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SOME OF THE CONDITIONS WHICH TEND  
**DWARFISM AND**  
TOWARD A STUNTED PHYSICAL DEVELOPMENT.

The existence of dwarfs has been recognised since very early periods of history. Instances are alluded to in the writings of Homer, Herodotus, Pliny and Aristotle. The ancients, it would appear, had some knowledge of the existence of five different pigmy races in the old world, and it is interesting to note that their speculations as to the location of these tribes have been largely confirmed by modern exploration. Coming down to more recent times, we find that in the seventeenth and eighteenth centuries dwarfs were kept at court and were the associates of princes at a time when it was thought beneath the dignity of the latter to converse freely with those below them in rank.

Various classifications of dwarfs have been adopted from time to time. They have been divided into true dwarfs - where the stature is symmetrically diminished in all its proportions - and micromelic or short limbed dwarfs, which latter class has again been/



been subdivided into two groups - one in which the whole four extremities, and another in which the lower limbs alone are affected. But as our subject is not restricted to cases of actual dwarfism, it seems better to adopt a broader basis of classification, such as:

- I. Cases of stunted physical development, due to the existence of some definite pathological change.
- II. Cases where no such pathological change is discoverable.

As examples of the first class, we may instance the rickety dwarf; of the second, any of the pigmy races of mankind. But between these well-defined extremes, there is a borderland where it is by no means easy to draw a line where the definitely pathological begins.

- I. Cases of stunted physical development due to a definite pathological change.
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Of the causes which tend to produce instances falling into this group, some act particularly by influencing adversely the growth and development of the bones, and especially of the long bones of the lower extremity. In this connection it must be remembered that differences in stature within normal limits/

limits are due much more to differences of length in the lower limbs than to differences of length in the body, hence any cause which retards the normal development of the former may produce a considerable degree of dwarfism. Other causes, such as Pott's disease, act by shortening the spine; whilst others again produce their effects by influencing unfavourably the general nutrition of the body, and secondarily the growth of the bones, as for instance, athyrea.

A. Causes acting by influencing the growth of  
the lower limbs.

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Of these the most important is Rickets. This disease, by its action upon the epiphyses, not only causes delay and imperfection in ossification, but owing to the softness of the bones, is apt to be associated with various curves and deformities, such as genu valgum and genu varum, so that the lower limbs appear shorter than they really are if straightened out. If, however, the shortening is extreme and if the child is kept off his feet during the early years, the bones may not be bent. In this group is probably to be placed the well-known (1) Norfolk dwarf, so minutely described by Hutchinson

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(1) Transactions of the Pathological Society,  
London, Vol. XL. p.229.

This dwarf, 50 inches in height, was executed in 1819 for the murder of his child. His skeleton exhibits great shortening of the lower limbs, the articular ends of the bones are enlarged and spring very abruptly from the shafts, no abnormal curves being present. Hutchinson considered that there was no evidence of rickets in this skeleton; but Humphry of Cambridge maintained that distinct traces were present. (2) The association of depraved moral characteristics with rickety dwarfs has often been remarked. The skeleton of another well-known rickety dwarf who exhibited traces of moral perversity is to be found in the Anatomical Museum of the Edinburgh University. Rickets may, of course, act in stunting the stature in other ways, such as by producing deformities of the spine, e.g., scoliosis, kyphosis.

Inherited syphilis sometimes causes arrest of growth in the lower limbs by producing an epiphysitis in the long bones. The effects of syphilis will be again referred to under C.

The condition known as achondroplasia, to which attention has been directed of recent years, may produce remarkable specimens of dwarfism. In this disease there is absence of growth in the diaphyses of/

(2) British Medical Journal, Dec.5, 1891, p.1188.

of the long bones, the epiphyses being more or less normal. The bones of the base of the skull being developed from cartilage undergo premature synostosis, while the bones of the vault arising from membrane develop normally, so that the skull assumes a remarkable shape. Kellock<sup>(3)</sup> describes the case of a boy aged  $4\frac{1}{2}$  years, height  $30\frac{1}{2}$  inches. The diaphyses of the long bones were abnormally short, the epiphyses enlarged. The vault of the skull was of normal size, the base contracted, the face small, the fingers diverging from each other like the spokes of a wheel. Turner<sup>(4)</sup> describes the similar case of a girl who at the age of ten years only measured 36 inches.

