the construction of Resolution 2121 was a negotiation process in which achieving the standardisation of growth assessment was the main goal. Through the development of a legal tool that could also work as a guideline for health professionals, the committee was aiming to formalise and impose an agreement regarding how to measure children's bodies. As I will show in the coming sections, standardising growth measurement implied reaching agreements on specific topics including age ranges, the form/design of the charts, as well as the standardization of malnutrition denominations and their associated cut-off points. In each of these negotiations, it is possible to identify ways in which the standards are adapted to the specific needs of the national context, while simultaneously remaining stable enough to be useful on a global scale.

a) Age ranges.

One key element that required standardization was the range of ages to be measured by the charts. Several curves covering different ranges of age were in circulation. Some charts covered the complete period between zero and four years and eleven

⁴² The child health card is a booklet given to parents or caregivers so they can keep track of the child's growth and vaccination scheme.

months; others were divided into two ranges, from zero to two years old, and from two to five years. There was no agreement about how to define early childhood in terms of age; some of the ICBF nutrition programs targeted preschool children from zero until six years old, while other programmes targeted children under five. The committees agreed that early childhood should be defined as the period between 0 and 4 years and 11 months, in line with the WHO and several other countries and international organisations' guidelines. The charts, in turn, would be printed for the ranges 0-2 and 2-5 years old. This division was considered useful since it would make it easier to trace a detailed growth trajectory for children in each of these two age ranges. Sufficient space between values for this degree of detail was especially important for infants. Charts covering 0 to 5 years old were felt to be problematic, given that the dots marking the measurements would be too close to each other, even overlapping. This division also guaranteed that the charts could be printed in a paper size that could be included in the child health card without compromising the collection of measurements.

The process of negotiating even the simplest details of the charts themselves shows how standardisation in action needs to be understood in terms of the material world. Negotiations about the design of the growth chart were also shaped by practical difficulties in crafting the standard. Bowker and Star have a similar example regarding the International Classification of Disease (ICD): 'The original ICD had some 200 diseases not because of the nature of the human body and its problems but because this was the maximum number that would fit the large census sheets then in use' (Bowker and Star 2000:42).

b) Chart Design.

The form containing the charts was also standardised in Resolution 2121. In addition to splitting the growth charts into two age brackets, the Resolution established that the charts could not be printed in a page of less than half legal size. In case of using

colours, pink should be used for girls and blue for boys. The form containing the charts also had to include the child's name, ID number⁴³, sex, date of birth, age, and a table to keep track of the height and weight of the child, as well as the dates when the measurements were taken. Finally, the lines in the charts that demarcated over- or undernutrition, or the risk of over- or undernutrition, had to be red and in bold.

c) Classification and denomination

To guarantee that all children were measured against the same anthropometric indicators, the committee began by standardising which anthropometric indicators should be used to assess children's growth. For children under two years, it was specified that children should be assessed according to their length/height-for-age, weight-for-age, weight-for-height, body mass index (BMI), and head circumference. Length/height-for-age, weight-for-height, and BMI were established as mandatory for children between 2 and 4 years 11 months old. According to the Resolution, health professionals were required to use these indicators, and could no longer choose using just one or two of them.

In addition to determining which indicators were mandatory, the Resolution also standardised the nomenclature used for the nutritional classification of children in the country. One of the main problems with the diagnosis and reporting of malnutrition was related to the lack of a common classification for it, or for its degrees of severity (e.g. 1, 2 or 3 or mild, moderate and severe). In Colombia, along with many other countries that speak Spanish, malnutrition by deficiency is divided into three categories: chronic malnutrition (height-for-age), acute malnutrition (weight-for-height) and global malnutrition (weight-for-age). Each of these indicators could be classified as moderate or severe. In English, the same indicators correspond to the terms 'stunting', 'wasting' and 'underweight'.

⁴³ In Colombia, children and adults have a unique number for identification. A child's ID number is given on the birth certificate.

In order to standardise the classification and interpretation of anthropometric indicators, the committees decided to adopt the WHO classification – which, in its Spanish version, does not use the terms acute, chronic or global malnutrition (*desnutrición aguda, crónica o global*). Instead, it describes each anthropometric indicator using *low* or *severely low* as the degrees of severity (e.g. low weight or severely low weight; (see WHO 2008a). For Colombia, the committee made a change to the use of the adverb ‘severely’ and instead used ‘very low’. In other words, instead of classifying children as having ‘severe chronic malnutrition’ or being ‘severely stunted’, they recommended using the descriptor ‘very low height for age’.

Even though the main effort of the committee was to use just one system of classification, in the Resolution, the use of the terms ‘acute’ or ‘global’ malnutrition remained as options that could coexist with the WHO classifications. When I tried to explore this topic in my interviews, very few could remember why they chose to adopt the WHO classification system or why they found it more useful. However, some interviewees mentioned that this classification made the interpretation of the indicators easier for those who were not health professionals, but who still had to measure children and use the charts – including, for example, community leaders working in government nutrition projects like *Jardines Comunitarios*. The Resolution applied to everyone measuring children, and in that sense the recommendations applied to different types of actors, with and without formal training in health sciences.

The standardization of the classification system was intertwined with the standardisation of cut-off points. Following a standard deviations (SD) system, in the WHO nutritional classification, the range of normality for all anthropometric indicators is located between +2SDs and -2SDs. Between -2SDs and -3SDs, a child would be classified as stunted, wasted or underweight, depending on the

anthropometric indicator measured. Below -3SDs, the same classification is considered severe (e.g. severely wasted). Similarly, the range above +2SDs is classified as overweight, and above 3SDs, obese. Though the committee agreed to use the same nomenclature and cut-off points used in the WHO classification system, the denominations used for each of the mentioned ranges of standard deviations was adjusted to assess risk. The range between -1SDs and -2SDs, which according to the WHO corresponds to adequate growth, in the Colombian system was classified as a risk zone for all indicators. That means that if a child is measured and the weight for her age is located in the range between -1SDs and -2SDs, in the WHO classification the child would be classified as having a normal growth; but in Colombia, the same child would have been classified as being at risk of low weight-for-age or at risk of underweight (see table 3 and figure 7 for a better understanding of the differences in the nutritional classification system between the WHO and Resolution 2121).

In the case of undernutrition, the committees reached consensus about the need for thinking in terms of risk. This option was described in the interviews as a good measure at both the individual and population level. By classifying children ‘at risk’ of underweight, wasting or stunting, it was expected that parents and caregivers could have access to timely information to prevent a child from moving to actual undernutrition. In addition, at the population level, adding the category of risk was expected to be useful for policy-making. Having a classification for risk could mobilise resources for prevention strategies targeting specific populations. Tatiana, a nutritionist with a long career in nutrition surveillance in the country, an active member of one of the committees, and an expert in nutrition surveillance explained:

Once you can locate the children that are at risk, it is possible to identify associations between different variables such as vaccination, access to health services, or if they are registered in the health system. Once you know all this, you can develop specific interventions for that specific population. Mobilise the resources of the government in a clever and more effective way. You might need, for example, to send more health professionals to the field to guarantee vaccination, or you can organise educational campaigns to inform parents about how to improve children’s diets. In addition, you can find other

programs or strategies and make them your allies to improve the nutritional status of the community. It is necessary to find a way to prevent undernutrition. Adding the category of risk in the nutritional classification system gave us some tools to make it (Tatiana, Bogotá 2014).

On the positive side of the normal distribution, the committee decided to adapt the WHO nutritional classification. Instead of following the WHO terminology, which uses the category 'possible risk of overweight' for the range between +1SDs to +2SDs (WHO 2008b:14), in Colombia, this same range was classified as 'overweight'. Consequently, the range between +2SDs and +3SDs that the WHO recognises as 'overweight' in Colombia became 'obesity'. This decision was motivated by the committees' aggressive approach to preventing obesity. If children were classified as being overweight early enough, then it was possible to prevent obesity.

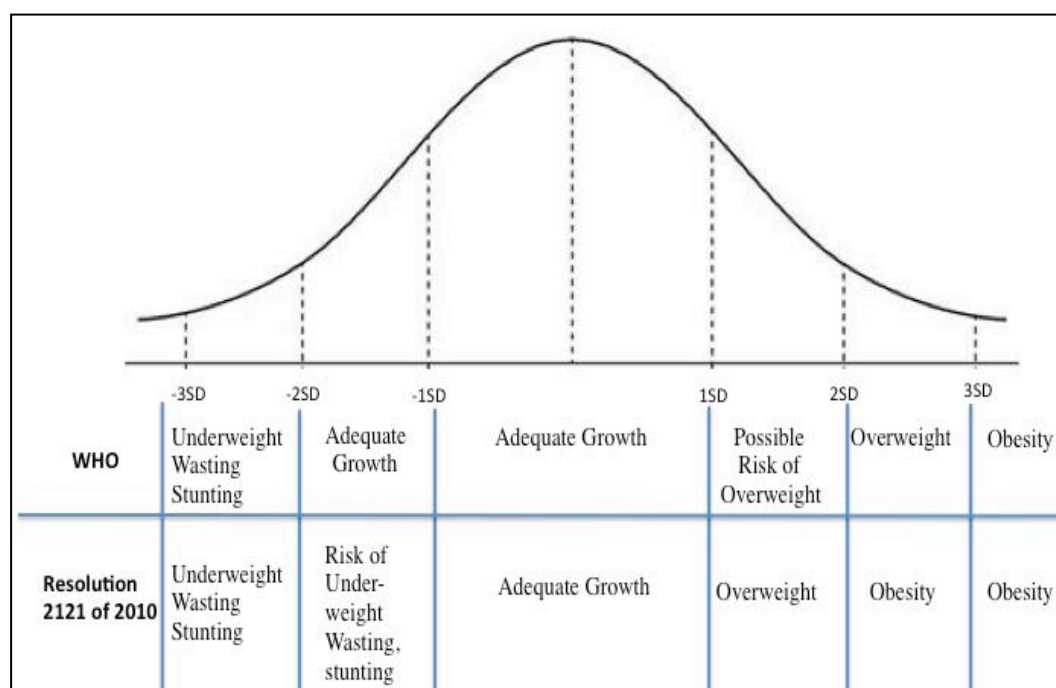
Table 3. Nutritional Classification according to the WHO and Resolution 2121 of 2010¹

Growth indicators		Weight-for-age		Weight for length/height		BMI	
Standard Deviations	Length/height- for-age	WHO	Colombia	WHO	Colombia	WHO	Colombia
Above 3				Obese	Obese	Obese	Obese
Above 2				Overweight	Obese	Overweight	Obese
Above 1				Possible risk of overweight	Overweight	Possible risk of overweight	Overweight
Below -1							
	Risk of low length/height for age ²		Risk of low weight for length/height				
Below -2	Stunted	Low length/height for age	Under weight	Wasted	Low weight for length/height	Wasted	
			Low weight for age/ Global malnutrition		Acute malnutrition		
Below -3	Severely stunted	Very low length/height for age	Severely under weight	Severely Wasted	Very low weight for length/height	Severely wasted	

¹ Cells left in grey have no denomination in the WHO documents or Resolution 2121 of 2010.

² All the nomenclature used in Resolution 2121 is translated in English following the exact words in Spanish. Even though it is possible to state that, for example, low weight for age in English could be translated as underweight, I have chosen to translate the Resolution as literally as possible – especially given that the specific words chosen to standardise denominations have empirical implications for how malnutrition is reported and recorded in everyday practice. I will return to discuss this point further in Chapter Six.

Figure 7. Normal distribution in standard deviations and nutritional classification according to the WHO and Resolution 2121 of 2010



At the time I was conducting the interviews – almost three years after the committee meetings took place – members of the committee were still discussing whether they had taken the right decision or not regarding the category of overweight and obesity. From what was described in the interviews, the discussion was divided into two perspectives. On one hand, there were those members who believed that the country needed a strong approach to face the increasing cases of child obesity, which required an aggressive strategy of prevention; and therefore they supported Resolution 2121. On the other hand, some members thought the category ‘overweight’ should remain between +2SDs and +3SDs, as promoted by the WHO.

Those in this group considered it unnecessary to diagnose children as being overweight when they could be developing perfectly normally.

Those promoting the use of the denomination 'overweight' instead of 'possible risk of overweight' for the range between +1SDs and +2 SDs argued that the country needed a strong means of mobilising prevention efforts – not only to protect individuals from obesity, other diseases and co-morbidities associated with being overweight, but also to protect the health system from having to expend resources on chronic diseases of high cost. The interviewees that supported and agreed with the new classification were concerned about the possibility of not being able to control an obesity epidemic if the country did not assume preventive initiatives quickly and forcefully.

Elsa, one of the nutritionists who strongly promoted the initiative to adopt the denomination 'overweight', emphasised that the reason the terms for overnutrition created so much disruption was related to how policy makers, politicians and health professionals perceived the significance of the problem. For Elsa, obesity and overweight in Colombia had only very recently become a subject of concern. It was only in 2009 that Colombia had developed a national policy on obesity, 'The Obesity Law', which recognised obesity as a public health priority of national interest. But accepting the presence of obesity in the country was difficult because, as Elsa pointed out, both the government and the lay public perceived under-nutrition as Colombia's primary public health problem. In this way of imagining and representing the country, child obesity was still not a 'real' priority – as it was for the United States, Mexico or Chile. Elsa described Colombians' fear of accepting child obesity as an epidemiological reality:

Some people in the committee strongly opposed the idea of being aggressive with the cut-off points of overweight and obesity. However I feel that the problem is not in the arena of epidemiology. If you take a look at the ENSIN 2010, it will be obvious that the rate of obesity in adults is increasing, and

that soon we will have problems with children too. We need to prevent child obesity. We still can prevent becoming like Chile and Mexico. That is why we need a radical approach and to intervene as soon as possible to prevent overweight being transformed into a major problem. This will also have a positive effect on the health system in the long term, since we already have evidence of the impact of overweight and obesity in the development of chronic diseases in the future. I feel we [policy-makers, health professionals and civil servants] are scared of using the right words and accepting that Colombia is facing the challenges of having the double burden of malnutrition, under- and over-nutrition (Elsa, Bogotá 2014).

Carla, another nutritionist who strongly supported the new classification, not only agreed with Elsa's assessment of fear, but added that this classification implied more effort in clinical practice, and could also create a new reality that was currently unrecognised in terms of quantification. In other words, approving the denomination 'overweight' for measurements between +1 and +2 SDs, and 'obesity' between +2 and +3 SDs, implied the construction of new quantitative data that could jeopardise or at least call into question the efforts of the health and education sector to tackle child obesity.

N: How do you feel about the denomination 'overweight' and how it was adopted in the Resolution?

C: That was a hot discussion; many people disagreed with our way of looking at this problem. My personal opinion is that we are used to measuring undernutrition, the national policy is oriented to undernutrition. However, when we analysed the ENSIN 2010 data it became clear that rate of overweight was increasing. When we thought about classifying overweight above one standard deviation, many looked terrified, like saying: "No we cannot do that, we will have many children located in that range and then what are we going to do?". But the truth is that that's our reality. The percentage of obese children is increasing and we are not doing our job correctly. What kind of food are we providing to children at school? What are we offering them for lunch? We keep offering them rice, potato, plantain, sometimes some meat and a desert. And before that we have given them bread, a cookie, and milk. Schools are also making the wrong choices. So, why do we have second thoughts about preventing if we know already that the indicators in children that attend school are increasing? We are scared of the number, of the statistics, but also I wonder if we are just omitting that the health and education sector need to pay attention to this and not just to underweight (Carla, Bogotá 2014).

Those opposing the classifications proposed in the Resolution were concerned mainly about the risks of skewing the category of overweight and obesity one standard deviation to the right. According to them, the best practice was to do exactly what was done for the case of undernutrition by adding the category ‘risk of overweight’ to the range between +1SDs and +2SDs. At the individual level, the classification proposed in the Resolution could lead parents, or in some cases professionals, to decide to expose the child to restrictions in her diet, thinking that the child should lose weight. This practice could easily lead to unnecessary deprivations and create avoidable concerns for parents. Liz, a nutritionist who worked with the ICBF and Ministry of Health, and who disagreed with the overweight classification, observed:

If you think in terms of a normal distribution, including a range for risk works perfectly fine for undernutrition. Almost 30% of the population is located there, twice the amount of the population expected to be there. The case of overweight is different, only 12% or 15%, well let’s say 20% in some regions of the country, is located in this area of the bell. For us [those who disagreed] there was no need to be so extreme with the cut-off points. The risk of using the denomination ‘overweight’ instead of ‘risk of overweight’ is that practitioners will intervene. As a nutritionist you will think: this child needs to lose weight, and there is a high probability that the child does not need to lose weight at all. Instead, if I have to use the label ‘risk of overweight,’ then the intervention is closer to preventive recommendations and practices, more physical activity, for example. We did not disagree with the idea of risk, we are aware that we need to be cautious. The obesity trend is a reality, that is why calling this range [between +1 and +2 SDs] cannot be called adequate or normal, but we can call them at risk of overweight (Liz, Bogotá 2014).

In this regard, promoters of the new classification suggested that the idea of normal weight had changed, and that professionals were classifying children as normal when they were overweight as a result of common representations in which the excess of weight in children is associated with a healthy body.

