AN ENQUIRY INTO THE PHYSICAL CONDITIONS AND SOCIAL CIRCUMSTANCES OF MENTALLY SUBNORMAL CHILDREN ATTENDING ELEMENTARY SCHOOLS IN THE CITY OF LINCOLN.

BY

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C O N T E N T S.

INTRODUCTION.

METHODS OF COLLECTING DATA.

INTRODUCTION.

The aim of this thesis is to consider the factors which might have a bearing on the subnormal mental conditions of children living in a clearly defined administrative area.

The factors analysed are the physical conditions and social circumstances of the children, including hereditary traits.

The results are summarized statistically, and where possible they have been compared with findings relating to apparently normal children.

The basis of the enquiry was the examination by me of 323 such children attending elementary schools in the City of Lincoln.

Methods by which data were collected.

The examination consisted of a physical investigation, the application of certain mental tests, and enquiries into the mental and physical health of other members of the family with a view to assessing importance of heredity in relation to mental deficiency. In my work in connection with Infant Welfare, Ante-Natal, and Venereal Diseases Clinics, there were frequent opportunities of meeting many of the mothers and of acquiring details of the family life. Homes in most cases were visited to find out environmental conditions. Certain items of family history were supplied by the City of Lincoln school attendance officer who had been engaged on this work for many years and was, prior to this, an uncertificated teacher in the town. Consequently, the school life of some of the parents was well known to him. A midwife who had been practising in the City for many years confirmed relevant stories of abnormal pregnancy told by the mothers. The mothers' information, too, of the health of the children in their early years was compared with Health Visitors' notes and Infant Welfare Records. Bearing in mind the possibility of inaccuracy of the mother's statement and also the time elapsing

between infancy and the age at which the children were examined, I have endeavoured to give all information its true value.

The mental tests used were the Stanford Revision of the Binet-Simon scale. In many cases the Healy Form Boards were used.

Lincoln, which has a population of 66,000, in addition to being a Cathedral City, also contains several large engineering works. Consequently the inhabitants approach more to the industrial than to the rural type which might be expected.

The average elementary school population in the City is nine thousand, three hundred and fifty nine.

The enquiry, which was started early in 1925, was continued for over three years. As will be seen from the table of the Intelligence Quotients of the children (Appendix A) the examinations covered a wide range of subnormal grades. Included among the children examined were epileptics, stammerers, the offspring of tuberculous parents, and the siblings of very mentally defective children. Some children were tested because they were reported to be "difficult" to deal with in school, others because they were decidedly backward in certain subjects of the school work.

II.

HISTORICAL.

METHODS OF ESTIMATING INTELLIGENCE.

CLASSIFICATION AND STATISTICS.

Historical.

There are records of mentally defective children from early times in history. The ament was, however, an outcast, and it was not till the advent of the Christian era that any sympathy was extended to them. (1). In medieval times in England, the revenue of a defective who owned land went to the King, and the custody of the defective was given to a guardian. The poor were under the surveillance of the landowner. If they had no property and did not break the law, very little notice was taken of them. In the early Lunacy Acts, no distinction was made between Idiocy and Mental Deficiency, and lunatics and idiots were put in asylums together. (2).

During the seventeenth century St. Vincent de Paul started giving instructions to idiots at his Priory of St. Lazare, France. The successful teaching of the deaf and dumb by Pereire about 1750, and by the Abbe de l'Epee in 1770, led to more systematic efforts to teach mental defectives. (3). At the beginning of the nineteenth century Itard (4) published an account of his attempt to teach the wild boy of Avignon. It was in France that alienists first of all paid serious attention to the problem of abnormal children. In 1828 a school for idiots was started by Ferrus and Leuret

at Bicêtre. Esquirol defined the term idiocy and distinguished between an idiot and a dement. Voisin (5), another distinguished Frenchman organised a school in Paris and showed that idiocy was capable of amelioration. Perhaps the most brilliant teacher of mental defectives was Dr. Sequin, a pupil of Itard.

In Germany, care of the mental defectives was established even before that of cripples. Care and supervision was exercised with the definite idea that it was as much for the good of the community as for the unfortunate individual. In 1811, Guggenbuhl, at Salsburg, established a school for cretins, the results of which attracted considerable interest. (6).