Double Coxa Vara may cause shortening of the stature up to  $1\frac{1}{2}$  inches, owing to the neck of the femur being directed horizontally to the shaft, or even downwards instead of upwards. So also, <sup>double</sup> congenital dislocation of the hip may be associated with considerable shortening.

Infantile Paralysis affecting both of the lower extremities may cause a great want of development in the limbs, as may also some other diseases affecting the spinal cord in early life, such as the pressure/

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(3) British Medical Journal, March 3, 1900, p.510

(4) Ibid. May 6, 1899, p.1092.

sure of a caseous mass in Pott's disease.

An interesting variety of Arthritis deformans in children, lately described by Still, generally leads to arrest of development.<sup>(5)</sup> It is characterized by anaemia, profuse sweats, enlargement of the spleen and lymphatic glands, with marked muscular wasting.

B. Causes acting by shortening the spine.  
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The principal causes which tend to affect the length of the spine are, scoliosis, lordosis, kyphosis and spondylo-listhesis.

Scoliosis, when marked, produces a definite shortening of the spine. It has been alluded to under rickets. It is very prevalent among school children, owing to their being confined too long in one position. It is stated that in a set of German schools, while there was not one case of scoliosis among the children of the first year's attendance, 52 per cent were found to be suffering from it in the fifth or sixth year of school life.<sup>(6)</sup>

A debilitated condition of the general health also predisposes to it. Any condition which produces marked/

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(5) Osler, "Principles and Practice of Medicine, 4th Edition, p.402.

(6) British Medical Journal, Dec.12, 1903. p.1555.

marked shortening of one lower limb, unless compensated for artificially, leads secondarily to scoliosis and may thus be a cause of stunting<sup>of</sup> the stature.

Lordosis, when very pronounced, may lead to a certain amount of shortening.

More important, however, is the condition named Kyphosis. The most marked examples of shortening are produced by tuberculous disease of the spine, when the bodies of several vertebrae may be destroyed and a marked angular deformity produced. Less marked examples are seen in other diseases affecting the spine, such as osteo-arthritis, osteitis deformans, hypertrophic pulmonary osteo-arthropathy, all of which may be associated with stunting of the stature.

Spondylo-listhesis is a rare cause of shortening of the spine. It consists in a luxation of the lumbar vertebrae downwards and forwards over the sacrum.

C. Causes influencing adversely the general nutrition and secondarily affecting the growth of the bones.

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Among the most interesting of these is **cretinism**. This condition is due to lack of the internal secretion of the thyroid gland, owing to a congenital absence/

absence of the gland or atrophy occurring during early life. The disease is characterised by a remarkable absence of growth, by bloating of the features, stunting of the extremities, spade-like hands, protuberance of the abdomen and various degrees of mental enfeeblement. Some of the most marked instances of dwarfism have been produced by this disease. Thus Amand Routh<sup>(7)</sup> describes the case of a female who at the age of  $25\frac{3}{4}$  years measured 41 inches; Byrom Bramwell<sup>(8)</sup> records another case, age sixteen, height  $29\frac{1}{2}$  inches, and Parker another, age eighteen, height 33 inches.

Inherited Syphilis is another cause of want of development. It may act by producing affections of the brain - idiocy, hydrocephaly, etc. More characteristic of the disease, however, is the condition known as infantilism, in which there is a retention till adult years of the external form and characteristics of childhood, the cases as a rule presenting one or more of the various stigmata of the inherited disease. That syphilis acquired during the early months of infancy may have a similar effect is indicated by a case recorded by/

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(7) Medical Press & Circular, May 14, 1884, p. 439.

(8) British Medical Journal, Jan. 6, 1894, p. 6.

(9) Ibid, June 27, 1896, p. 1551.

by Eudlitz and Barrasch.<sup>(10)</sup> A male aged 24 years only 1.4 metres in height, had been infected at the age of two months, by his mother, who had contracted the disease from another child. There was an absence of hair on his face, axillae, and pubes, associated with extreme atrophy of the genital organs.

Infantilism is also said to be produced by a heredity of alcoholism and tuberculosis<sup>(11)</sup>.