Other arguments against the Resolution classification raised concerns about the diagnosis of obesity in children that were overweight. Two interviewees raised the question of how to provide services to children that used to be at risk, who were now classified as being overweight and obese. With the new classification, the health system was going to diagnose more children with over-nutrition. This raised a significant concern, given that the health system did not cover treatment or the exams triggered by a diagnosis of overweight. A higher percentage of children would be diagnosed as overweight and as obese, when the health system had no tools or protocols to provide services to those patients. Sandra, an epidemiologist and a policymaker in nutrition raised this topic during her interview:

Let's say we keep the classification of the Resolution. What will happen is that the health system will report more children as overweight and as obese. Right now the system only covers treatment and tests for obesity; we do not have regulations or guidelines for overweight. So tell me, what are we supposed to do with all those children that we used to classify as normal or at risk, and now we are going to classify as overweight? I find it incredibly irresponsible to have children in the consultation room telling the parents that the child is overweight and not having a common agreement in terms of services that can be provided to the child and that are covered by the health system. Also, I feel that the category 'at risk' was best. By using the WHO system, the few children that are obese [those that are in the range above +3SDs] will have access to the limited resources of the health system. If we use the classification of obesity in the range between +2SDs and +3SDs we will have more children than we can afford (Sandra, Bogotá 2014).

The discussions of the committees around the overweight classification were described as intense and highly contested. It is difficult to identify how the discussion reached closure, and why the new classification 'overweight' was the one chosen to become mandatory in the Resolution. The lack of minutes and documents reporting what happened in the meetings leaves an important gap regarding the process of decision-making around the cut-off points and denominations for overweight and obesity.

5.4 Final remarks

In this chapter, I have shown how the WHO-CGS were adopted and adapted to the Colombian context. By following the standard from the international level to the national level, I have shown how standards and classifications are transformed and re-signified according to the specific infrastructure and networks in which they are embedded (Bowker and Star 2000).

Some of the narratives of the WHO regarding the WHO-CGS were adopted and replicated by the members of the working group and the extended committee. One of them was the idea that the WHO charts were standards able to measure how children should grow, as opposed to the simply descriptive NCHS charts. However, in other aspects, the importance of the standards and their adoption finds meaning only within the context of the institutions adopting the standard. The fact that the WHO-CGS included children from different countries, for example, was lauded as a way of diversifying representation in measurement. Having a standard that established that all children have the same growth potential was crucial in Colombia, given that it substantiated the argument that indigenous children are stunted as the result of poor living conditions. Locally, the standard could mobilise political action regarding malnutrition, inequality and food insecurity. The idea that the country needed to adopt the new standard to be aligned with the international trend, also speaks of a local context in which the WHO-CGS acquired specific meaning. Carmen, one of the interviewees above, explained it best by describing ‘saying no to the standard [as] a privilege’. For a country like Colombia – and perhaps all developing countries – adopting the standards became almost mandatory. Many, if not all, endorsed the MDGs, and depend on loans given by international organisation that use the WHO charts to monitor aid and social investment. Developing countries are often unable to generate high-quality growth standards for their own population able to compete with studies like the MGRS. Is not surprising that most of the countries that did not adopt the standard, at least until 2011, were located in Europe (See de Onis, Wijnhoven and Onyango 2004c).

Finally, in this chapter, I have shown some ways in which the WHO-CGS were adapted. Changes in the classification system might be the most relevant difference between the Colombian guidelines and the WHO recommendations. The concept of ‘boundary object’ helps make sense of these processes. The standards are flexible enough to be adapted, but rigid enough to facilitate cooperation across time and space. In Colombia, the categories used to assess overweight and obesity are clearly different from those used by the WHO; but what allows cooperation is the fact that data is compared in terms of standard deviations, and not in terms of categories. In other words, even if Colombia uses different categories for the range between +2SDs and +3SDs, when data is transported into the international arena to create rankings and compare countries, what is compared is the prevalence of cases among the specific range of standard deviations. As a type of standard, the WHO-CGS is able to travel, and in the process be transformed and shaped by the needs of different actors; but there are some characteristics that remain immutable, allowing standardisation, commensurability,

Chapter 6. Individual Growth Measurement in Practice

Anthropometric assessment can include several different types of body measurements. However, individual growth monitoring in children is normally based on the assessment of weight and height. With these measurements, it is possible to assess whether a child is following a ‘normal’ pattern of growth, or whether the child is at risk of or suffering from malnutrition. A reliable strategy for monitoring growth requires measuring children with a certain frequency, using calibrated instruments of measurement, and deploying trained personnel who can collect, record and interpret information regarding the nutritional status of the child.

As we saw in the last chapter, Resolution 2121 of 2010 was developed with the aim of regulating growth assessments by standardising the use of growth charts, anthropometric measurement techniques and nutritional classification terminology. In the logic of the committees that developed it, standardisation would improve the capacity of health professionals to identify children at risk or in early stages of malnutrition, so they could be intervened with as soon as possible and might have better chances of recovery. An improvement in individual assessment would have a positive impact on the quality of the data that fed into nutrition surveillance systems in the country. With the release of Resolution 2121, health professionals and health institutions providing services to children were not required by the Ministry of Health, the INS and the ICBF to adopt the WHO standards, and to make sure their instruments of measurement could follow the basic requirements to guarantee accurate data. The national government established a limit of two years for the transition to the new charts, and the implementation of the technical recommendations stipulated in the Resolution.

In the previous chapter, I explored the process of adopting the WHO-CGS at the national scale, and the reasons that motivated the Ministry of Health, the INS and the ICBF to create Resolution 2121 – thereby reconstructing one stage of the biography of the WHO-CGS in Colombia. However, this side of the story revolved around an expected and desirable way of doing and interpreting growth assessment, according to policy-makers' and experts' notions of ideal measurement procedures. Given that Resolution 2121 was designed as a guideline, it can be thought of as a script (Akrich 1992): a set of rules attempting to prescribe the behaviours of users (health professionals) and the conditions of use. In this chapter, I focus my analysis on how growth measurement takes place in practice, and how the adoption of the WHO-CGS and the desire to standardise growth monitoring work in the context of consultation rooms.

I chose to explore the adoption of the WHO-CGS and the recommendations of Resolution 2121 in the context of Colombia's Growth and Development Programmes (G&DP). The G&DP were developed in the country during the 1990s to follow children's health status and facilitate the early detection of abnormal conditions or diseases during the first ten years of life. Before Resolution 2121, Colombia did not have any guidelines on anthropometric assessment; but the G&DP followed 'Technical Standard 412 for the Early Detection of Changes in Growth and Development in Children under Ten Years Old'. According to this guideline, besides growth monitoring, the G&DPs were responsible for implementing the immunization scheme, developmental monitoring, screening of hearing and eyesight, preventive oral health care, and guidance for parents on breastfeeding and warning signs regarding children's health.

The G&DP was created as a prevention strategy that could be regulated by the national health system. All children in the country, regardless of their economic status, health insurance provider or place or residency (rural or urban) should be able to attend the program for free. According to both Resolution 2121 and Technical Standard 412, during the first year of life, a child should have an appointment with a

paediatrician or a general practitioner on the first, fourth and twelfth months. The child should also have an appointment with a nurse in the second, sixth and ninth month. Between the first year and the fifth year, the child should have a consultation with a nurse in months 15, 30, 42, 54, and should visit the paediatrician or general practitioner in months 18, 24, 36, 48 and 60. In all appointments, the child's growth should be measured.

Aiming to observe how growth assessment took place in practice, I began my fieldwork in a small town in La Guajira, one of the departments of the country with the highest malnutrition-related mortality rates in children under five years old. I spent three weeks in the only town's hospital. This was a first-level hospital⁴⁶, that offered primary health care services and clinical procedures of low complexity. I also visited a health centre managed by the hospital, located in a small village distant from urban settlements in a geographical area difficult to access. One of the first things I noticed when I began data collection was that the staff working at the hospital were not fully aware of Resolution 2121. Even though the Resolution established that by 2012, all health providers had to be using the new charts, the implementation of the WHO-CGS had not yet begun in La Guajira. All the paperwork used to monitor children's growth employed the NCHS charts, and the only nutritionist at the hospital continued to follow tables of ideal weight and height for children that were released by the Ministry of Health in 1986.

While I spent a substantial amount of time in the hospital, and observed consultations with both the doctor and the nurse implementing the G&DP, I also included another two cities in the Caribbean region in my research, to diversify my data collection. I added Barranquilla and Cartagena in my study, and in each city I visited two health centres implementing the G&DP.

⁴⁶ Hospitals in Colombia are classified in four levels of complexity. Level III and IV provide services for diseases like cancer, HIV, and chronic kidney disease. These two levels also have intensive care units.

This chapter is based on the interviews I conducted with doctors and nurses implementing the G&DP, as well as on the observation of 158 anthropometric assessments of children. Given the constraints of my data collection, I was unable to examine in detail the organisational context of each health facility, or to study how growth monitoring takes place over time. However, the period I spent in each facility was enough to obtain a detailed snapshot of diverse scenarios in which anthropometric assessment can take place. Visiting different health centres allowed me to compare approaches to and applications of the growth charts in different settings, as well as commonalities and differences across different G&DP.

The chapter is divided in four sections, each showing that four years after releasing Resolution 2121, growth monitoring was not a standardised practice across the G&DP. In the context of individual growth monitoring, diverse growth charts and instruments of measurement were used to assess weight and height. Just as Timmermans and Berg showed in their work on medical protocols, health professionals are not ‘mindless followers’ of standards (1997:288); instead, medical practitioners are constantly negotiating and adapting the standards’ use according to their own goals, trajectories and material resources.

By showing how growth measurement works in practice, I illustrate some of the challenges of integrating the WHO-CGS and Resolution 2121 into pre-existing local infrastructures and procedures associated with individual growth monitoring. I also emphasise the materiality of measurement; rather than focusing my analysis on forms of interpretative flexibility, I am interested in showing examples of ‘procedural flexibility’ (Jordan and Lynch 1998: 783). Procedural flexibility involves not only different ways of thinking about an artefact, but also different ways of giving it material life. For Jordan and Lynch, procedural flexibility

...is not simple a question of there being different ways of representing or thinking about the artefact in question. Procedural flexibility does involve

choices, interpretations and rationales for them but as a matter of procedure it implicates the material design and embodied enactment of the protocols used and disseminated in particular disciplines, establishments and industries. Procedural flexibility has to do with selections of alternative materials and instruments, precautionary steps and prophylactic architectures, the scale of repetitiveness of operations, and the methods and mechanism for coordination and standardizing practices. It implicates, and is implicated by, many features of the local economy at a specific production site, including the recruitment and training of staff and the costs and regulations involved (Jordan and Lynch 1998:784).

Thinking in terms of procedural flexibility facilitates the analysis of how health practitioners negotiate, adapt and sometimes create measurement tools or strategies adapted to the material resources available. Attention to the ways growth measurement and growth charts are used in the consultation room shows diverse aspects of the social life of standards, including the way users adapt them and integrate them into everyday life practices.

6.1 The Consultation Room

During several of my conversations with health professionals, growth assessment was described as a simple and old technique that could not offer much in terms of research purposes – at least not from a qualitative perspective. Doctors would frequently ask me about the inclusion of parents in my research. Some of their questions included if I was going to talk to the parents, if I was going to explore parents' attitudes, beliefs or practices around feeding practices or how they cope with a diagnosis of malnutrition. Suggesting the inclusion of parents expressed a genuine interest in knowing about parent's needs and practices; but it also spoke to how parents were perceived as better subjects of research than health professionals measuring children's growth. In the understandings of many health professionals across my fieldwork sites, the possibilities of social analysis on the anthropometric assessments of children was restricted to the world of parents and caregivers. Measuring was described as an objective, neutral practice. Parents' and caregivers'

practices and beliefs, on the other hand, were described as shaped by social and cultural dynamics. Dr López, a medical doctor in his 40s whom I met in Barranquilla, explained why he thought I should include parents in my research in terms of his understandings of anthropometric research

Look, a centimetre is a centimetre and a kilogramme is a kilogramme. That is a reality, a fact. The weight and the measurement tape do not lie. We measure and we draw the dots in the chart and then we make an interpretation of the growth pattern. There is not much I can tell you about the actual process of measurement. It's a very simple technique; it's not rocket science. You just need to follow some basic rules. The growth charts tell us where the child is located in the curves in relation to other children of the same age. We measure against a population of reference. There is nothing extraordinary about this, it's pretty straightforward. Parents, instead, they are interesting because they are the real ones who are responsible for the child's weight and height. We measure the child and when he is under or overweight, we have the responsibility to provide good information and advice. The information we get from the charts really has an impact on the parents and consequently on the child (Dr López, Barranquilla/B 2014).

Like Dr López, other health practitioners described growth measurement as an unproblematic and routine practice to assess children's nutritional status. During interviews, we often ended up talking about why children were malnourished and what kind of initiatives were important so parents could improve children's diets and nutritional status. The interviews seemed to go back and forth between what happens before and after a child was measured – but the act of measurement itself was often taken for granted, making questions about it seem unnecessary. It was only through the observation of growth assessments, and by spending time with doctors and nurses that I was able to identify some of the practices in which the politics of measurement and standardisation emerged. As opposed to what Dr López had told me, in practice, not all centimetres and not all kilogrammes were the same – just as being measured in La Guajira was not the same as being measured in Cartagena. The following fragments of my fieldwork notes in a consultation room in La Guajira and another in Cartagena show how anthropometric measurement takes place in different contexts.

Juan, La Guajira

Juan, a two year old boy, comes into the consultation room with his mother. They are both Wayuu⁴⁷. They left their home at 5:30 in the morning and walked for almost two hours to queue early enough that Juan could get an appointment with the nurse and be checked that morning. The Growth and Development program only runs on Wednesdays, so if they do not find an appointment they will have to come again next week. It's 10:30 am, and around 20 children are sitting in the waiting room, mainly with their mothers. Many of them, just like Juan and his mother, walked to the hospital for one or two hours; very few could pay for a bus ticket (which costs less than a pound).

The heat in the waiting room reaches 32 degrees. There are a few fans, but they are not enough. I am spending the day with Rubi, a nurse; she will be assessing children enrolled in the Growth and Development Program. She is in her mid-20s, and she has been working in the hospital for a year. She is from Valledupar, a city located on the Caribbean coast. She does not speak Wayuunaiki – nor does most of the medical staff. Consultations can be challenging when the patients do not speak Spanish.

The consultation room is a large space, approximately three meters square. There is a bathroom, a desk, and enough space for the examination bed and another table with basic medical instruments. I am sitting in a corner, trying to not be disruptive. Juan comes into the room with his mum. She takes out a plastic bag where she keeps Juan's growth chart to protect it from the dust of the desert, or occasional rain. She gives the chart to Rubi, who gives it a quick look and asks why Juan did not attend the assessment for month fifteen. The mother does not reply. I am not sure if she understood the question clearly. She does not seem to speak Spanish. Maybe she does not want to answer. I am not sure. The last measurement recorded in the chart is from a year ago, making it very difficult to determine Juan's growth pattern. Rubi feels pressure to measure Juan quickly in order to continue with the other children in the waiting room, so she does not ask many other questions.

Juan is wearing a t-shirt, shorts and sandals. She asks the mother to remove Juan's clothes, although when he is measured, he is still wearing his nappy. This might add a few extra grams to his weight, but I think Ruby does not want to remove it in case Juan has too pee. Juan does not want to stand on the scale, and he starts crying. He looks for his mother's arms and refuses to

⁴⁷ Indigenous community from La Guajira.

stand alone on the scale. After five minutes, Rubi gives up. She goes for an alternative option, less accurate but more practical: she weights the mother, and after that she weights her again, this time holding Juan in her arms. “Let’s see, your weight is 55 and with the baby it’s 66 kg. Juan must be around 11 kg.” Rubi writes the number on a piece of paper and proceeds to measure Juan’s height.

There is no stadiometer available, so she measures the child against a plastic measuring tape that has been attached to the wall. The metric tape is just like those that are used for sewing. The average temperature of this town is 30 degrees, and the tapes stretch easily in these conditions; over time, one centimetre can easily turn into 12 millimetres. The metric tape is also located one or two centimetres above the floor, but Ruby does not pay any particular attention to this factor. Juan is finally standing still without crying, and this is her opportunity to measure his height. He is 80 cm tall. Rubi goes back to the desk and writes the numbers in the medical record. Then she opens Juan’s personal health record, and locates weight and height in the curves. The booklet given to children in the hospital only includes the indicator weight-for-age and height-for-age. In both cases the charts are those from the NCHS, and data is organized around percentiles and not standard deviations. There is not much information about the previous measurements, and it is hard to know if Juan has improved or if his growth is slowing down. According to the chart, Juan is underweight, wasted and stunted. According to the WHO charts, the median for a child like Juan is 88 cm and 12.9 kg. Rubi asks the mother if she is giving the child enough food. The mother remains in silence. Rubi decides to send Juan to the hospital nutritionist, and recommends the mother to talk to the ICBF workers so Juan can be included in one of the food and nutrition aid programs that are taking place close to where they live (Fieldwork notes, hospital in Guajira, 2014).

Andrea, Cartagena

I met Ana for an interview in the health centre, and she invited me to stay with her so I could observe how children were measured. The consultation room was spacious and divided in two by a panel. When one enters the room, there is a desk with a computer and enough space for a child to play. There are a lot of toys on the floor, a little chair and a table. Behind the panel, there is a examination bed and some basic instruments (alcohol, a sharps disposal box, gloves). Ana, the nurse, is 32 years old. She is easy-going and very proud of being a nurse. Ten children are coming today, all of them having booked their appointment by phone.