A well known German school for M. D. children was established at Elberfeld in 1879, and furnished the model for the English day school for defective children (7).

The interest in the mental defective shown on the Continent was not without effect on Great Britain and America. Painstaking work was done in America by Dr. Howe (43), widely known through his pupil, Laura Bridgman, the blind, deaf mute girl. On his invitation Dr. Sequin went to America about 1845, and stimulated enthusiasm for the teaching of

the mental defective.

Towards 1890, Witmer started a clinic in Philadelphia. This has been very much elaborated now and a number of experts are attached. A school attached to the Clinic was started in 1907. (8).

The opening of this century saw great advance in the psycho-clinical movement and several psycho-clinical laboratories were established. The founding of these laboratories increased the interest in the study of psychology, and endeavours were now made to establish through psychology some relation between criminal tendencies and mental abnormality. Dr. Wm. Healy of the Psychopathic Institute in Chicago has been one of the foremost investigators of this problem.

In Great Britain, the first institution, which later became the Magdalen Hospital, was established at Bath under Miss White in 1846. In the following year the institution now known as Earlswood was opened. No facilities, however, were provided by Poor Law Authorities. If the mental defective came under the notice of the Poor law, it was not because of his feeblemindedness but because of some breach of the law or inability to support himself. In 1875, the Charity Organizations' Society of London, drew attention to

the unhappy situation of the mental defective, and recommended that special schools and asylums should be provided. (9).

With the introduction of the Education Act in 1870, it became more and more recognised that many children were unable to take advantage of the educational course, and gradually Committees were formed to make enquiries.

The London School Board considered reports on the Elberfeld School in Germany, and were impressed by accounts of the progress made by defective children attending the special day schools. (7). In 1892, this School Board and the Leicester School Board opened day-school classes for mentally defective school children. Other big towns followed suit.

Towards the close of the nineteenth century in response to reports from numerous organisations interested in the mental and physical condition of children, a Departmental Committee on Defective and Epileptic children was appointed. Legislators now realised that there was a class of children too feebleminded to be taught in the elementary school, and not so feebleminded as to be imbecile or idiot. They required special treatment during their school life. In 1899 the Elementary Education Act (Defective and Epileptic Children) was passed.

Its powers were permissive only. It gave power to Local Education Authorities to ascertain what children in their area were physically or mentally defective, or epileptic, and to provide for their education in special schools or classes. The mentally defective children included in this scheme were those who not being imbecile and not merely dull and backward were by reason of mental and physical defect incapable of receiving benefit from instruction in the ordinary school, but were not incapable of receiving benefit from instruction in special classes or schools. The Act raised the school-leaving age for such children to 16 years of age. This Act, though only a moderate measure, was an advance. An Education Act of 1907 (Administrative Provisions) brought routine medical inspection into the schools. Day teachers, to whom for the most part had been left the care and education of defective children, were now to have the advantage of the advice and observations of medical workers.

The Royal Commission on Mental Deficiency of 1908 realized the need for early recognition and education of the mentally defective, and especially the need of after-care. Its Report led to the passing of the Mental Deficiency Act 1913.

Education Acts passed in 1914 and 1921 looked after the needs of the mentally defective child. They defined mentally defective children from an educational point of view in contrast to the social relationship of the mental defective to his fellow men as expressed in the Mental Deficiency Acts. The local Education Authority became responsible for all mentally defective children educable and between the ages of 7 and 16 years. A feebleminded educable child may be certified and sent to a Special School, even without the sanction of the parents.

The organisation of more schools and special classes for the feebleminded was slow. The cost was great and many doubted the worth of such schools. Certainly, the results so far as subsequent employment was concerned were nothing like so successful as those obtained at Elberfeld School in Germany. Medical Officers began to realise, however, that the type of child who was filling the special class or school was a low grade type from which one could never hope to produce a self-supporting workman. The special class should be reserved for the high grade feebleminded child, the child who by very careful tuition and training could make his life useful and earn a self-supporting wage. The low grade type can more advantageously be placed in an institution.

The course of instruction, too, in the special schools required alteration. At this time in the history of education, the value of manual work even for normal boys and girls had not been fully realized. Manual work by reason of its value in training the muscle and tactile senses was not used to full advantage. The work of Madame Montessori gave an impetus to the teaching of children by methods of training the senses.