Affections of the brain: Mental deterioration is as a rule attended by physical deterioration. The poor physique of the inmates of lunatic asylums is evident to the casual observer. Roberts<sup>(12)</sup> found that lunatics and criminals were on an average two inches below the mean height. This poor development is especially evident among the idiots and the imbeciles. Shuttleworth<sup>(13)</sup> gives the following figures shewing the deficiency in children the inmates of lunatic asylums as compared with ordinary children at corresponding ages:

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(10) La Semaine Médicale, April 11. 1896, p.149

(11) Vide Ballantyne, Antenatal Pathology & Hygiene pp. 276 & 215

(12) Report of the Anthropometrical Committee of the British Association, Vide British Medical Journal, Sept.29, 1883, p.647.

(13) British Medical Journal, Jan.30, 1886, p.184.

Deficiency in Stature of Asylum Children.

At 5 years of age	.....	1 inch.
" 10 " " "	.....	2 inches.
" 15 " " "	.....	3 "

Deficiency in Weight.

At 8 years of age	.....	4 $\frac{1}{2}$ lbs.
" 10 " " "	.....	6 "
" 15 " " "	.....	8 "

Hence any cause which produces idiocy in children will secondarily interfere with their physical development. Among the more important of these is a heredity of insanity, epilepsy and hysteria.

The influence of such conditions as a parental history of alcoholism and phthisis upon the descendants is a question upon which acute differences of opinion exist. The followers of Weissmann, applying the doctrine of the non-transmission of acquired characteristics, deny that these diseases are a cause of deterioration in the descendants. Most authorities, however, still hold that these conditions are a cause of filial degeneracy, particularly by predisposing to mental instability with its accompanying imperfect physique.

Bourneville states that of 2554 children admitted to the Bicêtre and Fondation Vallée in Paris/

Paris, all suffering from idiocy, epilepsy, or hysteria, 1053 were the offspring of drunken parents<sup>(14)</sup>. Elam says that after the removal of the spirit tax in Norway, insanity increased by 50 per cent, and congenital idiocy by 150 per cent.<sup>(15)</sup>

Langdon Down among 2000 cases of idiots found a history of phthisis in 25 per cent of the fathers or near relations, and in 20 per cent of the mothers, of gross intemperance in 12 per cent of the fathers, and in 2 per cent of the mothers<sup>(16)</sup>

Shuttleworth and Fletcher Beach in 2380 cases found a family history of phthisis in 28.31 per cent, of intemperance in 16.38 per cent.<sup>(17)</sup>

The existence of an adolescent form of general paralysis is now recognised and is associated with retarded physical development. Charcot and Dutil<sup>(18)</sup> describe the case of a boy aged 16 in whom the symptoms began at the age of 14, after which somatic development ceased. The boy was of short stature and had a childish look.

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Congenital/

- (14) Vide Ballantyne, Antenatal Pathology, p.276.  
 (15) A Physician's Problems, p.84.  
 (16) Mental Affections of Childhood & Youth, p.64.  
 (17) Hack Tuke's Dictionary of Psychological Medicine, Vol.II, p.664.  
 (18) Archives de Neurologie, March 1892, p.146.

Congenital Hydrocephalus, when the subject survives, has long been recognised as producing a distinct type of dwarf. Barnes<sup>(19)</sup> in 1848 described the case of a child, who at the age of 9 years was only 28 inches in height. Congenital hydrocephalus is not necessarily associated with mental enfeeblement.

The opposite condition, microcephaly when at all pronounced, is incompatible with mental health and forms a distinct type of imbecility. This affection is also, as a rule, attended with stunting of the stature. Shuttleworth<sup>(20)</sup> instances a lad aged 20 years, with a head circumference of 15 inches, who was only 55 inches in height.

Other affections of the brain in early life, such as the congenital paralyses, porencephaly, etc, have a more or less marked influence in retarding physical development.

Any condition which during the growing period of life prevents the free oxygenation of the blood, will more or less tend to produce stunted physique. It is true that these causes have a greater effect upon the form of the skeleton, and more especially of the thorax, but they also to a certain extent interfere/

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(19) Transactions of the Pathological Society,  
London, Vol.II., p.126

(20) British Medical Journal, Jan.30, 1886, p.184.

interfere with the normal development in height. Among these may be mentioned adenoids, collapse and atelectasis of the lung, chronic empyema, some forms of congenital heart disease, etc.