Andrea's appointment is just after lunchtime. She is four years and five months old. When she enters the room, she looks healthy and happy. She is shy, but after a minute she is already playing with a doll and tells me she knows how to count to five in English. Ana and Maria, Andrea's mum, have a short conversation about the child's general wellbeing. Ana asks if Andrea has been sick lately, or whether Maria has noticed problems with the girl's language or motor skills. All answers are negative. Andrea gets her shoes off, and her mum unties her ponytail so Ana can measure her height. There is a modern stadiometer in the consultation room. Ana explains to Andrea that she is going to check how much she weighs; she is just wearing some shorts and a t-shirt, and Ana says it is fine to leave the clothes on. Ana stands just in front of Andrea, observes the number in the scale – 18.5 kg – and then asks Andrea to step down, and repeats the measurement to make sure it is the right number. As far as Ana is aware, the scale has not been calibrated in a long time, but she thinks it is still accurate and reliable. I am impressed by how careful Ana is measuring about measuring the child, how patient, and fast.

Ana spends another five minutes asking Maria questions about Andrea's development. There seems to be nothing to worry about. All Andrea's data is registered in an electronic health record that includes the growth charts. Andrea's health insurer used the WHO charts for weight-for-age, weight-for-height and height-for-age, all of them using standard deviations. Maria shows the nurse Andrea's personal health card so Ana can mark the corresponding coordinates in the curves for her personal records. The booklet is printed in colour and has around ten pages, including the WHO charts, the vaccination schedule, and a table with some information on the development of children under five. I can tell Andrea has come to many follow up appointments. The curves have six dots, and when they are connected they create an ascending line. Maria tells Ana she is concerned about her daughter's height; according to Maria, Ana is small compared to the other kids in the nursery. Ana explains the chart to Maria, and tells her that the most important thing is that she is growing; and then Ana adds, Andrea might not be the tallest, but she is growing in the range of normality, and one should only worry when the line stops going up or when children are really underweight – neither of which hold in Ana's case. Andrea will be back in six months for a follow up (Fieldwork notes, health centre in Cartagena/B⁴⁸ 2014).

Andrea represents a very select group of children, who live in the urban areas and have parents or caregivers able to pay for health services. She represents the ideal case among healthy children, those with access to water and food, who have been

⁴⁸ I will add the letter A in the parentheses of quotes gathered in the health centres of the more deprived areas of Barranquilla or Cartagena. I will use the letter B for those located in wealthy areas.

nourished and can overcome the typical diseases of childhood because their bodies are stronger. Juan, on the other hand, represents a significant group of the Colombian population who live in a context of discrimination, poverty and food insecurity. Juan represents the experience of many children in La Guajira, who live in isolated rural areas where the conflict was or perhaps remains active. Differences between Juan and Andrea were also extrapolated to the type of services to which they had access. Juan, for example, was measured using old and worn out instruments, while Andrea was measured with almost new instruments. Likewise, Rubi and Ana had different working conditions in terms of the amount of time they could spend with each patient, and in terms of the material resources they each had to assess each child.

Some of the differences between the health services I observed in La Guajira, Barranquilla and Cartagena were related to the way the national health system is organised. In Colombia, the health system follows a health insurance scheme in which each insurer has a network of care providers (hospitals, clinics and health centres). The hospital and health centre I visited in La Guajira were public health providers, owned by the department, their services provided to patients affiliated to the health system either through a contributory regime (a scheme that covers all citizens able to pay for their insurance) and a subsidized regime (a scheme that covers citizens classified as poor)⁴⁹. None of the other health centres I visited in Cartagena or Barranquilla were owned by the state. They were private health providers, selling their services to several health insurers. Just one centre in Cartagena was owned by a large health insurance company and they only offered services to their own clients.

⁴⁹ Since the early 1990s, the Colombian health system has followed a universal health insurance scheme with these two forms of affiliation. Formally employed and independent workers earning at least the minimum income must be enrolled in the contributory health insurance regime, and contribute 12.5% of their monthly salary. The poor, on the other hand, do not make contributions, and they are covered by the subsidized regime. In both regimes, insured individuals can choose their health insurer. Health insurers pay different health care providers (hospitals, clinics, health centres) to offer services to their clients. A health provider might offer its services to different insurance companies. However, there are cases in which the health insurer owns its own network of health providers (Escobar et al. 2009). By 2016 there were 40 public and private health insurers in the country (Ministerio de Salud 2018).

Figure 8. Health Centre in La Guajira



The fact that in Colombia, health providers and health insurers are diverse in terms of scale, number of users, facilities, and organisational models has an impact in the kind of services offered to patients. Compared to the health providers in Barranquilla and Cartagena, the hospital and health centre in La Guajira had not only fewer human resources to attend patients, but also fewer financial resources to invest in facilities and health services of high quality. Though all health providers I observed measured children and implemented the G&DP, the techniques and instruments of measurement, including the growth charts they used were diverse. In the following section, I show how weight and height monitoring differ from the recommendations given in Resolution 2121, but also how growth assessment diverges across health providers.

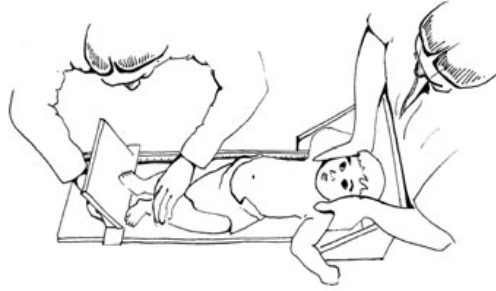
6.2 Height/Length and Weight Measurement: Guidelines Vs. Practice

Maria is 13 months old. She enters the consultation room with her mum and her grandmother. Maria has been weighed, and now her length is going to be measured. Maria is already uncomfortable after being weighed in the baby-scale, and everyone seems aware she might soon start crying. Her mum tries to make her laugh and keeps distracting her. The nurse locates Maria in the length board, and asks the mother to hold Maria's head against the headpiece.

The nurse straightens Maria's knees and then moves the footboard until it rests firmly against Maria's heels. Maria begins crying and moves. The nurse is uncertain about the measurement so she tries again. The procedure lasts a couple of minutes, and then the search for a number ends: Maria's length is 74 centimetres. The mother asks the nurse if Maria is normal, if 74 is a "good" or "bad" number. The nurse replies, saying it's a "good number", and then congratulates the mother for her for taking care of her daughter (Fieldwork notes, Barranquilla/A 2014)

According to the recommendations of Resolution 2121, children under two years old should be measured lying down, against a length board. This instrument must be made from wood or aluminium, with a measurement length of between 110 and 120 centimetres. The child is supposed to lay on her back with her head against the fixed headboard. The child's eyes should be looking straight up, the shoulders should touch the board, and the spine should not be arched. Some tension is applied to the knees to straighten the legs as far as they can go. Once this position is achieved, length can be measured. The measurement requires two people: one holding the infant's head while the other makes sure the knees are in the right position and takes the measurement (figure 9). Children over two years old should be measured standing against a stadiometer, also made in wood or aluminium and with a base of at least 25 cm wide. Shoes need to be removed, as well as ornaments or braids that might affect the measurement. According to the WHO recommendations and the Resolution 2121, the child's feet should be together and flat, the legs must be straight, the scapula against the backboard, the arms loosely at their sides, and the head must be positioned in a way that a 'horizontal line from the ear canal to the lower border of the eye socket runs parallel to the baseboard' (figure 10).

Figure 9. Figure Length Measurement



Source WHO (2008c:22)

Figure 10. Figure Height Measurement



Source WHO (2008c:23)

Even though children's length/height were measured in all the consultations I visited, in none of the consultations I observed were all the recommendations of Resolution 2121 followed. To measure length, most of the consultation rooms used a simple measuring board or infantometre. In only the consultations rooms of one of the facilities I visited, in Cartagena (B), did the nurse and doctor use measuring mats

(figure 11). In the case of the health centre in La Guajira, I also found that the nurse had attached and secured a measurement tape to the examination bed, to improvise an instrument that could work as a length board (figure 12). Even in a context in which professionals have access to limited material resources to assess children's growth, they find creative ways to adjust and work with what is available to them.

Figure 11. Measurement mat



Figure 12. Measuring tape on examination bed



The instruments used to measure height, on the other hand, were more diverse. Very few places that I visited during my fieldwork were equipped with a height board or a professional stadiometer that could be used to measure children. Most of the consultation rooms I observed had a ruler against a wall or door. In some cases, the ruler was made from plastic or acrylic, and it would be located as close to the floor as possible (figure 13). In other cases, the consultation room would use a height chart wall sticker, located, most of the time, approximately 60 cm above the floor (figure 14). While most of the places I visited would use one of these two options, during my time in the health centres, I also saw consultation rooms with instruments designed by the health professionals themselves to recreate stadiometers. In the hospital in La Guajira, for example, one consultation room had a measuring tape attached to the frame of a door (figure 15), while in Barranquilla, one of the health centres had a handmade ruler on the wall. Even when children's height was measured, then, in many cases the data collected was inaccurate because of the instruments used. As can be seen in some of the pictures below, the rules and measuring tapes might start one centimetre above the floor. In addition, measuring tapes can also stretch with time and with the temperature. Particularly in the case of La Guajira, children's height and weight values could easily be incorrect.

From left to right:

Figure 13. Example of measuring tape 1

Figure 14. Example of measuring tape 2

Figure 15. Example of measuring tape 3



As in the case of height measurement, weight measurement did not follow standardised procedures across health centres. According to Resolution 2121, consultation rooms should be equipped with a baby scale to measure children up to two years old and should have an accuracy margin between ten and twenty grams, and a capacity for between twenty and twenty-five kilograms. To measure children between two and five years old, the Resolution recommends the use of digital, electronic or mechanical scales with a capacity range for between 120 and 150 kilograms, and an ideal accuracy within at least 50 grams and not more than 100 grams. Though the requirements for the scales were not very difficult or expensive to achieve, in practice, consultation rooms tended to have scales that did not follow the recommendations.

Baby scales were diverse – being more modern in the facilities I visited in Cartagena and Barranquilla than those in La Guajira – but not as varied as the scales for children above two years. Most of the consultation rooms I visited were using mechanical scales: in some cases they were balance weight scales (Figure 16), but in

many others they were bathroom scales. In most of the consultation rooms, the scales were old and practitioners were not able to remember the last time their instruments had been calibrated or changed.

From left to right:

Figure 16. Example of baby scales 1

Figure 17. Examples of baby scales 2



In terms of measuring techniques, practices were not standardised either. To measure children under two years old, doctors and nurses often measured the mother or caregiver on her own, and then measured them a second time while holding the infant. This way, practitioners could infer the child's weight, as in Juan's assessment. Practitioners described this method as easier to use given that the child would normally be more relaxed than when he was measured in the baby scale. The main problem with this technique was that it increased the chances of human error. Two measurements are taken, and the professional has to calculate the weight of the infant by subtracting the recorded weight of the caregiver from the recorded weight of the caregiver and the child. The precision of the scales was often affected by simple practices in which the weight of the child was altered as well. The most frequent practice was to measure children with diapers or wearing trousers and t-shirts.

According to the WHO, ‘a wet diaper, or shoes and jeans, can weigh more than 0.5 kg’ (2008c:24).

As I have shown in this section, individual growth measurement takes place following diverse techniques and using diverse instruments. Far from following a standardised approach to measurement, health practitioners implement individual growth monitoring using the resources that they have available. The goal of Resolution 2121 to implement a uniform type of measurement has been integrated only into the local infrastructure or practice of the health systems in which the G&DP take place.

6.3 Use of Growth Charts in Practice

Once the child’s weight and height are measured, this data is plotted in the growth charts. Like the instruments used to measure children, growth charts were also highly diverse in terms of design and use. I observed that health professionals and parents are constantly interacting with two types of charts. The first type corresponds to the charts that are kept in the medical record of the child, while the second type corresponds to the charts contained in the *Carné de Salud Infantil*, or Child Health Card⁵⁰. This is a booklet given to the parents or caregivers of all newborns, which aims to provide them with a document where they can keep a record of the child’s growth, vaccinations, and development milestones. The charts in the child’s medical record remain in the physical or digital archives of the health provider, while the parents or caregivers of the child keep the child’s health card. In the six places I visited, only the hospital and health centre located in La Guajira were still using the NCHS charts for both their medical records and health cards, while the other health centres were using the WHO-CGS.

⁵⁰ Giving child health cards to the parents of a new-born became mandatory in 2002, through Resolution 1535.

In all cases, health professionals had to include children's measurements in the medical record of the child. With the exception of La Guajira, all the health centres recorded growth measurements in a digital version of the medical record. Once the doctor or nurse entered the weight and height of the child in the form, software plotted the growth cart of the patient. In the case of La Guajira, some of the patient's data was kept in digital form, including measurements for weight and height; but the charts were not plotted on the screen. Each child had a health record on paper, each file had a copy of the growth chart, and it was in that document that health professionals would keep track of the child's growth. Children's files included a legal-size paper with the weight-for-age and height-for-age charts printed in blue for boys and red for girls.