The Mental Deficiency Act, 1927, altered the definition of mental deficiency. The reading now is:- "Mental Defectiveness is a condition of arrested or incomplete development of mind existing before the age of 18 years, whether arising from inherent causes or induced by disease or injury." This better definition draws a wider net and may include children whose mental retardation is a sequel to Encephalitis Lethargica or similar infections.

To consider the problems presented by the mentally defective child, a Committee comprising members of the Board of Education and the Board of Control was arranged in 1924. The enquiry was later extended to adult defectives. Six areas representative of England were chosen and thorough examinations were made by a medical investigator, Dr. E. O. Lewis. The Report, published in 1929,

contains interesting recommendations with regard to the education of not only feebleminded but of dull and backward children.

Methods of Estimating Mental Intelligence.

During the latter half of the last century psychologists essayed to find a method of estimating the development and the progress of mental intelligence. It was not till the twentieth century that suitable methods were elaborated. In 1908, two French investigators published a series of tests, now universally known as the Binet-Simon tests.

A certain number of tests were allotted every year from three to sixteen years. In 1911, a revised series of tests were issued in which the number of tests for each year was equalized. These tests had already been tried on hundreds of children in Paris. Where a majority of average children failed to pass any particular test, that test was transferred to the series of a later year. Intelligence has been found to grow at a fairly constant rate up to 14 - then it slows down and stops at 17. The value of these tests in differentiating children and in discovering the subnormal or feeble-minded, was quickly recognised. The use of the

tests became universal. They were subjected to much criticism, many asserting that the tests were too academic, and that the capacities tested were influenced by training. But the comparative value of the tests is excellent. Modifications of the Binet-Simon have been introduced - the most widely known being the Stanford Revision of the Binet Simon scale. The tests are described in Appendix B.

In America where the measuring of Intelligence levels has been extensively employed, group-testing has been introduced. It is applicable where there are large numbers. It may, however, fail to detect the high grade feebleminded individual.

Performance Tests, such as Healy's Form Board and the Porteus Maze tests, are now in use. They require a certain amount of co-ordination between the hand and the eye. They are useful in testing deaf and dumb children. Healy's Form Board was used in a large number of the children under review. This test was generally applied towards the end of the examination, and proved an attraction to most of the children. If the child of 10 years of age performed the Healy Board test satisfactorily, yet failed in all the tests of the 10 year old scale, one gave him a further mental test three months later,

and assessed his mental ratio on the second examination. This test gives an indication of how a child can meet a situation.

In the Stanford Revision, there are six tests in each year. This gives a value of two months to each test. The child is therefore given two months for each test answered. A figure is obtained, called the child's mental age. If this mental age is assessed as a ratio of the actual age and expressed as a percentage, a figure is obtained commonly called the Intelligence Quotient or Mental Ratio:-

$$\frac{\text{Mental age}}{\text{Actual age}} \times 100 = \text{Intelligence Quotient.}$$

The higher ages of testing tend to become affected by social circumstances, the children of better social classes often returning as much as 20 higher in the Intelligence Quotient than the children from a lower social strata. How far this is due to wider opportunities, and how far due to a better inheritance, it is difficult to say.

While these mental tests take no account of temperament, of will power, of self-control, or of moral stability, yet close observation of child during investigation reveals much. It is interesting to note how the child tackles the questions.

It is instructive if he is afraid of mere questioning and if he is easily embarrassed and, therefore, makes no effort to unfold his mind. Perspiration of the hands, and nail-biting reveal a state of anxiety. In the Stanford Revision of the Binet Simon scale, Drawing tests and the Ball & Field test reveal manual dexterity and will power. It is possible to obtain a survey of the child's mental stability from his replies to the absurdities to the comprehension tests. In the children examined one found the Colour test was invariably well done. This was probably due to the extensive use of coloured wools and chalks in the Infant Schools. The "Right and Left" test of the VI year group was one which revealed mental inferiority before any other at this age. Most of the children knew which was the right hand, but not the left ear or the right eye. The "Date" test did not usually cause difficulty as in most class rooms the date is marked on the blackboard every day along with the class attendance figures.