Any chronic wasting disease during early life has also a distinct influence in retarding development, such as long standing phthisis, chronic suppuration from bone or joint disease, chronic diarrhoea, etc. Dr Byrom Bramwell records the case of a youth who at the age of 19 years presented the appearance of a boy of eleven, being  $52 \frac{1}{8}$  in height and 63 lbs. in weight. He had been for nine years subject to chronic diarrhoea, the existence of which, there was evidence to show, was due to pancreatic disease. After two years treatment with pancreatic extract, the boy increased 5 inches in height, and 57 lbs. in weight. (21)

A remarkable case of dwarfism is recorded by Hastings Gilford<sup>(22)</sup>, a male aged 18 years, only 42 inches in height. He had an expression of premature senility, marked absence of hair and subcutaneous fat, defective and irregular teeth. The thyroid was normal, but the thymus was enlarged and persistent, the intelligence being unimpaired. Gilford/

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(21) Lancet Feb.22, 1902, p.522 and Mar.12 1904, p.725.

(22) British Medical Journal, Oct.31, 1896, p.1320

Gilford considered the condition to be due to defect in that part of the brain which presides over nutrition, and proposed the term micromegaly, in contradistinction to acromegaly for the condition. Hutchinson also describes a very similar case.<sup>(23)</sup>

II. Cases of stunted physical development  
occurring without any discoverable  
pathological change.

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Of the causes which tend to produce instances belonging to this group, one of the most important is heredity. This is best exemplified in all the dwarf races of mankind, who generation after generation hand down this characteristic. The influence of racial heredity is also seen in Great Britain. The aborigines of Britain were of moderate or short stature, whereas the early invaders were known to be men of great height. Now it is found that in the counties of Great Britain which shew the least admixture of foreign blood the stature is lowest, but in the counties which shew the greatest admixture of foreign blood the stature is much greater.<sup>(24)</sup> Thus Cardigan, Radnor and Brecon shew the greatest preponderance of descendants of the early British and in these the average male stature is only 66.59 inches. The Saxon counties, Sussex, Berks, and Oxford, /

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(23) Archives of Surgery, Vol.VI., p.140.

(24) Report of Anthropometrical Committee of British Association, vide British Medical Journal, Sept.29, 1883, p.647

Oxford shew an average of 67.22 inches; the Anglian counties - Lothian, Northumberland, and Norfolk - an average of 68.73 inches and the Scandinavian populations of Shetland, Caithness, North and East York and Lincoln an average of 68.32 inches. The stature of the foreigners in Great Britain was also found to be  $2\frac{1}{2}$  inches less than the mean average of the natives. In considering the effects of heredity upon the human stature as observed in every day life, the following considerations have to be borne in mind:

1st, The effect of the stature of the actual parents upon that of the offspring.

2nd, The effect of ancestral heredity.

3rd, The effect of assortive mating.

1st. Stature is an instance of what is called a blended inheritance, that is to say that both the paternal and maternal elements have an influence in its determination. But while this is so, it is found from examination of a large number of cases (25) that in this matter the influence of the paternal element is prepotent and this for the offspring of both sexes; so that stature is a characteristic which is inherited more through the male than the female line.

2nd. But stature is influenced not only by the parents but also by ancestral heredity. "In the/

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the tenth generation a man has 1024 tenth grandparents. He is eventually the product of a population of this size, and their mean can hardly differ from that of the general population. It is the heavy weight of this mediocre ancestry which causes the son of an exceptional father to regress toward the general population mean; it is the balance of this sturdy common-placeness which enables the son of a degenerate father to escape the whole burden of the parental ill."<sup>(26)</sup> This explains to a great extent the failure of the numerous attempts made to propagate artificially a race of dwarfs, when these were kept at Court. Probably a number of such unions were without issue and in others the offspring did not exhibit the characteristic. Thus in the reign of Queen Henrietta Maria, a pair of dwarfs whose united stature amounted to little over 7 feet, were married. There were nine of an offspring, and of these, five who survived were of ordinary size.<sup>(27)</sup> Professor Pearson gives the following figures representing the height of fathers and sons as observed in 476 cases among the middle classes<sup>(28)</sup>

Mean height/

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(26) Karl Pearson, Loc. cit. p.456.