Figure 18. Example of NCHS charts for girls used in medical records

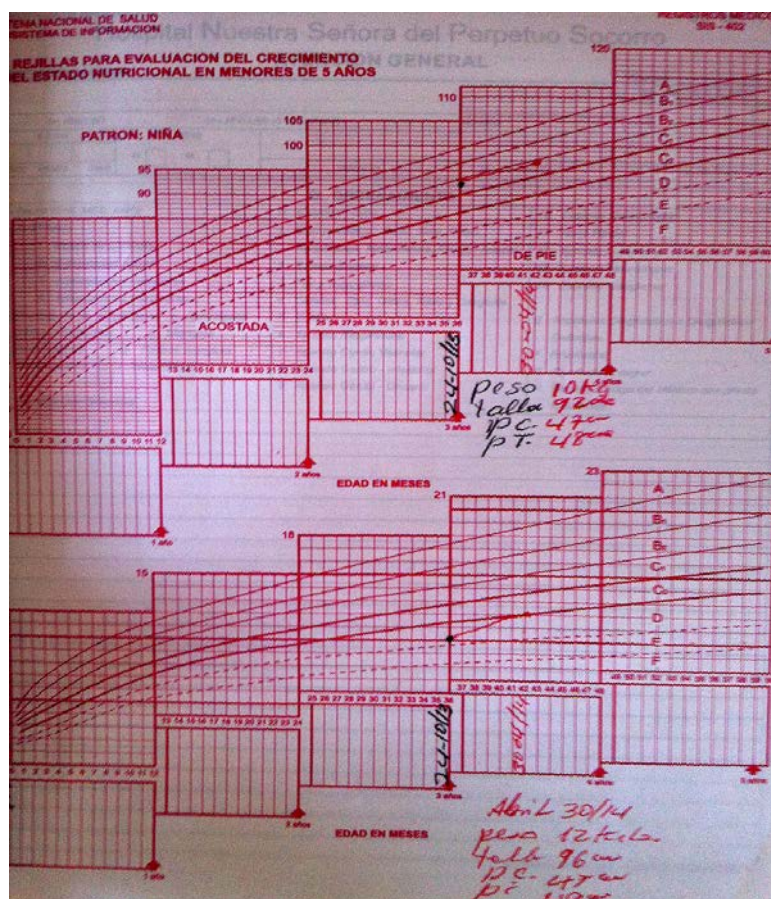


Figure 19. Example of NCHS charts in a Child Health Card

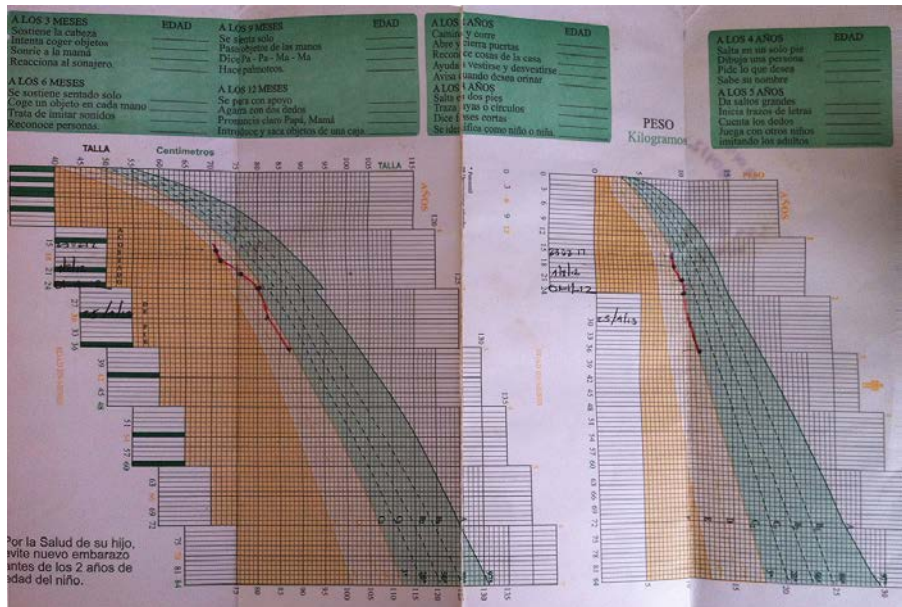


Figure 20. Example of the NCHS chart in a Child Health Card

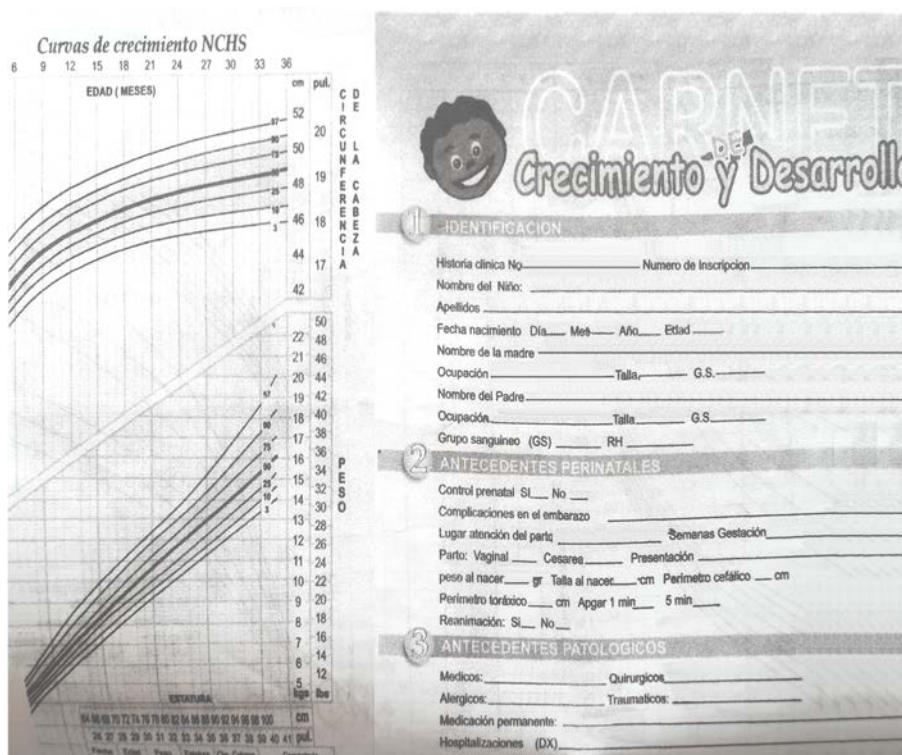
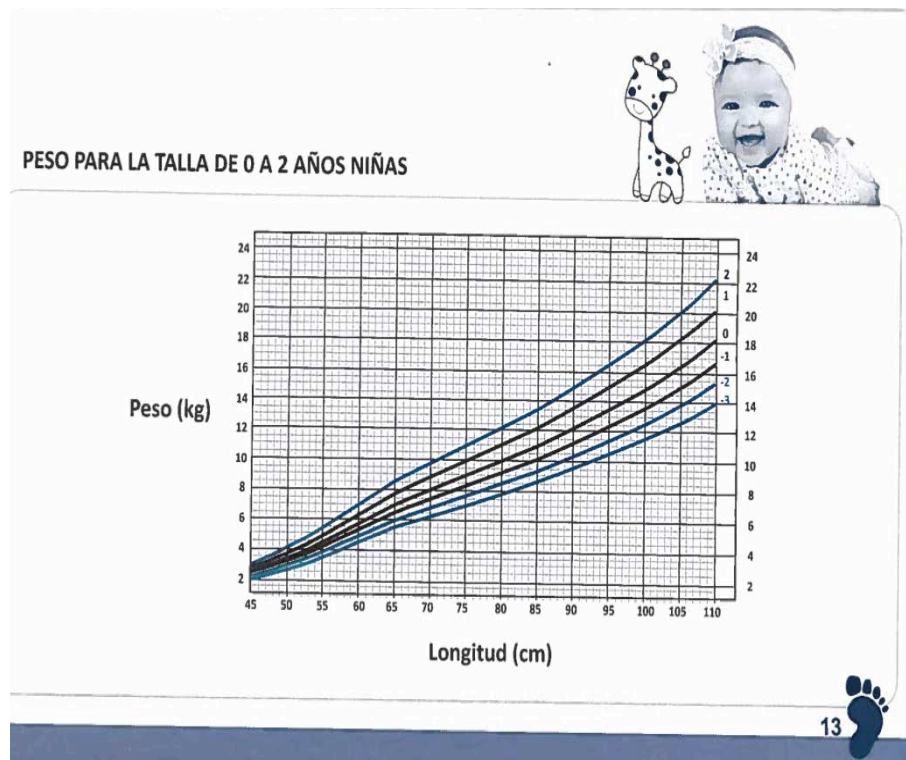


Figure 21. Example of the NCHS chart in a Child Health Card



In terms of the charts used for the child health card, I found that none of the health cards I saw followed a standardised design. Each health provider, and in some cases different health insurers, printed their own booklet. The only rule that health providers had to follow was that the health card had to include a set of growth charts and a table to follow the child's immunizations. Since the information system of the health sector in Colombia is not totally integrated – there is no single, centralized medical record for each patient that is shared regardless of the health insurance a person has – the health card functions as a mobile and patient-held record of basic key information about the child. The health card is an independent record form, and unlike the medical record, its data is not systematised within the information system of the health system. As a document, the health card is used by parents and caregivers, but also by health professionals and health visitors when the medical record of the child is not available (e.g. if the child changes health facility or health

insurer for the G&DP, or if the child attends a health program in which children's health records are not accessible).

The charts kept in children's medical records are used exclusively to register information on the health status of the child, and the information plotted in the charts can only be accessed by health professionals. Like all medical records, they are guarded by the hospitals, clinics or health centres. Child health cards, on the other hand, are constantly moving beyond clinical settings, linking the health system with the world outside the consultation room. Growth charts not only kept parents informed about growth, vaccinations, and future appointments; they were also highly valued as documents that could mobilise resources from the government. Milena, the nurse of the health centre in La Guajira, explained:

One of the reasons why parents bring their children to be measured is because they need the charts to claim their benefits from *Familias en Acción*. It is really sad to see those cases in which you can really tell that parents do not understand the importance of bringing their children to be measured. They just want to claim their money. All the incentives that the government is giving to vulnerable communities are making the Growth and Development Programme more active. The fact that they need the charts updated has a positive consequence, more children are coming to be measured – and that helps us to find children at risk and to identify children that need intervention to improve their nutrition (Milena, health centre of La Guajira, 2014).

Two main government initiatives targeting early childhood required a copy of the child health card. The first one was the program *Familias en Acción* (Families in Action), a program of the national government funded almost entirely by the World Bank and the Inter-American Development Bank. This program aimed to complement the income of extremely poor families with young children by giving beneficiaries a specific amount of money every two months (approximately 27 – 32

USD)⁵¹. Besides *Familias en Acción*, parents also required the health card to access one of the Centres for Comprehensive Development (CDI/*Centro de Desarrollo Integral*) in the country. These centres were public day-care nurseries for children under five years old. The service was free, and restricted to children coming from low socio-economic backgrounds. One of the benefits of the centres was that they implemented a nutritional program meant to cover between 40% to 70% of the daily caloric and nutritional requirements for a child (Ministerio de la Educación Nacional 2012). In both cases, the growth charts acquired new meanings: for the parents, they mobilised resources; and for the government, the growth charts became a tool of surveillance over parents and children. By asking for a health card signed by a doctor or nurse, the government had found a way to make sure that children were attending the G&DP.

In terms of format, child health cards were diverse in terms of content and size. The card used in La Guajira looked like a brochure printed on legal size paper and folded in four parts⁵². On one side, it contained the personal information of the child and the vaccination schedule; on the other side, it had the NCHS charts for the indicators weight-for-age and height-for-age. Some of the cards were printed in colour (blue for boys and pink for girls), but many others were photocopies in black and white printed on regular paper and then folded. The same health cards have been used for many years, and the health professionals I talked to did not recall having another card before that one. In an informal conversation with one of the doctors of the hospital, I was told that one of the reasons the health cards were not updated was a lack of resources. According to Dr Martinez, if the hospital still had material printed, it was not a priority to spend money on the design and printing of new material.

The health cards used in the other health centres I observed were clearly different from those used in La Guajira. They included the WHO charts for weight-for-age,

⁵¹ In 2014, *Familias en Acción* invested \$1,149 million US aiding approximately 2.6 million households

⁵² Since the health centre is dependent on the hospital, both places use the same growth charts and child health cards.

height-for-age, weight-for-height, BMI, and head circumference for boys and girls, as recommended in Resolution 2121. Most of these health cards were booklets with several pages, including information about breastfeeding and child development as well as several tables to keep a record of vaccinations, oral health and growth. Differences between the health cards in La Guajira and those in Cartagena and Barranquilla show vastly unequal ways of measuring children.

In order to explore how wide-spread the use of the new charts was in Cartagena and Barranquilla, I visited a CDI in each city. While talking with the nutritionists in charge of the nutrition programmes of each centre, I was told that growth measurement was still not standardised throughout the health system, and that child health cards using the NCHS chart were still common. The diversity of growth charts became evident in the CDI in Cartagena, one of the biggest in the city, which serves 300 children. While I was interviewing Johanna in her office, she decided to select fifteen folders from a pile she had on her desk. The folders contained the nutritional information of a child attending the CDI, including a copy of the growth chart that the parents had to show as a requisite to get a place. From among the files, she selected six children who were measured against the NCHS charts. The other nine had been measured against the WHO-CGS. The charts were also diverse in terms of size: some were printed on a full legal-size paper, others on half- sheets; some were printed by the health insurer, and still others by the health providers. In a couple of cases they were printed by pharmaceutical companies. Some health cards included the chart for weight-for-age, while others also included height-for-age, weight-for-height, and BMI.

For Johanna, the information in the charts was not only diverse but also unreliable, so she did not pay much attention to it. In her eyes, this documentation was just required to prove that the child was visiting the doctor; the chart could not be used as a source of data to assess children's growth. Because the documents did not share a standard chart, nor common agreements regarding nutritional classification, Johanna felt that she could only trust the information she collected every two months in the

growth monitoring program of the CDI. The charts that parents were providing to the CDI every year were filed as they did not have information that the nutritionist could trust.

Children are not measured very often in the health sector, so it's difficult to tell the growth pattern of children. Besides, I can't trust these measurements because I can't guarantee they were taken in a standardised way. As you can tell, they are so diverse in their design, size and anthropometric indicators. For me this is just a piece of paper. I only trust our own growth monitoring program. I measure the child and I follow up her growth. We use the WHO-CGS and I include all the data in ANTRO [the WHO software]. Data is also recorded in the software from the ICBF, because we work together. The child health cards are useful to keep track of some basic information about the child, like vaccinations, and sometimes they are useful to explain to parents what is going on with their children, but they are not very useful for serious follow up purposes (Johanna, CDI, Cartagena 2014).

Johanna's quote illustrates how the lack of trust in the data collected by other professionals, resulting from a lack of standardisation, constrained the transferability of data between the health system and the CDIs. Difficulties exchanging data also inhibited cooperation between actors. In the particular case of the CDIs I visited, the growth charts provided to parents within the health system were regarded as just bureaucratic documents rather than medical records containing relevant data about the child's growth.

6.4 Interpreting weight and height

As I discussed in the previous chapter, policy-makers and experts at the national level often described the adoption of the WHO-CGS as pivotal – mainly because these charts were promoted by the WHO as able to represent how children should grow. A diverse reference sample was favoured as a better tool for assessing breastfed children and children coming from indigenous communities. The standardisation of growth measurement was expected to improve the quality of

epidemiological data about malnutrition in the country. But four years after the Resolution was published, as we have seen, there was still diversity in terms of both instruments of measurement and growth charts.

My descriptions of different charts and instruments used in consultation rooms illustrate how anthropometric assessment takes place in practice, and how the materiality of measurement constantly challenges standardization. But even when measuring tools are not standardised, practices of measurement still take place, and users – in this case health professionals – find ways to cope with this reality. In some cases, professionals improvised their own measurement tools, like the measuring tape attached to the examination bed or to the frame of a door. Even when the instruments were there, many were not calibrated, and could generate inaccurate data. Seen from the perspective of how measurement should be done, these practices produced not only poor-quality data, but also mistaken nutritional classifications. In children, one centimetre or one kilogram could mark a real difference between a normal and an abnormal weight or height.

In practice, however, nurses and doctors were not so concerned about the accuracy of their data. In the majority of interviews and informal conversations I had with practitioners, they indicated awareness about the accuracy problems associated with the instruments they were using. While they described it as a less-than-ideal scenario for measurement, most mentioned that weight and height were not the only variables they were taking into consideration to assess children's health status. When I asked whether they trusted their instruments, three general practitioners answered me thus:

Of course I know this height table I have is not the best, and I might not have the exact value, but one knows when those centimetres matter and when they don't. If a child is healthy, happy and is still in the range of normality when I measure him, I do not get concerned about the accuracy of the instrument. An endocrinologist or a nutritionist, on the other hand, they should have instruments that are precise, because for them a centimetre or a kilogram matters a lot (Dr Sánchez, health centre in Cartagena/A 2014).

When I assess whether a child is growing healthily I look at the child's hair, eyes, teeth, the skin, language, motor skill. A child might be short and according to the charts stunted, but if the weight for the height is correct and the child looks healthy I don't get too concerned (Dr Rodríguez, health centre in Cartagena/B 2014).

If I were doing research I would never trust data coming from the Growth and Development Program because not everybody has the right instruments. And people still make many mistakes when measuring a child. We work with what is available. If one is concerned, the patient is referred to a paediatrician, a nutritionist, or an endocrinologist. With experience and time, you just know when there is growth failure and when the child is just short or has a slow growth velocity, which is perfectly fine. Children that come to this program are normally healthy or at risk, but never in severe condition (Dr López, Barranquilla/A 2014).

In all three quotes, the importance of experience and context was emphasised. The collection of accurate data was relevant only if it was used for research, or if the doctor or nurse had identified other signs of alarm related to malnutrition.

The lack of standardization in practice, and the fact that health professionals did not trust previous data collected in the medical records or the child health cards, also constrains interpretations of the growth pattern of a child. During several appointments, nurses and doctors were making decisions based on the measurements that they had just collected, rather than looking at the growth pattern of the child. Without previous data plotted in the charts, it was difficult to interpret whether a child was gaining or losing weight, and whether the child was gaining height. One of my observations in Cartagena illustrates some of the challenges professionals face when they do not have enough data available from previous measurements, or when data does not look convincing.

I was observing a consultation with a child of five years old in one of the health facilities in Cartagena. The doctor measured his height and weight. After collecting all the information relevant for the appointment, she opened the child's medical record on her computer and then she asked the software to show her the chart for height-for-age. When the software displayed the chart, I noticed that it had the shape of a wave. It went slightly up and down. When the patient left, the doctor smiled at me and asked: "Have you seen that chart?"

It looked like an electrocardiogram. I deal with this more often than I should. It is obvious that the child did not grow tall and then get short. If we just look at the chart then we would have the growth pattern of a strange little creature [we laugh]. I am certain that child did not lose two centimetres since the last appointment.” Dr Rodríguez highlighted that this was the perfect example of what can happen when professionals do not share a common standard. Maybe in the previous appointment, the child kept his shoes on, or maybe the instruments used were very different from hers, or maybe the doctor or nurse wrote the wrong value. In order to make an interpretation of the patient’s growth, Dr. Rodriguez decided to compare the measurement with a table of ideal height for the age of the child, and based on that, and on the rest of the clinical examinations, she decided to classify the child as having a normal height (Fieldwork notes, health centre in Cartagena/B).

In this case, the doctor interpreted the measurement she took by comparing it against a table of ideal heights for a boy of the same age as the patient. Just as in those cases where previous data was not available, making an interpretation or diagnosis regarding the child’s height was difficult with the sometimes-unreliable charts. The complications around not having enough data to determine if the growth pattern of a child was normal or not were clearly explained to me by Dr Sánchez in Cartagena:

In the context of growth monitoring, what is valuable is the accumulation of data throughout time. Every dot in the curve matters because this is what can really tell you if a child is growing in the range of normality. It often happens that a child comes to the consultation room and you measure her and you think she’s below the average height. However, when you look at the previous measurements, you notice that the child has been growing along the same channel of growth, the same percentile. In those cases, there is nothing to worry about. That is what is normal for that particular child. A child might be short and still be healthy. The real problems come when you have a child whose growth velocity changes in a significant way. In those cases, you will probably have many other warning signs telling you that child might be ill: the hair, skin, weight and so on (Dr Sánchez, health centre in Cartagena/A).

When previous measurements were not reliable or were non-existent, doctors and nurses used the NCHS or WHO tables of ideal weights for age or height to infer whether the child had normal growth. In almost all the consultation rooms I visited, I

noticed that these tables were available, and for many, they were significant objects with which to assess children's growth. While the tables could describe the mean weight or height for a specific age, omitting the trajectory of growth could be problematic in some cases. A child could be classified as being at risk of wasting on the day of the appointment, but without the previous measurements it was impossible to identify whether the child was losing or gaining weight.

Nidia, the nutritionist at one of the CDIs I visited in Barranquilla, offered an important example to illustrate the importance of having a series of measurements when interpreting children's growth. She mentioned the case of a girl that she classified as being underweight and stunted, who required referral to a nutritionist working in the health system. Basic lab tests and medications were prescribed. When the parents took her to a doctor, he disagreed with the CDI nutritionist, and did not approve the referral to another nutritionist. According to Nidia, the doctor classified the child using different growth charts and instruments, and because the child was not severely underweight, she fell into a grey area where two different people could reach different diagnoses. If the child had been severely underweight, she could have attended hospital directly, and likely a consistent diagnosis would have been more easily agreed upon. However, since the doctor did not have access to data collected bimonthly, like the nutritionist did, he had not noticed that the pattern of growth was not progressing, and that the child needed more attention. Nidia gave the parents of the child a copy of the chart she uses to follow up children in the CDI to take to the doctor so they could prove the child's failure to thrive. According to Nidia, the doctor was mainly paying attention to one point in the chart, but not to the specific growth pattern of the girl.

The nurses and doctors I talked to were not completely aware of the characteristics of the new WHO-CGS charts. Among the eleven interviews I conducted in the health centres and hospital, only three doctors and two nurses knew the characteristics of the WHO-CGS. In all cases, they described the new charts as 'better' because they

were based on breastfed children. Like others, they noted that the WHO-CGS were based on a reference sample that included children from different countries. These interviewees also noted that the NCHS charts could make the Colombian population look smaller, given that the reference sample for the NCHS included exclusively children from the United States. Having a new chart with a diverse reference sample could facilitate the measurement of a population, like Colombia's, with a multi-ethnic background.