The Ball & Field Test was interesting. One did not feel satisfied with standard introduction to this test. (Appendix B). After trying it on thirty average children, in which the responses were very poor, one altered the reading to:- "Suppose this is a field as big as the Common. Suppose you have

lost your ball..... ". One found that this slight amendment made the position clearer to the child, yet at the same time it did not detract from its value as a test.

Mental testing is used throughout the world. In view of this universal application, it is necessary to bear in mind Prof. Findlay's remarks:- "It should not be assumed that the application of the test relieves the practitioner from responsibility and further study of each case as presented for investigation." (10).

Classification.

Different modes of classification of mental deficiency have been adopted by various investigators. A classification suitable for the educationalist is not appropriate for the pathologist. The educationalist is concerned with the degree of intelligence, the pathologist with the possible cause. Goddard (11) bases his classification on the possible cause, while a similar analysis of his cases was made by the late Dr. John Thomson (12). Tredgold (13) recognises three grades of Amentia, high grade, medium grade, low grade.

These three grades are defined in the Mental Deficiency Act of 1927 as idiots, imbeciles and mental defectives. The definitions in the Education Acts are similar, the term feebleminded child in the Education Act being synonymous with the term mentally defective in the Mental Deficiency Act. In America, the Term "moron" is used in place of feebleminded.

In the educational grading of children, there is a group between the mentally normal and the feebleminded, namely "The Dull or Backward Group". Their inefficiency becomes apparent in the Junior School or even as late as the Senior. They are unable to profit by instruction in a class with children of their own age. They are two or even three years retarded.

The use of mental tests has been valuable in ascertaining to what grade subnormal children belong. Having assessed the child's intelligence quotient, he may be placed thus:-

Intelligence Quotient over 90-100, normal.
" " 75-89, dull or backward.
" " 70-74, borderline.
" " 50-69, feebleminded.
" " under 50, imbecile or idiot.

Cyril Burt (30) regards as technically backward all those who are retarded by more than 15% of their age and therefore possess ratios of less than 85%.

Dr. Lewis, the Medical Investigator of the Committee who issued their report in 1929 (14) gives the incidence of mental deficiency in children as 4.18 per 1000 of total population. This figure was sub-divided as follows:-

3.36 feebleminded.
.67 imbeciles.
.15 idiots.

There figures were higher in the rural areas under survey. The same report states that at least 10% of children attending public elementary schools are educationally retarded 2 years, i.e., they are not deriving benefit from instruction in the ordinary school.

Modern Attitude.

"Many outstanding problems educational, social and economic, are largely problems created by the presence in the community of mentally abnormal or mentally defective people." (15).

The mental defective as a difficult administration problem is not generally encountered until school is reached. Hitherto, the individual has lived in his own home circle and so far has not

affected the general community. But at school he is placed in an atmosphere which reflects all his weaknesses - his defect of attention, his want of concentration, his lack of purpose. He shows no foresight, no judgment, and very often very little manual control. The defects follow him when he leaves school, and reduces or nullifies his wage-earning capacity. Sooner or later he joins the ranks of the unemployed and drifts towards pauperism and the slums. Among adult mental defectives, there are the problems of alcoholism and prostitution. The habit of excessive drinking tends to become engrafted on those who lack foresight and self-control, while prostitution cannot fail to attract a large number of girls. Potts, (16), estimates that in Rescue Homes where careful exclusion is not exercised thirty percent of the inmates are mentally deficient. Closely allied to prostitution there is the medical and social problem of Venereal Diseases.

With the introduction of individual and group mental testing much investigation on the relationship between Mental Deficiency and Delinquency has been carried out. Whilst some of the startling figures of American workers should be accepted with caution, the accepted results of all investigators are frankly appalling.

In U. S. A. by use of Binet Simon tests, one investigator (17) stated that probably 80% of children in Juvenile Courts of Manhattan and Bronx are feebleminded. Healy (18) gives an estimate of 11.2% which consists of feebleminded and imbeciles.

In this country much work has been done by the psychologist, C. Burt. Using the Binet-Simon tests (19) and "working on the assumption that mental deficiency means capable of being certified for a Special (Mental Defective) School", he estimates that 7% of delinquents are feebleminded. He states further too, (20), that 90% of delinquents fall below the middle line of average ability and over 30% fall so far as to be technically classed backward in general intelligence.