(27) Encyclopaedia Britannica, 9th edit., Vol.VII., p.568.

(28) Loc. cit., p.455.

## Mean height in inches of

Fathers	Sons	Fathers	Sons	Fathers	Sons.
62	64.5	68	68.0	74	72.4
63	65.5	69	69.5	75	70.3
64	68.1	70	69.5	76	73.0
65	67.6	71	70.4	78	73.0
66	68.3	72	70.8	79	73.0
67	69.0	73	70.5		

Thus in the sons there is evident a tendency to approach the average stature. The sons of the dwarfs among the series are taller than their parents, but still below the mean stature. The sons of the giants are smaller than their parents, although still above the average.

3rd. The effect of assortive mating. In investigating the stature of a thousand married couples, Pearson<sup>(29)</sup> found that there was a distinct tendency for husbands to marry wives of a corresponding stature, tall tending to marry tall and short to marry short. Husband and wife resembled each other more in stature than did uncle and niece, and he is inclined to think that this assortive mating has a considerable effect on heredity.<sup>(30)</sup> There is also to be considered the assortive mating which occurs to/

(29) Loc. cit., p.431

(30) Ibid. p.457, note.

to some extent among the lower orders and criminals in the slums of cities. It is calculated that a permanent type of stature can be produced by six generations of carefully selected marriages. In a similar way the degenerate among the slums may produce a permanent stock by the exclusion of better blood. Happily, however, this tendency is to some extent neutralised by the fact that under such circumstances sterilization is prone to occur after three or four generations.

Consanguinity between the parents has been thought to be a cause of poor development in the offspring. The bulk of evidence, however, seems to indicate that provided there is no morbid tendency in the parents, the marriage of consanguineous persons has no such effect, and indeed much evidence has been adduced to show that the marriage between closer relations is not necessarily attended by a degenerate offspring. Among the ancients, especially among the Medes, the Ethiopians, the Persians and the Egyptians, incestuous marriages were very frequent, with no evil results, as far as can be ascertained, to the descendants. Professor Ball of Paris, in discussing the subject<sup>(31)</sup> instanced the Incas of Peru who were under religious obligations to marry their eldest sister and stated that these unions/

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(31) British Medical Journal, Sept.25, 1886, p.581.

unions gave rise to a line of twelve princes all equally distinguished for prowess, vigour and ability. Huth<sup>(32)</sup> after an exhaustive study of the question, concludes that any deterioration through the marriage of near kin per se in man is impossible. Langdon Down<sup>(33)</sup> found that 5 per cent. of the outpatients at the London Hospital were the offspring of consanguineous parents and that they were rather above than under the average in physique and vigour. Voisin<sup>(34)</sup> as a result of the examination of 1077 patients at the Bicêtre and Saltpêtrière states that in no case could healthy consanguinity be regarded as<sup>a</sup> cause of idiocy, epilepsy, or insanity in the offspring. A much more potent cause of degeneracy in the descendants is the union of widely dissimilar races, striking examples of which are seen in mulattoes and the half breed tribes of India and America.

When, however, a morbid taint is present in the parents, there is a distinct tendency to its exaggeration in the offspring. Thus in neurotic parents and in those with a phthisical tendency, the offspring is predisposed to mental degeneracy, with its accompanying imperfect physique. Fletcher Beach<sup>(35)</sup> found/

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(32) The Marriage of Near Kin, 2nd Edit. p.343

(33) Mental Affections of Childhood and Youth, p.71.

(34) Medical Times and Gazette, Oct.10, 1868, p.436

(35) British Medical Journal, May.28, 1887, p.1147.

found that of 836 cases of idiots 14 were the children of first cousins, in most of whom there had been a marked history of mental unsoundness, either on the father's or mother's side. Langdon Down<sup>(36)</sup> found that of 400 idiots whom he examined, 19 were the children of first cousins, but was struck by the frequency with which a history of morbid tendencies were present in the parents in these cases. Howe<sup>(37)</sup> states that to 17 marriages between nearly related parents, most of whom were scrofulous or intemperate, or both, there were 95 of an offspring. Of these 44 were idiotic, 12 were scrofulous and puny and one was a dwarf.