Given that only the hospital and the health centre in La Guajira had constant experience working with indigenous communities, I had several discussions with the health professionals working there about the idea that the WHO-CGS could provide better data to measure indigenous children. I was surprised to find that in general, they seemed to agree that rates of stunting and wasting in La Guajira were not down to the sorts of charts that were used – conditions were so extreme that any growth chart would show similar results.

Yes, the new charts might be better because they don't include just white children. But I don't think their use make a specific difference for indigenous children. Any chart, the NCHS or the WHO charts can show if a child has acute or chronic malnutrition. In individual monitoring what matters is the growth pattern; the chart you use does not make a big difference (Rubi, hospital La Guajira 2014).

In an interview with Beatriz, the only nutritionist at the hospital in La Guajira, I asked what she thought about the idea that indigenous children were short because they were indigenous. Her answer condensed what other doctors and nurses in the hospital had told me in formal and informal conversations.

Wayuu children are suffering a lot, I have cases of undernutrition all the time. I think children here are in fact shorter than the average Colombian child. Part of it is connected with their ethnic background. They are indigenous and they will not be super tall. Have you seen their parents? They might be

around 1.50m maximum. They are small. On the other hand, it is also true that those children live under very difficult conditions. Their diet is not the best and access to water is difficult. Many are really poor. This is the story of the Wayuu but also the story of many other indigenous communities in the country. It has been decades of exclusion; of course they are shorter than the average Colombian who lives in the cities (Beatriz, hospital La Guajira 2014).

For professionals working in La Guajira, indigenous children were shorter given a combination of two aspects – both related with their ethnicity. The first was that they were one of the most vulnerable groups of population in the country; they frequently lived in conditions of poverty and food insecurity. Given their living standards, they could hardly achieve their growth potential. The second was related to the genetic background of these communities. Due to chronic exposure to precarious living conditions, as a population, the Wayyu have struggled to achieve ideal potential height. If parents are short, it is likely that their children will be short too.

The fact that the hospital and the health centre in La Guajira were still using the NCHS charts was not described in the interviews as a concern. Practitioners did not have resources for that purpose; but they also noted that the NCHS chart was ‘doing the job’, at least in the hard-working conditions that they were facing. In one of my interviews with Beatriz, she pointed out the challenges of working with indigenous communities that are isolated and hard to reach. While describing her concerns, she also made a clear point regarding the use of the NCHS charts.

Life in the desert is not easy; reaching the communities is hard work. People in Bogotá imagine that children die because we don’t do our job correctly. But I wish they could see what it is like when we have a child severely underweight in a Rancheria [rural settlements] that is located three hours from here, in the middle of nowhere. If the child goes to the health centre or the hospital we transfer him to Riohacha [the capital city]. We do not have what is needed to recover children in severe conditions. We work hard with what we have. I do this because I love it. I am not getting rich here. Many documents, resolutions, guidelines are produced in Bogotá but that does not mean we can implement what they want. We have a lot of printed booklets that we can still use [referring to the child health cards]. We are measuring

children, we are still doing our job. Does it really matter if I use the Cuban charts, the NCHS or the WHO charts? (Beatriz, Guajira 2014)

Beatriz's observations demonstrate how processes of standardization do not occur in isolation, but within an infrastructure in which work practices, national and international policies, material resources and social and cultural dynamics are nested within each other. Beatriz stressed not only the challenges associated with the social and geographic conditions of La Guajira, but also the tension between local practices and national policies designed in Bogotá. For Beatriz, like for other health practitioners I talked to in La Guajira, the shift between charts was secondary considering the basic limitations the hospital still faced in terms of human and material resources.

6.5 Final remarks

In the previous chapters, I explored the creation of the WHO-CGS and their adoption and adaptation at the national level. In this chapter, I showed how standards are, and are not, integrated into existing infrastructures where growth monitoring takes place in practice, such as the G&DP. After observing six settings in which growth assessment was conducted, the lack of standardisation of charts, measurement tools and measurement techniques were striking. Four years after adopting the new charts and releasing Resolution 2121, not all health facilities and health professionals were following the guidelines. Standards are not adopted *in novo*; they are integrated into existing infrastructures and institutional settings with specific needs and resources. As I described for La Guajira, neither the hospital nor the health centre had migrated standards or caught up with the requirements established by the Resolution regarding instruments of measurement – though it is in contexts like La Guajira that growth monitoring and preventive assessments should be a priority. At the same time, La Guajira is also the place where anthropometric assessment was most limited by material, financial and human resources. Those that depend on health services the most, in other words, are also those who are most excluded from practices of

standardisation. Though health professionals have developed ways to assess the health status of a child using the resources that they have available, that does not mean that growth monitoring for preventive purposes can accomplish its main goal: to follow up children's growth, find children at risk, and provide services as early as possible to guarantee a successful recovery. In a context like La Guajira, social inequality is reproduced in both the material and procedural aspects of measurement.

The lack of standardisation also means that anthropometric data is often unable to travel beyond the consultation room, limiting potential cooperation between programs within the health system that might otherwise improve the implementation of nutrition surveillance systems. As I described in the fourth section of this chapter, health practitioners rely on different variables to assess the health status of the child, and to interpret the measurement of weight and height. Those variables include clinical signs as well, including the clinical record of the child and what professionals can infer from the living conditions of the patient. This information fills in for the lack of trustworthy anthropometric data. However, as soon as the data loses its context and is isolated as a dot in a chart, the information stops being useful for allowing cooperation between different communities of practice. Health professionals do not trust previous data on the child, and the CDI and the G&DP have difficulties using

each others' data. As a result, that data may create an under- or overrepresentation of cases of malnutrition within the local statistics (at the level of municipality or department).

Chapter 7. Measuring Malnutrition at the Population Level: Changing Standards, Changing Numbers

Shifting from the NCHS to the WHO-CGS implied adopting a new growth pattern as the benchmark to assess children's growth. The earlier benchmark, based on the growth pattern of white US children who were mainly fed with formula, was replaced by a new benchmark based on exclusively breastfed children from a range of countries, which enabled new classifications regarding normal, optimal and abnormal growth. As I showed in chapter four, the idea that breastfed children grew differently from formula-fed children during the first year of life was one of the main motivations for developing new growth charts for international comparison. Therefore, using the NCHS charts to assess breastfed children could lead health professionals to mistakenly identify infant growth as inadequate, and consequently to recommend unnecessary supplementary feeding or a halt to breastfeeding (de Onis et al. 1997:1). According to the WHO, the new standard derived from breastfed children would enable a prescription for how under-fives *should* grow.

The change in standards came together with a new way of understanding and classifying children's bodies. Since the nutritional classification of children is referential, a normal or abnormal growth can only be established by comparing the child against a reference sample of children of the same age and sex; a change in the standard produces a new way of defining the subject that is measured. The power that standards have to enable new entities and subjects in biomedical practices (Timmernans and Berg 2003) became evident in the measurement of the nutritional status of children at the population level. With the shift between charts, some children that were classified as having a normal growth with the NCHS became classified as overweight with the new charts, while in other cases, children that were underweight had a normal weight according to the new charts. At the population level, different studies showed that the prevalence of stunting, wasting and overweight could be higher if measured against the WHO-CGS than if the NCHS charts were used (de Onis 2006, Wang et al. 2009, Nuruddin et al. 2009).

In the particular case of Colombia, the changes in the prevalence of malnutrition during early childhood were calculated when the Ministry of Health, the INS and the ICBF implemented the second ENSIN in 2010. The ENSIN analysed its data using both the NCHS and the WHO-CGS, reporting a higher prevalence of stunting and wasting and a lower prevalence of underweight when measured against the WHO charts than when measured against the NCHS charts.

For almost thirty years, the country used the NCHS charts to measure malnutrition in national surveys; the adoption of the WHO-CGS challenged the existing indicators of malnutrition, forcing health policy-makers and government officers to give meaning to the new statistics. The transition between standards created a context in which the metrics of malnutrition became dynamic, losing their ability to look like stable numerical accounts of an external reality, i.e. as objective descriptions of the population. This disruption generated by the shift between charts rendered the standards more visible, providing an ideal opportunity to examine how standards work and what standards do (Bowker and Star 2000).

In this chapter, my analysis moves from the use of the WHO-CGS to measure individuals to their use for measuring the population. Using the case of the ENSIN 2010 and the consequences of adopting the WHO charts to measure malnutrition in Colombia, I show how the adoption of the WHO standards enabled the creation a new epidemiological reality, in which more children were malnourished. Given that the ENSIN is a pivotal source of information for policymakers, politicians, government officials and investors, in this chapter I also explain how the adoption of the WHO-CHS constitutes a relevant example of how standards shape quantification practices used for policy formation and governance. Most of the data I used for this chapter come from a set of ten interviews with policy-makers, researchers and civil servants that participated in both the design and implementation of the Resolution 2121 and the ENSIN 2010.

The chapter is divided into three sections: the first section describes the ENSIN and explains the reasons why this survey is a key source of epidemiological data in Colombia. The second section discusses the consequences of adopting the WHO-CGS for the measurement of malnutrition and the last section discusses the challenges that the transition between charts triggered in terms of comparability with previous statistics.

7.1 The ENDS: Measuring Nutrition through a National Survey

In 2010 the Ministry of Health, the INS and the ICBF implemented for the second time the ENSIN, a cross-sectional household survey exclusively dedicated to collecting data about the nutritional status of the Colombian population through questionnaires, anthropometric measurements and biochemical markers⁵³. The first ENSIN was implemented in 2005 and since then it has been taking place every five years⁵⁴. The survey covers a representative sample of households in both rural and urban areas across the 32 departments of the country⁵⁵. The ENSIN collects data on key topics related with the nutritional status of the population including household food security, exclusive and complementary breastfeeding, food consumption frequency, body-weight perception and practices around watching television and playing video games.⁵⁶

⁵³ Blood samples were collected to assess micronutrient deficiency.

⁵⁴ The ENSIN 2015 was delayed and its results were only published this year. For this reason, I do not include it in my analysis.

⁵⁵ The sample of the ENSIN 2005 was 17.740 households and the ENSIN 2010 included 50.000 households.

⁵⁶ The survey's data collection took approximately ten months and was done by 15 teams composed of four surveyors, one nutritionist, one bacteriologist and a team supervisor. According to the ENSIN report, all members of the team were trained before collecting data, and in the specific case of the anthropometry module, the nutritionists were trained to follow standardised measurement techniques.

The objective of the ENSIN is not only to estimate the prevalence of the main nutritional problems affecting the Colombian population but also to generate information to plan, strategically monitor and assess public policy. Researchers and policymakers often use the ENSIN to characterise, analyse and follow up changes in specific health-related topics of public health interest (e.g. eating practices, micronutrient deficiencies). The national and local government also use the ENSIN results to identify the population that needs to be prioritised in terms of resource allocation and health strategies and programmes.

Before the first ENSIN in 2005, the national prevalence of stunting, wasting and under- and overweight was established using the National Demographic and Health Survey (ENDS)⁵⁷. The ENDS is part of the Demographic and Health Survey Program (DHS), an initiative mainly funded by the United States Agency for International Development (USAID) with support from other donors and countries.⁵⁸ The aim of the ENDS (as of the ENSIN) is to generate information about demographic and health variables that can be used to monitor and assess programs or to create or improve policy. Since 1990 and until 2005 the ENDS was the main source of information about the prevalence of malnutrition in the country⁵⁹.

During the late 1990s, the Colombian government transformed its policies on nutrition and food security. In 1996, the first National Plan on Food and Nutrition

⁵⁷ Part of the data collection of the ENDS included the measurement of weight and height of the population between zero and 18 years old and weight, height and waist circumference for the population between 18 and 64 years old.

⁵⁸ The program has conducted over 300 nationally representative household surveys in more than 90 countries since 1984. DHS surveys are mainly focused on domestic violence, fertility, family planning, HIV/AIDS, malaria, maternal and child health (e.g. vaccination, child mortality, pregnancy) and nutrition and they are designed to allow international comparability (WHO 2012).

⁵⁹ Even though the ENDS collected data about the nutritional status of the population, this information was not enough to conduct a comprehensive analysis of the nutritional status of Colombians and its relation with variables like food intake, micronutrients deficiency or physical activity. For this reason the Colombian government decided to implement a new national survey, the ENSIN, able to collect data about different variables related with nutrition and food security but also able to implement both anthropometric and biochemical assessment of the nutritional status of the population.

(1996-2005) was created and in 2008 it was replaced by the National Policy on Nutrition and Food Security-Conpes 113. As opposed to previous initiatives that were initiated by successive governments, both the national plan and later on the national policy were designed to be long-term strategies that would remain stable beyond each elected government⁶⁰. The National Policy in particular, established a set of sixteen goals to be accomplished by 2015, which included the reduction of the mortality rate caused by malnutrition of children under five years old, the reduction of the rate of children with anaemia, the reduction of stunting, wasting and underweight and the increase of the overall breastfeeding rate.

The efforts of the national government to consolidate the policy on nutrition and food security and the plans and strategies associated with it triggered the need to generate a tool of measurement especially oriented to variables that could characterise the nutritional status of the population from a comprehensive approach. Even though the ENDS provided information about the nutritional status of the population it did not include enough information about food security in the households, breastfeeding, eating practices or physical activity. Moreover, as the ENDS was part of the DHS project it followed specific standardised questionnaires designed to facilitate international comparison and in that sense, as a tool of measurement, it was not flexible enough to allow the inclusion of several new variables. Within this context, the Ministry of Health, the ICBF and the INS promoted the creation of the ENSIN as an independent survey exclusively designed to measure the prevalence of variables related with food and nutrition security.

In the context of international comparison, the ENSIN and the ENDS constitute the most frequent source of international metrics that develop rankings and indexes using malnutrition estimates to measure development across the globe. The prevalence of underweight for example, was used to monitor the accomplishment of the MDG's. Likewise, the prevalence of underweight has been used for the Child

⁶⁰ During the late 1970s and 1980s each elected government designed the national initiatives on nutrition. Therefore, they normally had an implementation time of four years maximum.

Development Index (CDI) while the prevalence of stunting has been used since 2010 as one of the variables of the Multidimensional Poverty Index (MPI) and as one of the monitoring indicators of the Sustainable Development Goals.

7.2 The ENSIN as a Reliable Source of Data

Most of the policy-makers, researchers or civil servants working on nutrition, food security and early childhood I talked to during fieldwork described the ENSIN as the only source of reliable information about the nutritional status of the Colombian population. Even though there are other sources of epidemiological data about malnutrition during early childhood, such as the Sistema Nacional de Salud Pública (SIVIGILA)⁶¹ and several local nutrition surveillance systems, the ENSIN and the ENDS are the main sources of data on the national prevalence of underweight, stunting, wasting, overweight and obesity.

There are three main reasons why the ENSIN is a pivotal source of data for the country. The first one is that the ENSIN is the only study that generates estimates of malnutrition based on a representative sample. The data that the SIVIGILA or the local nutrition surveys described is only based on cases of malnutrition reported every epidemiological week. The second reason is that the survey collects data of all children living in the households selected in the sample of the survey, therefore, it includes both healthy and malnourished children. The surveillance systems, on the other hand, are mainly based on cases of severe malnutrition. The third reason is related with the quality of the data of the survey. The anthropometry module of the ENSIN is conducted by a group of nutritionists trained to follow the same guideline to measure children using calibrated and standardised instruments of measurement. The nutrition surveillance systems, on the other hand, use data reported by health providers (health centres, hospitals, private practices) that, as I showed in the

⁶¹ National Health Surveillance System

previous chapter, do not necessarily follow standardised procedures to assess children's growth.

These three reasons were frequently highlighted in interviews and informal conversations with researchers, policy makers and civil servants involved in the implementation of the ENSIN. A fragment of an interview I conducted with Alejandra, an epidemiologist and a civil servant that participated in the design of the Resolution 2121 and the ENSIN 2010, illustrates a common narrative among interviewees:

In terms of accurate data, the ENSIN is all we have. The surveillance systems we have so far cannot tell us accurate information. If you ask me how many stunted children we have right now in the country, or how many children are severely wasted, I would not be able answer you with certainty. We do not know. Some surveillance systems are better than others. Bogota, Antioquia and Cundinamarca are good examples, however they work at the scale of departments. At the national level we just follow low birth weight and mortality associated with malnutrition. My data relies on what the hospitals or health providers report. How can I trust that data? I am sure you have seen that in some places, weight is measured using bath scales, it is just not good data. The ENSIN, on the other hand, is conducted carefully, the nutritionists that go to the field are standardised, they know how to collect the data. In addition, they travel with their own equipment. That includes the scale, the stadiometer and the calibration weights. The ENSIN's data is delightful. It is reliable. There is nothing that as an epidemiologist I value more than being certain that I can trust the data (Alejandra, Bogotá 2014).

As opposed to what I described in the case of individual growth monitoring in which the interpretation of weight and height measurement heavily relies on the context in which the child is measured, in the case of the ENSIN the use of standardised procedures allows data to be decontextualized to be comparable. In consultation rooms, health professionals interpret data based on the growth pattern of the child, other clinical signs and on the data parents can provide. Once the data needs to travel outside the consultation room, the lack of standardisation limits cooperation between different communities of practice. In the particular case of the ENSIN, the standardisation of data collection generates trust in the data and its robustness to be

used even when it is detached from the body/medical history of the participant of the survey or from the circumstances in which the measurement took place.

In an interview with an epidemiologist that participated in the extended committee, I asked about the differences between the ENSIN and other sources of information about nutrition. In her answer Carmen described the ENSIN as a ‘Polaroid picture’ of the country in which the sources of error or bias are reduced enough to produce health indicators of good quality.