Environments, habits, etc. of the individual  
during the period of growth.

The early life spent in the sunless, overcrowded and ill ventilated slums of our modern cities accounts to no small extent for the deterioration, physical, mental and moral, which is only too <sup>often</sup> evident. Although much has been done in later years to remedy this state of affairs, much still remains to be done. In many cities there is still a large proportion of back to back houses, and houses with only one or two small rooms with insufficient windows. It is to be noticed/

(36) Loc. cit., p.75.

(37) Journal of Psychological Medicine and Mental pathology, July 1858, pp.393, 394.

noticed also that adverse factors as a rule co-exist; where there is overcrowding there is poverty and where there is poverty there attempts to make the best of matters by artificial ventilation are at a minimum. Rowntree found that of 663 overcrowded families in York, 94.5 per cent were in a state of poverty<sup>(38)</sup> and investigating the ventilation of 2480 houses, he found that whereas of the houses of the highest class of labour ten per cent. had their windows open at night, of the poorest class where the rooms would be smallest and overcrowding most prevalent, only 3 per cent. were found to have windows open at night, the observations being taken in September<sup>(39)</sup>. Surroundings such as these conduce also to mental and moral deterioration and, as has been noted, the physique of criminals as well as lunatics is below the average.

But not only in the home are factors adverse to the physiological growth of children present, but also in the school. Here bad ventilation and overcrowding are often present, though fortunately to a decreasing extent, and perhaps more frequently in country schools, thus counteracting to some extent the more healthy surroundings of the latter. In this/

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(38) Poverty, a Study in Town Life, 2nd edit. p.177

(39) Ibid. p.176.

this connection a more general knowledge of hygiene on the part of teachers is greatly needed. The early age at which children are sent to school, the long hours without a break, the too prevalent practice of cramming children for examinations, the want of healthy physical exercise, and the often underfed condition of the children are all factors in retarding normal development. As indicating in a rough way the effect of some of these factors the experiment of the late Mr Charles Paget, M.P. is interesting <sup>(40)</sup>. He divided the children attending the village school on his estate into two approximately equal groups, one of which spent the full number of hours in the class rooms, whilst the other was sent to work during half those hours in the garden. At the end of six months it was found that the group which only spent half the time in study surpassed the other in everything. The necessity of physical as well as mental training is recognised. in the Report of the Royal Commission on Physical Training (Scotland). It lays down the proposition that "the education cannot be based on sound principles which neglects the training and development of the bodily powers". Uncorrected errors of refraction in school children, especially myopia, have also/

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(40) Times. Dec.29, 1903, p.7

also an adverse influence, owing to the contraction of the chest produced by long continued stooping over the desk. Sir Wm. Anson states that there are no less than 60,000 children in London who are physically inferior. "They start badly, they are the offspring of early marriages and unhealthy parents, they are overworked. . . . . They do not have enough food. They go out to school in the morning without breakfast . . . . .and their housing is bad. The result is that these children are usually tired both in mind and body, they cannot sustain their attention, they cannot last through an ordinary day at school, they fail early, any sort of disorder takes easy hold of them and they are backward to the extent of two, three and sometimes four years behind the well fed and well cared for child of the same age."<sup>(41)</sup>

The Factory Acts have without doubt been useful in preventing the indiscriminate employment of child labour, but even after children have left school their employment in unhealthy trades, at a period when growth ought to be most active, often causes a check in development. Professor Cash of Aberdeen in an address to the Educational Institute in Scotland, attributes much faulty development to the increase/

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(41) Vide Lancet, July 18, 1903, p.197.

crease in juvenile smoking to which he traces a number of abnormalities.

Another factor which is at work in influencing the general physique is the migration of the rural population into the towns. In England about 80,000 persons migrate every year from the country to the towns, where they go to swell the ranks of poverty and misery. Brought up in the country, they are practically ignorant of the hygiene suited to town life and are often found in a more squalid condition than the other inhabitants. There is also to be considered the depletion of stock thus produced. This result is also brought about by emigration, the effects of which have been seen more particularly in Ireland during the last fifty years. The rural population ought to be the robust stock from which the physique of the nation is recruited and any cause which tends to deplete this class cannot be viewed with satisfaction.