The data derived from health insurers is useful for local surveillance. However, this information does not tell us the prevalence of malnutrition in the country. The collection and follow up of cases of malnutrition can tell us how the population is doing and they can help us to identify the places where we need to pay more attention. However, this data is full of bias and with too many mistakes making its interpretation quite difficult. The ENSIN, on the other hand, is designed with the purpose of measuring the Colombian population. Many variables are controlled so there is less error and bias. We try to control as much as possible how data is collected and recorded. The ENSIN survey is like a Polaroid picture of the country. Every five years we take a picture (Carmen, Bogotá, 2014).

In the context of the ENSIN, the singular measurements for weight and height, is what is valuable as data⁶². Through the use of standard instruments and procedures, weight and height measurements become self-contained units of information that can be compared. This is a key reason why the ENSIN is valued by policy-makers, government officials and researchers, not only as a source of accurate information, but also as an ideal measuring tool to generate indicators to monitor and assess the existing plans, strategies or policies targeting nutrition and food security across different regions of the country. The narratives of interviewees regarding the ENSIN showed how the standardisation of measurement, or at least trusting that data was collected following standardised procedures, improved not only the quality of the data but also the possibility of decontextualizing it in order to make it comparable. The ENSIN, as Merry (2016) has described in her work on indicators, was described

⁶² In a context like the G&DP, the measurement of weight and height, at least ideally, is only valuable in comparison to a previous measurement. What is important is the growth pattern of the child.

as being a source of object and transparent data robust enough to generate knowledge about the population and inform decision-making.

7.3 Changing charts, changing numbers

When the ENSIN 2010 was in the process of being planned and designed the working group discussing the adoption of the WHO-CGS was working on the production of the Resolution 2121. Given that the Ministry of Health, the INS and the ICBF were the institutions in charge of the ENSIN and the Resolution 2121, many of the professionals involved in the planning of the survey were also actively participating in the debates around the adoption and implementation of the WHO-CGS. Having a similar group of policy-makers, experts and researchers working on both projects created ideal conditions to coordinate efforts in the production and analysis of data in a moment in which the country was going to face an important transition in how to measure the nutritional status of children. Given that, through the Resolution 2121, the WHO-CGS were adopted and promoted as the official standards to measure malnutrition in the country, the ENSIN had to use the WHO-CGS as the reference charts to analyse the data of the anthropometry component of the survey.

The adoption of the new charts to analyse the data of the ENSIN had as a consequence changes in the expected estimates of malnutrition. Changing the reference charts necessarily implied having a different reference population and a different growth pattern as a benchmark to measure the Colombian population. The consequences of shifting standards in terms of malnutrition estimates were reported in different international studies. The most common finding was that the estimates of stunting and overweight tended to be higher throughout childhood if they were measured against the WHO-CGS. Likewise, underweight and wasting rates increased during infancy when assessed with the new charts; however, they tended to be lower if they were measured for the first five years of life.

According to Onis et al. (2006), differences between both charts are particularly significant during infancy because the WHO sample mainly included breastfed infants while the NCHS reference sample included formula-fed infants. Breastfed and formula-fed infants have different growth patterns: breastfed infants have greater weight-for-length ratios than formula-fed infants and they thin out during the second year and beyond. Changes in the estimates are also related with the fact that both references were constructed based on different measurement intervals: the NCHS measured infants every three months and the WHO-CGS every two weeks in the first two months and monthly thereafter (de Onis et al. 2006, Martorell and Young 2012).

A study conducted by Onis et al. (2006), the same group of researchers that participated in the MGRS, used three data sets (Bangladesh, Dominican Republic and a pooled sample of infants from North America and Northern Europe) to compare the growth patterns and estimates of malnutrition using both charts. The results of this study showed that the overall prevalence of underweight in children under five years old is lower using the WHO charts. It also concluded that the prevalence of stunting in Bangladeshi children had a relative increase of 10% when using the WHO charts. Wasting and severe wasting rates were also higher when estimated with the WHO charts. Similar studies using data from India (Deshmukh et al. 2007), Indonesia (Madarina 2009), Pakistan (Nuruddin et al. 2009) and China (Wang et al. 2009) have shown similar results.

In the Colombian context, two studies have been conducted with the aim of assessing the outcomes of changing growth charts in terms of the measurement of malnutrition. One of them corresponds to a descriptive cross-sectional study with a sample of 2290 children attending a supplementary food program called MANA. This research concluded that the prevalence of overweight and stunting was higher when measured with the WHO charts (Álvarez, López and Estrada 2009). The second study was

conducted by Velasquez et al. (2011), using the NCHS and WHO charts to classify children with acute malnutrition admitted in a nutrition rehabilitation program. This research showed that from the total number of children classified as normal with the NCHS charts, 10.4% would be classified as stunted with the WHO charts. From the 64% of children admitted to the hospital with a diagnosis of being wasted, 44.8% were severely wasted according to the WHO charts. Finally, the study highlights that 5% of the children leaving the hospital would have been requested to stay longer if they had been assessed with the WHO charts. Velasquez et al. (2011) show with his case study, the implications that the change of standards could have in the health system, as they would experience a higher number of children in need of health services to recover their nutritional status. The change in the estimates of malnutrition as a consequence of shifting growth charts makes evident the performative nature of standards. The change in estimates of malnutrition was not simply an issue of representation; the new standards did not necessarily make evident a population that existed independently from the measurement tool. Instead, the shift of standards enabled the creation of a new reality with new classifications defining who conforms to normal growth and who does not. The use of growth charts in the creation of quantitative data about malnutrition is a good example of how the production of quantitative indicators do not simply reflect the world, following Rottenburg and Merry, instead ‘they are the product of a series of interpretative decisions about what to quantify, how to categorize, and how to label it’ (Rottenburg and Merry 2015:11)

The data-set of the ENSIN was the first data-set with a national representative sample analysed with the WHO-CGS in Colombia. Given that previous studies had reported changes in the malnutrition estimates, the ENSIN working group decided to analyse the data-set using both reference charts and assess the implications of changing growth charts for the Colombian population. Even though the report of both surveys states that the official results of the ENSIN are those analysed against the WHO-CGS, the survey report includes the estimates of malnutrition in children under five years old using the NCHS charts as additional information. As I will

discuss later on in this chapter, this decision was made to facilitate comparability with the previous national surveys.

Aligned with the studies cited before, in the Colombian case the prevalence of underweight when measured against the WHO-CGS was lower than when measured with the NCHS charts – 3.4% versus 4.5%, respectively. The opposite was observed for the prevalence of wasting: when assessed with the NCHS charts it was 0.7% while the result with the WHO charts was 0.9%. Similarly, the prevalence of stunting was higher when using the WHO chart – 13.2% as against 9% for the NCHS (ENSIN 2011). In terms of overweight, the ENSIN report does not provide the corresponding result for overweight or obesity using the NCHS, however it does state that an unexpected percentage of children under five years old was overweight (see figures 22 and 23 for a comparison of malnutrition estimates using the NCHS and WHO charts).

Policy-makers and experts constantly described the change in the estimates of underweight and wasting as an expected outcome from the change in standards. For these two indicators, several interviewees suggested that the difference between the values using the NCHS and WHO was not significant enough to generate instability or chaos in how malnutrition was measured. The indicator of stunting, on the other hand, was described in most of the interviews as a source of concern. Even though stunting is often reported in the literature as showing higher discrepancies when compared with the NCHS, the impact of an increment of 4.2% was a sign of alarm.

When talking about the results of stunting, I was often told that the WHO charts were just emphasising an existing problem in the country that was directly connected with poverty, social inequality and general low living standards, especially in rural areas and among indigenous communities, who showed a higher prevalence. The prevalence of stunting was particularly worrying given that, according to the ENSIN 2010, 30,2% of the population under five years old was classified between -1 and -2

standard deviations, which according to the nutritional classification system of the Resolution 2121 corresponds to the category ‘risk of stunting’. In other words, the survey not only reported an existing group of population classified as stunted, but also a significant group of population at risk of having a low height/length-for-age.

In this regard policymakers and experts stressed that one of the key problems associated with low height-for-age was not only that children were not achieving their growth potential, but also that they might be losing their chances to achieve their cognitive potential. Given that the fastest rate of brain development occurs during the first years of life, having children exposed to chronic malnutrition, expressed in low height-for-age, could limit children’s cognitive development in the present and the future.

The relationship between stunting and brain development is framed in a strong economic discourse mainly supported by the Nobel Prize winner James Heckman, who states that investment in early childhood yields robust returns to the society (Heckman 2000). Within this discourse, a stunted population not only implies that children are not reaching their growth potential, but also that this will have economic repercussions for society, as they might experience poor health, poor educational attainment and economic dependency. The relationship between malnutrition, brain development and economic loss is at the heart of the current discourses of international organisations like the WHO, UNICEF and the World Bank, which advocate for an investment in early childhood as a strategy to guarantee the development of productive human capital in the future (Penn 2011, Monaghan 2012).

The following two quotes, one from Catalina and another from Leonor, both nutritionists working in public health, illustrate the way in which policy-makers and civil servants would often talk about stunting. In both quotes, they mention how difficult it is to modify the indicator of stunting as it depends on several social

determinants. In addition, they highlight the connections between stunting, brain development and economic loss.

With the WHO charts, more children were classified as stunted. I think we can use this to our advantage as civil servants and policy makers. This gave us evidence to ask the government to continue working on the implementation of programs targeting children under five. What happens in this period will determine a lot of who those children will be in the future. Their brains are being developed up to 70%. This indicator is a challenge for all of us because height is very difficult to recover. This indicator will change only if structural changes occur. Water supply, access to health services, access to healthy food for example. I hope this indicator can be used to create more awareness about the need to continue investing in early childhood. Whatever we do during those 1000 days will have a repercussion in our society (Catalina, Bogotá, 2014)

Today we have enough evidence that during early childhood the brain develops up to 70%. A stunted population is a population that might have lost the opportunity to develop many cognitive skills. When we guarantee that a child has good nutrition we are also making sure that child has better opportunities to become someone productive in the future (Leonor, Bogotá, 2014).

The prevalence of stunting and the fact that it was higher if assessed against the WHO-CGS also triggered two interconnected concerns. Since stunting is the result of a long period of malnutrition, the physical dimensions of children's bodies was evidence of their unsatisfactory growth-inhibiting living conditions. As a consequence, these statistics also exposed the failure of the State and its institutions to provide the conditions for proper growth. In the particular case of stunting, the fact that the data was higher using the WHO charts, provided an opportunity to use the data of the survey as a tool to hold the State to account (Merry 2016). Therefore, the indicators of malnutrition contained the potential not only for generating knowledge of the population, but also for indirectly measuring the performance of the State.

The prevalence of stunting among indigenous children measured by the ENSIN is a good example of how the increase in the statistics of malnutrition was politically charged. According to the ENSIN 2010, the prevalence of stunting among indigenous children was significantly higher than the prevalence among the rest of the children included in the sample (12.6% and 2.4% respectively). The fact that the prevalence of stunting among this population was higher, showed that indigenous communities were particularly vulnerable to chronic malnutrition. In this regard, Consuelo, a nutritionist working in nutritional surveillance in Bogotá expressed that the estimate of stunting and severe stunting among indigenous children showed that these communities required special and urgent attention. In addition, she also mentioned that the stunting indicator confirmed that the State was responsible for not generating an environment in which children could exercise their right to have a healthy growth. The fact that a high proportion of indigenous children were stunted was directly associated with (infra)structural problems, such as limited access to a healthy diet, access to clean water, access to health services, poverty among many others. She also commented that indigenous communities could use the results of the ENSIN to demand the improvement of the living conditions in their territories.

Many of the key health indicators are really bad among indigenous communities. This includes the child malnutrition and child and maternal mortality rates. They have been victims of the conflict, inequality, displacement...I am not surprised by the statistics. We did not need an ENSIN to know they are one of the most vulnerable ethnic groups of the country or that they do not have access to basic health services. For many decades they have been direct victims of the conflict and in many ways they have been living in territories where the State has no representation [making reference to the idea that there are very few formal institutions of the government]. The fact that many of those children are malnourished and stunted speaks about many social aspects, not just about access to food. We are all responsible for those children. I feel this is what they don't understand yet, that they could use these statistics to show the government they need attention, that they have been neglected and that their children deserve to grow, to play like other children (Consuelo, Bogota 2014).

Leonor also displayed a keen awareness of the dual governing and accountability functions of malnutrition indicators:

The ENSIN is extremely important for all of us who work in nutrition and food security. This data gives us an idea of where we need to invest, where we should put our efforts. Many research projects use the ENSIN to justify studies, programmes or interventions. As a data-set, it is an amazing source of information for many researchers. In addition, with this survey we can say to each department [region] of the country: “Look, those are your numbers, so what are you going to do about it?” A data-set like the ENSIN gives you enough variables to find out if we are doing a good job. We are able to follow up data about the nutritional status of our population since 1990. Yes, we have changed a lot as a country, but we still have a lot of work to do. I guess that the problem with nutrition is that it is not only about food, it is about having a healthy agriculture sector, about people being able to afford healthy food. It is about reducing poverty and creating income, about letting farmers use the land, using the land to grow food and not biofuel. The statistics about nutrition in children not only express the rate of children wasted, they also speak about the capacity of the state to accomplish its functions, to guarantee food security (Leonor, Bogotá, 2014).

The quotes illustrate how the production of malnutrition indicators not only accomplishes the function of monitoring the population and its health status – for purposes of governance – but also how these indicators are constantly used to assess the State and its capacity to improve the living standards of the population – a tool for enforcing accountability.

In this section I showed how the shift between charts had as a consequence the creation of a new epidemiological reality. I showed that the higher prevalence of stunting represented by the new charts had political implications for the state. If indicators are used to hold the state accountable for its actions, having a significant percentage of children stunted or at risk of being stunted affected assessments of the state’s performance – implying that the policies, strategies and plans oriented to the improvement of children’s health were still not sufficient.

Having shown how malnutrition indicators changed with the adoption of the new charts, the next section explains how adopting the new charts obliged the national government to migrate previous data-sets to the WHO charts, so they could keep data comparable.

7.4 Comparability. Extending the WHO-CGS to previous data-sets

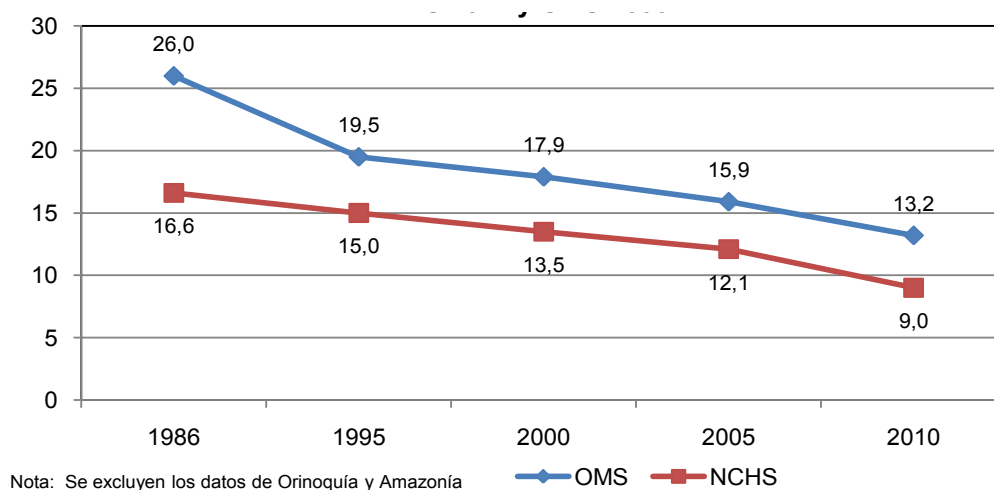
The adoption of the WHO-CGS to analyse the national surveys of 2010 limited the comparability of data across time. As I mentioned before, the ENSIN 2005 and all the previous ENDS analysed their data using the NCHS charts. When the WHO-CGS were adopted to analyse the data of the ENSIN and ENDS 2010, the new statistics of malnutrition stopped being comparable with the existing surveys. For this reason, the prevalence of underweight, wasting and stunting for children under five years old of all the ENDS and the ENSIN 2005 was recalculated using the WHO-CGS. Having all surveys analysed according to both standards allowed comparison and following up of malnutrition trends in the country.

In an interview with Inés, a nutritionist and an epidemiologist working as an expert in nutrition in one of the national bodies working on public health, I asked why it became necessary to translate the previous data using the new charts. In her answer she emphasised the importance of comparability in order to follow up epidemiological trends (e.g. underweight, obesity) but also to identify if the general living conditions of the population were changing. Inés, as many other interviewees, highlighted that the estimates of malnutrition during early childhood are great indicators of the general living standards of the population. In the following quote, Ines highlights that the use of both charts was necessary given that it is the possibility of comparability that makes relevant the collection of data every five years. Not being able to compare data would be a waste of public resources. Inés insisted that keeping the data comparable allows the possibility of making visible changes in the health dynamics of the population, which might be related with the improvement of the general living conditions in the country. In this quote, for example, she mentions that the country was no longer facing the same social problems that it was facing during the 1990s, a period that Colombians associate with the amplification of the armed conflict and drug trafficking. Consequently, the statistics should be able to show some improvement in the health conditions of the population:

Using exclusively the WHO charts implied not being able to compare data any longer. We have been waiting five years to know if all our efforts are finally making a change in people's lives. Indicators change over time and sometimes it is a matter of decades before one decimal changes. But that decimal counts. Even if we improve just a little bit and the breastfeeding rate increases from 1.3 to 1.5, that matters. This country is changing, this is not the 90s anymore, I expect that to be reflected in the numbers. Being able to compare data is important for the country because this is how we know if the population is having better nutrition, if our children are growing to achieve their growth potential, or if the obesity prevalence is increasing. Data coming from one survey is always good but it is the follow up that I find more relevant as a policy maker. Collecting data is expensive, all Colombians paid for that survey with their taxes, now we cannot just dismiss the previous data. In five years when the next survey comes, we might use just the WHO standards but for the ENSIN 2010, we had to keep both charts to make the transition as harmonious as possible (Inés, Bogotá, 2014).