The incidence of the birth rate is another factor which may have some influence. According to Pearson<sup>(42)</sup> there has been since the sixties a falling off in the birth rate among the middle classes as compared with the lower. Now the physique of the middle classes is superior to that of the lower, hence/

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(42) Loc. cit., p.467.

hence a falling off in the birth rate among the former may ultimately have a deteriorating effect upon the physique of the nation. Professor Taylor in his recent address to the British Gynaecological Society emphasizes this point and concludes that "marriages of the middle and better classes are now so sterile that quite an undue and dangerous proportion of the rising generation is recruited from the lower, the more ignorant, the more vicious, and semi-criminal population."<sup>(43)</sup>

Reliable statistics of the physique of the lower classes are at present wanting. The Army recruiting statistics cannot be taken as representing the average of the classes from which they are drawn. Robert Jones, in a paper in which he points out the effects of civilisation as a factor in degeneration, gives the average height and weight of 143 persons admitted to the Claybury Asylum between the ages of 15 and 25, typical, he says, of the class to which they belong.<sup>(44)</sup> The smallness of the numbers and the material from which the statistics are taken, are, however, open to objection. From these it appears that there was on an average a deficiency of one inch in height and 15.3 lbs. in weight as compared with the mean for corresponding ages. It is probably/

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(43) Medical Press & Circular, March 2, 1904, p.225.

(44) Lancet, August 8, 1903, p.369.

probably owing to bad environments and want of hygiene that the stature of persons of illegitimate birth are usually below the standard. In the years 1865-6 in France while only 16 per cent of the legitimate children were rejected from the conscripts for want of height, 22 per cent of the bastards and 33 per cent of the foundlings were rejected for this cause. (45)

Influence of Food: The quantity and the nature of the food received by the individual during the period of growth is one of the most important factors in determining whether or not development will proceed to physiological limits. Perhaps more important errors are made in dietary during the first year of life than at any other period. The number of mothers who suckle their own children is decreasing; more and more are taking refuge in those imperfect substitutes - patent foods. Despite the spread of popular knowledge, many mothers still experiment upon the digestion of their infants during the early months by prescribing substances totally indigestible by them, contributing thus not only to the heavy bill of infantile mortality, but also in many cases to the permanent stunting of growth. When to this there is added the adulterated and/

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(45) Vide Mémoires de la Société d'Anthropologie de Paris, 1870 III. pp.217, 218

and contaminated state of the milk supply which is open to the lower classes, it is not much wonder that their infants thrive badly. In later years mistakes are also made by providing badly balanced dietaries. There is often found an excess of starch and lack of proteid, insufficient material being present for the normal development of tissue. The abuse of tea among the lower classes to the limitation of substances with a food value appears to be on the increase. Dr Robert Jones thinks that an important cause of deterioration in the rising generation is the present day tendency of girls among the lower classes to abandon for factory life, domestic service which he considers to be the only real training for the class in household management.<sup>(46)</sup> These girls "lightly consider and readily undertake matrimony, but they are absolutely incapable of bringing up children or of cooking simple food for home consumption, preferring to fall back on the tinned enormities of local provision stores. Is it too much to surmise that the offspring of such mothers can preserve any factor of resistance to the incidence of disease or to surmise that they contribute to the maimed, the deformed and the degenerate in consequence."

But not only is improper food an important factor/

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(46) Times, December 29th, 1903, p.5

tor, but there is often evidence of insufficiency in the amount of food. A large proportion of the community are not earning enough wages to provide themselves and their families with the bare necessities of life, by the exercise of rigid economy. When to this group is added the number who by want of thrift, drink, gambling, etc., waste part of their earnings, the percentage of those living in poverty assumes formidable proportions in some cities.

Thus Rowntree found that 27.84 per cent of the total population of York, equal to 43.4 per cent. of the wage-earning classes were living in poverty. (47)

Now this lack of food naturally tells most severely upon the physique of the children, who require food not only for the repair, but also for the up-building of tissues. When children thus underfed are subjected to the long hours of school life, with its tax upon the powers of the brain, the tendency to physical deterioration is exaggerated. As indicating to some extent the effect of want of food, combined with insanitary and other unfavourable surroundings, the investigations of Rowntree upon the physique of 1919 school children of the working classes in York are interesting (48). He divided these/

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(47) Poverty, a Study in Town Life, 2nd edit. p.117.