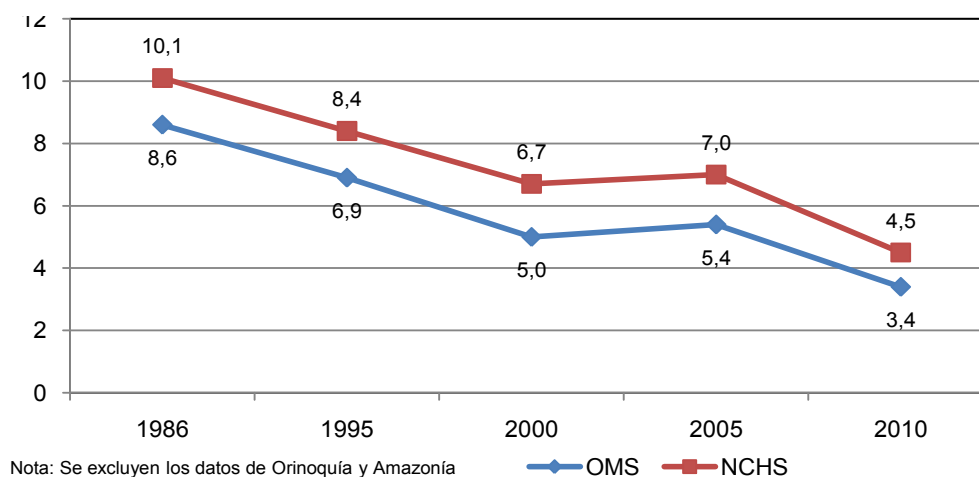
Given that the country had been collecting data for fifteen years, the generation of graphic representations of the trend of each anthropometric indicator across time was possible. The ENSIN and ENDS 2010 reports included these figures for the prevalence of underweight, stunting and wasting. In all cases, the figures show that the indicators of malnutrition have consistently been dropping. For the three indicators, the prevalence is measured and represented against the NCHS and the WHO-CGS (see figures 22 and 23 for an example). The prevalence of stunting using the WHO standards was 16.6% in 1990 and 9% in 2010. The underweight estimate was reduced from 8.6% in 1990 to 3.4% in 2010 and the prevalence of wasting was reduced from 1.4% in 1995 to 0.7% in 2010.

Figure 22. Prevalence of stunting for boys and girls (1990-2010) measured with the WHO (OMS in Spanish) and the NCHS charts.



Source ENDS 2011 (Profamilia et al. 2011:300)

Figure 23. Prevalence of underweight for boys and girls (1990-2010) measured with the WHO (OMS in Spanish) and the NCHS charts.



Source ENDS 2011 (Profamilia et al. 2011:300)

Following up the prevalence of malnutrition over time was described in most of the interviews as a pivotal tool to follow up changes in the nutritional status of children since the 1990s, as well as an important tool to assess if the general actions of the state that affect the nutritional status of the population are showing measurable results. As I mentioned before, malnutrition statistics are a powerful political indicator to make visible and accountable public policy. The improvement of the statistics of underweight for example, was described in some of the reports of the government as being connected with the implementation of different programmes on food security targeting early childhood. Two examples of these programmes are *Familias en Accion* (Families in Action) and *Desayunos Infantiles con Amor* (Breakfasts for Children with Love). *Familias en Acción* is a programme that gives economic incentives to vulnerable families with children with malnutrition. The program expects that the family will use the money to improve the food security within the household (Ministerio de la Protección Social, Ministerio de Educación and ICBF 2007).⁶³ *Desayunos Infantiles con Amor* (Breakfasts with Love for Children), on the other hand, is a programme targeting vulnerable children coming from extremely poor families that have been victims of the conflict or forcibly displaced. The aim of this programme is to supplement children's diet by providing caregivers with fortified complementary foods that can supply 30% of the daily recommendation of protein intake for a child and 15% of the recommended carbohydrate intake (ICBF 2011).⁶⁴ According to some policymakers that participated in the extended committee of the Resolution 2121, the fact that the prevalence of under-nutrition has decreased in the last decade might be related to the implementation of effective and stable food assistance programs targeting children from low socio-economic backgrounds.

⁶³ The programme *Familias en Acción* was created in 2001. It is implemented in all municipalities with a population of fewer than 100 thousand people. By 2007, 1.194.908 children under seven years old were beneficiaries of the programme (Ministerio de la Protección Social, 2007).

⁶⁴ The programme *Desayunos Infantiles con Amor* is one of the key programs targeting nutrition in preschool children in the country. The program began its implementation in 2002 with 78.152 beneficiaries. By 2011, 1.514.311 children under six years were making use of the services of the programme (ICBF 2011).

The need to keep the data comparable to follow up the estimates of child malnutrition was also a priority, given that this information is used to demonstrate improvement in the health indicators of the country to the international community. Being able to show a reduction in the statistics of underweight, wasting and stunting was described by some interviewees as relevant to show the international community that the country is an emergent economy moving towards development. In an interview with a policy maker on food security, she mentioned that the production of health indicators, including the estimates of malnutrition, were relevant to generate a good impression of the country in the international arena.

The improvement of the indicators of malnutrition, as well as other rates like child and maternal mortality, life expectancy and health coverage, are relevant for the country because they let us show the international community that this country is reliable. That our economy is improving. When you think about health indicators alone you might not see the big picture. The big picture is that the indicators are essential to attract international investment, to have access to international loans. The indicator of underweight, for example, is used to determine Human Poverty Index, which generates important rankings. The fact that the country can show that over time the statistics are getting better and that we are close to achieving the Millennium Goals helps to create a good image of the country for the world. It also shows that the loans we have from the IDB [Inter-American Development Bank] are being used efficiently (Diana, Bogotá, 2015).

The use of the ENSIN indicators not only played an important role in making accountable the government actions to improve the nutritional status of children, they were also relevant for measuring the country's performance within international agendas, as was the case with the MDGs.

Since 2000, when the Colombian government endorsed the MDGs, several of the national goals of development were aligned with the commitments made with the international community. Within this context, the prevalence of underweight gained particular relevance for the country, as this was the indicator for monitoring progress on the target that aimed to reduce by half the proportion of people suffering from

hunger. For this purpose the Colombian government set as a national goal to reduce the rate of underweight in children under five years old from 10% in 1990⁶⁵ to 3% in 2015 (Ministerio de Relaciones Exteriores et al. 2005). The following quote from Tatiana, a policy maker working in a national institution in the country, describes how the statistics of malnutrition are embedded with ‘extra value’ if they can be used for international comparison:

The ENSIN 2000 and 2010 are our most reliable sources of data, at least in the field of nutrition and food security, to know how far or close we are from achieving our goal as a country. For this reason, we had to adjust our analysis and use both the NCHS and WHO charts; this way data remained comparable and useful to follow up progress. The data of the ENSIN has value for the country but it has an extra value if it can be used in the context of international comparison. When we frame these statistics within the international agenda, there is more pressure to produce data that can really tell us information about our performance, if our efforts regarding policy making are making a difference (Tatiana, Bogotá, 2014)

Even though the MDGs only used the prevalence of underweight as an indicator to monitor progress, the National government decided to include stunting as an additional indicator to track the reduction of malnutrition in children. Taking this into account by 2015, the prevalence of stunting was expected to be reduced from 16.6% in 1990 to 6%. According to Alejandra, setting a goal for the indicator of stunting within the umbrella of the MDGs was a good strategy in terms of policy, given that attention to malnutrition could be used to target both weight and height at the same time. In addition, including height-for-age as a monitoring indicator to measure progress in the improvement of the nutritional status of children could generate more pressure among policy makers and local governments to improve their health services for children. According to Catalina and many other interviewees, the indicator height-for-age was a harder indicator to change but also more sensible indicator to measure an improvement in children’s wellbeing:

⁶⁵ The data for the base line of 1990 was taken from the National Survey of Knowledge, Attitude and behaviours in Health as well as from the WHO report called Malnutrition in Infants and Young Children in Latin America and the Caribbean: Achieving the Millennium Development Goals.

The MDGs only take into account the indicator weight-for-age. We decided to include the indicator height-for-age too to measure our progress improving children's nutritional status. Measuring height in a country like Colombia is challenging because we have a significant sector of the population that is stunted or at risk of being stunted. The indicator weight-for-age cannot translate the reality of our population in numbers as much as the indicator for stunting. We might have children that look abnormal under the indicator weight-for-age, but when we take into account the height of the child then we might find the child is short and that the weight for her height might be normal. What is relevant here is that the child was short first. We need to keep in mind height and weight to understand what is the status of our population. Weight-for-age might be convenient for international comparison because that is easier to measure. However, that doesn't mean it is the best indicator (Alejandra, Bogotá 2014).

Just as I described before in this chapter, when the data from the ENSIN and ENDS was analysed against the WHO-CGS the prevalence of stunting showed a higher value and the prevalence of underweight a lower value compared to the results if the NCHS charts were used. This was the case for all the other estimates of previous surveys including the data that was used as baseline to calculate the goals for the MDGs. For instance, the baseline for stunting, that was calculated using data from 1990, was 16.6% when NCHS charts were used and became 26.1% when measured with the WHO-CGS. On the other hand, the baseline for underweight decreased from 10.1% to 8.6% when the WHO-CGS was used. Given this changed in both indicators, the targets for 2015 were recalculated and instead of having a goal 6% for stunting the goal became 8%. For underweight the goal changed from 3% to 2.6%.

The shift between standards and the outcomes it generated in terms of the measurement of malnutrition made harder to achieve the new goal for stunting and easier to achieve the goal for underweight. Using exclusively the NCHS chart, the country was 1.5% away from reaching the MDGs goal, with the WHO charts it was 0.8% closer to reaching the target in 2015. The opposite happened with the indicator of stunting, since achieving the goal became harder with the WHO charts: the national indicators showed that instead of being 3% away from the target (using the NCHS charts) the country was 5.2% (using the WHO-CGS) from the ideal rate.

In a few interviews, this was described as challenging, given that generating a change in the statistics of stunting was, according to them, more difficult than changing the statistics of underweight. In an interview with Catalina, a nutritionist working in public health, she described that weight, as opposed to height, could be modified by providing services to the child that could modify her weight. In those cases, the recovery of a child's weight can be possible in a time frame of months. Catching up with height was described as a very slow process, especially in the case of children above two years old. In the following quote Catalina describes the difference between recovering height and weight in children. She emphasises that once a child does not achieve her growth potential in height, those centimetres that are 'lost' are difficult to recover. Weight on the other hand is highly malleable given that at any age a body can lose or gain weight.

Children under two years old that are stunted and that have received attention in terms of nutritional rehabilitation can recover some height. After they turn two, recovering the centimetres they have lost is very difficult, almost unlikely. Weight, is different, at any age a child can lose or gain weight. Height is a very different process. The height that the child did not achieve during the first two years where the body grows fast, will not be accumulated and develop later. Height is not something you can postpone; if you didn't achieve your growth potential those centimetres are just lost (Catalina, Bogotá 2014).

Given that height is a body feature difficult to recover or intervene in, changing the prevalence of stunting becomes harder. Some interviewees described how the achievement of the goal for 2015 was harder – a challenge for the state. Preventing children from losing height could only be possible if children were able to live in conditions that facilitate the achievement of children's growth potential and in that sense, this indicator depended on many structural changes in society.

7.5 Final Remarks

Throughout this chapter, I showed some of the consequences of adopting the WHO-CGS on the measurement of the nutritional status of children at the population scale. Using as an example the ENSIN 2010, we saw how the shift between charts was able to create new epidemiological data, in which a significant percentage of the population under five years old was classified as stunted or at risk of being stunted.

In the case of individual growth monitoring, the use of growth charts is flexible. Health professionals base their assessment of the nutritional status of the child on contextual variables that include the growth pattern of each child. In the case of the ENSIN, the use of the charts is rigid. The survey follows one specific protocol in which growth measurement is expected to follow standardised practices; one of those practices included that all data was compared against the WHO-CGS. It is in a context like the ENSIN that standards are particularly powerful in creating new realities and kinds of people (Hacking 1999). I am not suggesting that at the scale of the individual, growth charts lose their power to sculpt children's bodies to make them look similar to those in the range of normality. Instead, what I argue is that the power of standards to shape and classify children's bodies is constantly recalibrated by the way health professionals interpret the data of the child's height and weight.

At the population level, or at least in the case of the ENSIN, the standardised measurement of children (including the use of growth charts, instruments of measurement and techniques of measurement), or at least trusting that the data was collected following standardised procedures, is what makes the data commensurable and comparable. At the scale of a population study, the child's body is transformed into one measurement of weight and height; some of the individual data of the child will be collected in the survey questionnaire and merged with the data of other participants of the study. It is through and because of this process that the ENSIN and the indicators derived from it are perceived by policymakers, researchers and government officers as a trustworthy and accurate tool to render visible the population of children in the country.

Using the ENSIN example, I showed how standards shape quantification practices such as child malnutrition indicators. The change in standards enabled the creation of a new epidemiological reality that questioned the efforts of the State in improving the environment in which children grow. Indicators such as the prevalence of stunting, wasting and underweight have political value for two main reasons. The first one is because they are tools to produce knowledge about the population in order to control it and administrate it. Indicators able to transform complex data into homogenised and comparable data are central to governance (Rottenburg and Merry 2015). The second one is related to the fact that indicators are tools to make the State accountable for its actions, and are sources of information to monitor and assess the State performance. As I showed in several quotes, the indicators of malnutrition and the fact that the prevalence of stunting was higher with the new charts, was described in the interviews as a call to question the policies and strategies oriented to improve the living conditions of children. By exploring the consequences of changing standards for the analysis of the ENSIN data, this chapter revealed how standards can shape how populations are measured and thereby rendered legible, as well as the implications this has for State accountability.

Chapter 8. Conclusions

This research is about the life of standards. It is about how they are created, adopted and implemented – but also about how they travel, and how they are transformed when they move from an international to a national context. I have focused on the case of the WHO-CGS, the first set of growth charts created by the WHO specifically to facilitate international comparison – in part because they have been so widely adopted, with 125 countries reported to have been using them within five years of their release (de Onis et al. 2012). Since then, the WHO-CGS have become the international gold standard in measuring child growth, generating international and rankings comparing rates of malnutrition across the globe. While the WHO-CGS emerge from a long legacy of growth charts stretching back to the nineteenth century, I argue that they are distinctive because their circulation and applicability are directly linked to international policies and agendas.

The measurement of children's bodies has been a routine practice in medical settings since the early twentieth century (Turmel 2008). A century later, children's weight and height continue to be a central aspect of the child and maternal health services around the world. During the first half of the twentieth century, growth charts were used mainly to monitor children's bodies on an individual scale; but after the Second World War, with the creation of the WHO, the FAO and UNICEF, the use of growth charts found a new purpose: to assess the prevalence of malnutrition across the globe. Through the measurement of children's bodies, populations in need could be identified and nutritional interventions evaluated, creating political awareness of the magnitude of the problem and putting it on the international agenda. Growth charts moved from instruments used only in consultation rooms or for national nutrition surveys, and became key artefacts for rendering the nutritional status of the global population visible.

Inspired by the work of authors such as Geoffrey Bowker, Susan Leigh Star, Martha Lampland, Steve Epstein, Marc Berg and Stefan Timmermans, throughout this dissertation I have analysed how the WHO-CGS were created at international level; how they were adopted and integrated into Colombian national policy; and finally, how they were used as a tool to measure individuals as well as populations.

In Chapter Four, I covered the first stage of my research, into the origins of the WHO-CGS. According to the WHO, this new set of charts describes how children *should* grow – unlike previous growth charts, which described how the average child *did* grow in a specific context (Garza and De Onis 2004:57). This claim was substantiated by the fact that the sample in which the WHO-CGS was based was chosen using a specific set of inclusion criteria – criteria which, according to the WHO, were pivotal for reaching an optimal growth (e.g. exclusive breastfeeding, non-smoker mothers, absence of significant morbidities).

The development of the WHO-CGS constitutes a revolutionary shift in the history of child growth charts. The shift from a descriptive to a prescriptive approach challenged all previous growth studies, which had defined normal growth in relation to an average child. The new charts, instead, described the growth pattern of ‘standard children’; children that were growing under ideal conditions. More than representing growth as a biological reality that exists in the form of potential in every child, I argue that the new charts represented what the WHO defined as ideal growth. In other words, they were a tool of measurement consistent with the WHO’s ideas of how a child should be raised and fed. The fact that the Multicentre Growth Reference Study found that children from different countries followed a similar growth pattern reinforced the idea that the new charts could make children’s bodies commensurable and comparable.

After discussing the origins of the WHO-CGS, my analysis shifted to the question of how the new charts were adopted and integrated into Colombian national health

policy. As I explained in Chapter Five, the WHO-CGS were adopted in 2010, through the creation of a legal document called Resolution 2121. This document had two main purposes: to make the use of the WHO charts mandatory within the health system; and to standardise the tools of measurement used to assess children's growth, as well as the terminology and cut-off points used to determine whether a child is stunted, wasted, underweight, overweight or obese.