(48) Loc. cit. pp.209-214.

these into three classes, the poorest, the middle and the highest class of labour, 671 falling into the first, 790 into the second, and 458 into the third group.

Height in inches.

<u>AGE</u>	<u>BOYS</u>			<u>GIRLS.</u>		
	Class 1.	Class 2.	Class 3.	Class 1.	Class 2.	Class 3.
3 to 4 years	$36\frac{1}{4}$	$39\frac{3}{4}$	$39\frac{1}{4}$	37	39	$38\frac{1}{2}$
13 years	55	$56\frac{3}{4}$	$58\frac{1}{2}$	$56\frac{1}{4}$	$57\frac{1}{2}$	58
Combined average from 3-13 years.	$45\frac{3}{4}$	$48\frac{1}{2}$	$49\frac{1}{4}$	47	$48\frac{1}{4}$	$48\frac{1}{2}$

Weight in Pounds.

3 to 4 years	33	$35\frac{1}{4}$	$37\frac{3}{4}$	33	$34\frac{3}{4}$	34
13 years	73	80	$84\frac{1}{4}$	$79\frac{1}{4}$	$84\frac{1}{2}$	$83\frac{1}{4}$
Combined average from 3-13 years.	$52\frac{1}{2}$	$55\frac{1}{4}$	58	$52\frac{1}{4}$	$55\frac{1}{4}$	$55\frac{1}{2}$ .

It will thus be seen that the poorest class are inferior in height and weight at all ages, and at 13 years, at the end of their school life, the difference is most marked. He also divided the children/

children as to their general condition into four groups - very good, meaning children markedly healthy and well developed; good, meaning up to the average; fair, or children scarcely up to the average; and bad, indicating physical traces of under-feeding and neglect. His figures for boys and girls are very similar. Combining them we get the following percentages for all children.

	Very Good	Good	Fair	Bad.
Class 1 (Poorest)	2.5	14.6	31.0	51.9
Class 2 (Middle)	7.5	20.6	52.0	19.9
Class 3 (Highest)	27.3	35.8	25.3	11.6

It is thus evident while 63 per cent. of the highest class are of at least average physique, of the poorest only 17 per cent. come up to this standard, and over 50 per cent of the latter are classed as actually bad.

The question of the influence of the mother's diet during pregnancy upon the subsequent development of the offspring is an important one, upon which precise evidence is wanting. It is hardly to be supposed that the children of a woman markedly underfed would have the same inherent capacity for growth and development as that of a mother under favourable/

favourable circumstances. The investigations of Prochownick<sup>(49)</sup> confirmed by the analogy of the more recent experiments of Noel Paton<sup>(50)</sup> upon lower animals, indicate that at least the size of the foetus at term can be diminished by a restricted diet of the mother.

Climate: It does not seem possible to assign any definite influence to climate as a factor in influencing stature. Speaking generally, and to this there are many exceptions, the inhabitants of northern and cold climates are taller than those of warm climates, but the determination of stature in these cases is influenced by many other factors. The fact that races who have migrated to climates widely different from their own and still preserved their characteristic stature, would seem to indicate that climate was a factor subordinate to such others as racial heredity and adaptation to surroundings.

As to the causes which influence the production of cases of true dwarfism but little is known. To judge by the infrequency with which their skeletons are found in museums, they must be rare. Humphry only knew of two examples = one in the museum of the University/

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(49) Vide Ballantyne, Antenatal Pathology, p.473.

(50) Lancet, July 4, 1903, p.21.

University of Cambridge and another - the skeleton of the well known Nicholas Ferry, in the museum of the Jardin des Plantes, Paris.<sup>(51)</sup> There seems to have been but little history of heredity in most of the cases of dwarfs recorded in history. As a rule they have been the offspring of ordinary parents and there is seldom a history of more than one dwarf occurring in one generation. They are best regarded as anomalies of development, which like many other instances of the kind crop up from time to time in an unexpected manner.

(51) British Medical Journal, Dec.5, 1891, p.1188.