I argued that three key factors justified the decision of the national government to endorse the WHO-CGS. The first was that the new charts were consistent with national policies that promoted exclusive breastfeeding. The second was associated with the idea that the WHO charts were ideal tools to measure a multi-ethnic population like the Colombian one. Given the WHO's claim that the new charts described how children should grow, regardless of their ethnic background, policy-makers, civil servants and experts saw the new charts as more reliable tools for measuring indigenous children. The third factor was that the charts facilitated comparability with international statistics. Since international organisations such as the World Bank, UNICEF, the FAO and the IDB used the WHO-CGS to develop international rankings, and to monitor strategies like the MDGs, adopting the new charts was necessary to catch up with the international trend.

The adoption of the charts also implied adjusting the standard to the country's needs. In Chapter Five, I showed that the negotiations of Resolution 2121 modified the classification systems promoted by the WHO to interpret the WHO-CGS. In Colombia, the range between -2SDs and -1SD, classified as normality by the WHO, was assigned the denomination 'risk of underweight/stunting/wasting'. The range between +2SDs and +1SD, classified by the WHO as 'risk of overweight', in Colombia was labelled as 'overweight'. Likewise, the range between +3SDs and +2SDs was classified as 'obesity' instead of 'overweight'. These examples illustrate how the WHO-CGS were transformed as they were plugged into the local infrastructure that supported the nutritional assessment of children and the local political concerns about nutritional management.

After exploring the adoption of the WHO-CGS in national policy, in Chapter Six, I focused my analysis on the use of the charts in consultation rooms implementing the Growth and Development Programme (G&DP) – specifically, in six health facilities located in La Guajira, Barranquilla and Cartagena. I described the lack of standardisation of instruments and procedures to measure children across consultation rooms. Rather than focusing on cases of interpretative flexibility, in this chapter I used the concept of procedural flexibility (Jordan and Lynch 1998) to understand how health professionals working in different health facilities adjust their techniques of measurement, and their use of the growth charts, according to the material resources they have. After comparing how children were measured in health centres providing services through different health insurers, I also showed that as a consequence of how the Colombian health system is structured, those children that are more vulnerable to malnourishment are also those who have less access to health services able to monitor their growth.

Besides the fact that different consultation rooms follow different approaches, and have different material resources for measuring children, in Chapter Five I also argued that at the individual level, a lack of standardisation and a diversity of charts does not necessarily prevent health professionals from measuring children and assessing their health status. Health professionals measure and assess the child in context; they observe the child's hair, skin, eyes and development skills. In addition, they talk to the parents to collect information relevant to evaluating the nutritional status of the child. The assessment of children relies heavily on the expertise of health professionals and on their ability to interpret the information they gather. The lack of standardisation of instruments of measurement, growth charts or measurement techniques did not stop health professionals from assessing children; but it did limit cooperation between doctors and nurses, or among health programmes.

Finally, in Chapter Seven, my analysis shifted from the use of charts in individual growth monitoring to their use in population measurement. Taking the case of the ENSIN, the first national survey that measured the population against the WHO-CGS, I highlighted some of the consequences that changing standards had in the production of estimates of child malnutrition in Colombia. With the adoption of the WHO charts, the ENSIN reported higher estimates of underweight, wasting and stunting in children under five years old— a trend observed in similar population studies elsewhere in the world. The change in standards created a new epidemiological reality for the country. Rather than rendering visible a pre-existing malnourished sub-population that had been overlooked by the NCHS charts, I argue that the classifications introduced with the adoption of the WHO-CGS charts created a new malnourished sub-population (which nevertheless appeared to exist as a prior natural category rather than a constructed social category) that would become an object of intervention.

Given that the ENSIN is the most reliable source of data for monitoring secular trends in growth, for identifying populations in need, and for guiding the allocation of resources, this higher prevalence of malnutrition had political implications for the national health policy. Having a new group of children unexpectedly malnourished implied that the health system required new resources to increase the offer of services to children. In addition, the change in standards made harder to achieve the national and international goals to eradicate hunger and decrease the prevalence of malnutrition.

8.1 Key Themes

Analysing the construction of the WHO-CGS, their adoption at national scale, their use in consultation rooms, and their outcomes when used to measure the Colombian population, I have shown how human standards can function as boundary objects able to move across and between multiple interconnected levels. The methodological

approach I chose allowed me to compare how processes of exclusion and inclusion operate in different contexts, as well as demonstrating how standards, as boundary objects, become more rigid or flexible depending on the circumstances of their use.

8.1.1 Exclusion and Inclusion

With the exception of Dumit and Laet's analysis of the material life of graphs (2014), the question of who has been represented as the standard child has been overlooked in the existing literature on child growth charts. The work of Armstrong (2002) and Turmel (2008), for example, shows how growth charts became tools to monitor children's bodies in the context of antenatal care, infant welfare clinics and baby clinics; however, these authors did not investigate or problematize the construction of the charts themselves. Scholars that have worked on the history of anthropometry – including Lowrey and Watson (1973) and Tanner (2010) – have described the demographic characteristics of the samples on which some of the most emblematic growth studies between the 1870s and 1930s were based. However, they did not question why some children were included or excluded from these samples, nor the implications of the criteria of inclusion in generating a definition and understanding of children's average weight and height.

In this dissertation, I have advocated for an analysis of human standards that prioritises the question of who is included or excluded (Epstein 2007) from becoming the 'standard child' – that is, whose growth pattern is allowed to set the benchmarks for normal or abnormal growth. As I showed in Chapter Four, the NCHS charts were constructed using data on white children from the United States, most of whom were formula-fed. For almost thirty years, this population was the reference sample for international comparison. With the implementation of the MGRS, the WHO defined new criteria for determining who could represent ideal growth. This time, the charts were generated using a more diverse sample of children coming from five different countries, with different ethnic backgrounds, all

exclusively breastfed. Based on the sample that the WHO ‘designed’, the new charts represented the growth pattern of an ideal ‘standard child’ as opposed to the previous charts claiming to be a reference of the actual ‘average child’. In the case of the WHO-CGS, it was the diversification of the reference sample that legitimated the charts as a universal standard able to fit all humans under five years old.

The new charts represented many children, and not one specific type of child. This new option for measuring children was described in interviews with policymakers, civil servants and experts as positive and desirable, especially because the NCHS charts had normalised the growth pattern of a population that was already moving towards to obesity. As I showed in Chapter Five, policymakers, civil servants and experts perceived the transition from the NCHS to the WHO charts as a way of democratising children’s measurement. Besides welcoming the fact that the WHO charts were based on a diverse sample, these practitioners also noted that the new charts facilitated more inclusive measurement. Since the WHO-CGS were meant to show how children should grow, regardless of their ethnic background, all children were set under equal conditions to be measured. The new standards supposed that white children from Bogotá and indigenous children from Amazonia should be able to reach a similar growth patterns, if they were exposed to a healthy environment. On this logic, if the prevalence of stunting or wasting was higher in indigenous children, it showed that those children were living under conditions that constrained growth. A standard able to homogenise children’s bodies could thus be a political tool for indigenous communities to prove that being short is not a racial/biological feature, but the result of inequality and food insecurity.

Finally, at the scale of consultation rooms, the dynamics of inclusion and exclusion were displayed in terms of access to the standard. Those health facilities that provided services in larger cities, like Cartagena and Barranquilla, and sold their services to large scale health insurers, were more likely to measure children with adequate instruments, and against the WHO-CGS. But in La Guajira, one of the regions of the country where children still die of malnutrition and hunger, where the

estimates of child malnutrition are higher than the national rate, children's measurement was less trustworthy, and material and human resources to monitor child growth were less available. In the hospital and the health centre I visited in La Guajira, children were so vulnerable and so unreachable that they could seldom be measured for preventive purposes. In the case of the health facilities I visited, those that could benefit the most from having a detailed growth monitoring program were precisely those that, in practice, were excluded from accessing the WHO-CGS and effective growth and development programs.

8.1.2 From Rigidity to Flexibility

Growth charts are standards able to facilitate cooperation and communication among diverse actors. Standards created by international organisations, like the WHO-CGS, are not only used to assess individual growth; they are also used in nutrition surveys, nutrition surveillance systems, and within international strategies (e.g. MDGs). Growth charts act as a bridge, connecting diverse actors within international, national and local spheres as well as across them. To understand how growth charts travel, facilitate cooperation and address the needs of such different users, I adopted the concept of the boundary object. Star and Griesemer defined boundary objects as objects that are 'plastic enough to adapt to local needs and constraints of several parties employing them, yet robust enough to maintain a common identity across sites' (1989:393) . Following the WHO-CGS allows us to see not only how different actors use and interpret the standard, but also when and how growth charts become flexible, and when they become rigid artefacts.

In the case of individual growth monitoring, the use of the charts and the measurement of children were highly flexible. The material life of the charts was heterogeneous – they appeared in different sizes and colours, sometimes in digital form and sometimes printed in paper – as was the interpretation health professionals

gave them. This lack of standardisation in practice, and the fact that health professionals did not trust the accuracy of the data plotted in the charts printed in either medical records or on child health cards, limited the transferability of the data collected in the G&DPs, and constrained cooperation between actors and institutions that have growth measurement as a common activity (e.g. CDIs and health centres).

In the case of the ENSIN, by contrast, there was less space for the charts to be flexible. As the ENSIN is a national survey that follows a strict research protocol, the collection, recording and analysis was highly standardised. Like any other cross-sectional survey, children were measured just once, and the growth pattern of the child was not taken into account. Once the data on the child was collected, it was separated from the context in which the measurement took place. The unique body, in other words, loses its identity once the data is collected. In this sense, the charts are more flexible when their data can be interpreted in context, and they are more rigid when the context is removed to make data comparable.

Another example in which the flexibility of the standard becomes evident emerged when policy-makers, experts and civil servants agreed to modify the nutritional classification system suggested and used by the WHO to interpret the WHO-CGS. The fact that in the Colombian context, the category of overweight and obesity would have been skewed one standard deviation to the left compared to the WHO classification shows another way in which the standards are flexible enough to satisfy local needs, and robust enough to keep behaving and appearing like stable, unchanged and neutral artefacts.

Even though the charts were transformed once they were adopted at the national level, they were still stable enough to facilitate communication and cooperation on an international scale. The data that was shared for the MDGs follow up, for example, travelled in the form of standard deviations – meaning that differences in the categories assigned locally to each cut-off point need not necessarily affect the

transferability of data between actors. In other words, if Colombia needed to share information about obesity with the WHO, the Ministry of Health and the INS could simply provide the data that is above +3SDs – which corresponds to the WHO's category of obesity – instead of sharing data on the prevalence between +3SDs and +2SDs, which corresponds to the classification of obesity at the national level. The fact that the charts keep information in terms of standard deviations allows the standards to work as boundary objects between the international and the national scale.

8.2 Contributions to Knowledge

Most of the existing literature exploring the anthropometric measurement of children and the development of growth charts covers the period between the 1850s and the 1930s. Scholars working on the history of anthropometry – including Ulijaszek and Kolmos (2010), Tanner (2010), Young (1979), Lowrey and Watson (1973) – have written in-depth accounts of the history of child growth studies during this period. Likewise, authors interested in the history and sociology of childhood and medicine, such as Armstrong (2002, 1995, 1979), James (2005), Steedman (1995, 1992), Turmel (2008, 2004), and Wong (1994), have explored the role of growth charts in constructing the category of childhood and child normality at the beginning of the twentieth century. The study of anthropometric measurement and child growth charts after the Second World War is scarce, and still an open field for further research. As Star and Lampland (2009) have pointed out, standards might have escaped social analysis as a result of their invisibility as sociocultural projects in themselves; child growth charts and child measurement certainly seem to have done so. By researching the development, adoption and implementation of the WHO-CGS, I aim to contribute to the study of child growth charts in contemporary societies. By extending the study of growth charts to the twenty-first century, I have shown how new, interpretative uses of anthropometry are deeply intertwined with the political agendas of international organisations such as the WHO.

This dissertation also contributes to the study of standards and standardisation as a subject of inquiry in its own right. By unpacking the design of the WHO-CGS, and tracing how standards are adopted and used in different contexts, we can achieve a better understanding of the role of human standards in biomedicine. This research also contributes to understandings of how standards are transformed and replaced. My analysis of the shift between the NCHS charts to the WHO-CGS illustrates what happens to health infrastructures when a stable standard stops being defined as the right tool for the job.

The final contribution of this study is related to its methodology. My work is similar to other studies that analyse how different users interpret and transform standards to match their specific needs (e.g. Casper and Clarke 1998, Timmermans and Berg 1997, Jordan and Lynch 1998). However, most of these studies do not include in their analysis a variation of scale. I argue that the study of standards developed by international organisations would benefit most from methodological approaches that can identify how standards are adopted and transferred, as well as how they facilitate cooperation across international and national scales.

One of the contributions of this study is to explore how the WHO-CGS were constantly transformed by actors responding to different national and international agendas. The methodological approach I chose, which aimed to follow one of the chart's multiple biographical trajectories, required me to incorporate and work across international, national, and local scales. I explored the creation of the standards in the international context of WHO procedures and negotiations, their adoption at the national scale, and their implementation on the scale of consultation rooms. One of the problems of thinking in terms of scales/levels is that they might be, as Pollock and Williams have stated, 'mechanistically misconstrued as fixed and separate levels when in fact they are interpenetrating' (Pollock and Williams 2009:90). However, I argue that for standards created by international organisations, scale helps us to understand and identify diverse ways in which users transform standards according to specific international and national political agendas.

8.3 Suggestions for Future Research

One of the limitations of my research is that I could not include parents' perspectives regarding the use of growth charts and growth monitoring. The study of growth charts and anthropometric measurement would benefit from exploring the implications that growth monitoring might have for children and their families. While I showed how the growth charts are shaped by specific ideas of children's bodies, I was not able to explore to what extent the use of growth charts and growth measurement can shape individual bodies. I consider this to be a key topic of research for understanding the effects of the standards on children's biographies.

It would also be useful to explore how the growth charts are used and interpreted in the context of programmes oriented to nutritional recovery. My observations in consultation rooms were limited to the appointments of the G&DP, and for this reason, most of the anthropometric measurements I observed were from healthy children or children at risk of being malnourished. I did not cover cases of children with a diagnosis of severe malnutrition. The change in standard might have had significant implications for hospitals and nutrition rehabilitation centres. A study conducted in Colombia that measured children admitted to a nutrition programme showed that the use of the WHO-CGS implied a need for more resources to treat children (Velasquez et al. 2011). From the total number of children admitted to the hospital, 64% were diagnosed with acute malnutrition according to NCHS charts; however, from this same group, 44.8% were severely wasted according to WHO charts. Given the difference in the range of normality of both patterns, Velasquez et al. (2011) also found that 5% of the children that were ready to leave the hospital according to the NCHS required more days before leaving according to the WHO charts. This example provides some idea of the ways in which the transition between charts could affect hospitals, nutrition rehabilitation centres, the children and their caregivers. The study of child malnutrition, standardization and measurement could find a rich area of research in this topic.

Finally, research on the standardisation and measurement of child malnutrition requires a better understanding of the production of child malnutrition statistics within the discourse of global health governance. Using the literature on standards along with the recent scholarship on indicators, rankings and global metrics (e.g. Adams (ed) 2016, Davis, Fisher and Kingsbury 2015, Kenny 2015, Merry 2016, Rottenburg and Merry 2015, Shore and Wright 2015) would provide an ideal theoretical framework to understand phenomena like the assignment of economic value to children's height and weight, in order to determine the costs of child stunting, underweight and obesity. Exploring growth measurements through the lens of the literature that analyses processes of valuation of the human life in global health may also shed new light on our understandings of human standards in health.

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Appendix I

List of key documents on the development of growth charts for international comparison.

Articles, guidelines and reports on the child growth charts in general.

WATERLOW, J. C., BUZINA, R., KELLER, W., LANE, J. M., NICHAMAN, M. Z. & TANNER, J. M. 1977. The presentation and use of height and weight data for comparing the nutritional status of groups of children under the age of 10 years. *Bulletin of the World Health Organization*, 55, 489-498.

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Appendix B

Information Sheet



Growing Right. WHO Child Growth Standards in Colombia.

Thank you for your interest in this research. I am a PhD student in Science and Technology Studies at the University of Edinburgh. My research is centered in the use of growth curves to assess children's growth and nutritional status in Colombia. I am collecting information about how health professionals use the curves in medical settings such as this clinic; this is the reason why your doctor asked if I could be present during the medical consultation of your child. Before you decide whether or not you agree to let me observe the consultation it is important that you understand that:

- . - The purpose of this research is to understand how the nutritional status of children under five years old is assessed using child growth curves. To achieve this aim I am conducting interviews with health professionals and with experts in nutrition, however I am also interested in observing how health professionals use the curves in everyday practice, which includes the medical consultations.
- . - You can decide if you agree or not to let me observe the consultation and your decision will not affect your medical service. Whether or not you decide to take part in this study is entirely up to you. Even if you agree to let me observe the consultation you can change your

mind at any point. I will leave the room in any moment if you decide to.

- . - If you decide I can be present during the medical consultation I will observe how the consultation takes place. It is possible that I take notes while I am in the room. All information about you or your child will be confidential and I will never use your name or any information that can reveal your identity or your child identity during my research.
- . - I will not ask you for any contact information; I will not contact you again after the medical consultation.
- . - The results of this study will be written up in a final report and will be used to write academic articles. These may include data from the observation however all data used will not identify the individual participants involved in the study. Thanks for taking some time to read this information sheet, if you have any question about this research please do not hesitate to contact me by telephone or by email.

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