Lack of emotional stability which is one outstanding feature in the delinquent is largely responsible for anti-social behaviour. Suggestibility is another characteristic to be noted in the mental defective. Among the delinquent children he examined C. Burt found that at least half suffered from characteristic "instability". A study of mental intelligence must include personality and character.

Mentally, the defective child progresses only by a fraction of a year, for each actual year of his age. From an educational point of view

alone, the mentally inferior child raises a problem.

In more recent years, notice has been taken of a group of children numerically, much greater than the feebleminded, a group generally known as the Dull or Backward. These children may be retarded two or even three years. They, too, are raising problems as engrossing and as menacing as the feebleminded.

In several of the Annual Reports, Sir George Newman urges the need for provision for the child who, while not feebleminded, is so dull or mentally retarded that he cannot take advantage of ordinary elementary school curriculum. He may be mentally retarded owing to slow development, to physical defects, to defective vision or hearing, to irregular attendance or to bad home environment.

It is seen then that the mentally retarded individual, irrespective of the degree of his subnormality, is responsible for many problems, and the facets of this problem are interesting to the physiologist, to the psychologist, to the educationalist, to the eugenist, to the politician, to the magistrate, to the employer, in fact to all the community.

III.

ETIOLOGY
of
MENTAL DEFICIENCY.

Etiology.

In tracing out the etiology of mental defectives several factors alone or together are found to influence the intelligence level of the child.

Lapage (21) made an interesting analysis of factors affecting the parental germ plasm before birth.

Inherited factors affecting the parental germ plasm before conception of the child.	a. Transmitted neuropathic taint.	Mental Deficiency. Insanity. Epilepsy. Hysteria Neurosis.
	b. Vitiating Disease or habits.	Alcoholism. Tuberculosis. Other debilitating Disease.
	c. Sociological Factors.	Ages of parents. Consanguinty of parents.

These factors may be considered separately.
One factor dominates all others - heredity.
Tredgold (22) states that 80% of aments are of pronounced neuropathic stock, while Kelynack (23) in an analysis of 752 children under 16 years found 83% show hereditary traces.

In the Chadwick lecture Sir Fred Mott (24) quotes Prof. Starch's observations that 60-70% of mental character and disposition is due to heredity and only 10-40% due to environment and upbringing. In the same lecture there is described the results of

an enquiry, carried out in the Parish of Bethnal Green. The heredity and social conditions of a certain number of insane, mentally defective, and normal persons were investigated - 60 cases in each group, and the last two groups were from school children in the district. The enquiry revealed in the case of the mentally defective children that their parents were of a similar type - incapable or on a poverty level. A similar survey (25) was carried out by Potts among 200 children in five schools in different districts of Birmingham. He found in the special school group that the type with stigmata, the simple congenital group, were descended from an insane or a feebleminded group. He states "Half the feebleminded were the offspring of insane or feebleminded; the other half were the offspring of physical degenerates".

Woodrow (26) speaks of investigations of Karl Pearson, and says that the combined influence of the various environmental factors, (bad housing, overcrowding, alcohol, immoral behaviour of parents) does not approach that of heredity. Indeed evidence has been produced that both physical and mental traits may pass from parent to child.

The causative factors in 250 out of 500 "problem" children were investigated.(27). Heredity and bad home conditions were found in 46% and 55% of the cases.

Insanity.

Insanity has not been proved to be a decisive factor in the production of mental deficiency. The two conditions are dissimilar. The ament has never had mental endowment, judgment, reasoning powers or the ability to profit by experience. The insane has a store of mental pictures and experiences which are now out of focus and inco-ordinated. In the enquiry made in Bethnal Green (24) it was found insanity was much more prevalent in the pedigrees of the insane than in that of mental defectives - in the ratio of 50% as against 25% in defective. Even 25% is high compared with the normal child, in whom a record of insanity or mental deficiency among parents was almost unknown. Kelynack's group of children under 16 years (23) showed 47% had a history of insanity which required care and detention in an asylum.

Epilepsy.

Epilepsy is evidence of a neuropathic stock, and it is most probable that a retarded mental state will appear in an immediate descendent. In one set of statistics, (28), a history of epilepsy was found in 3% cases. When epilepsy begins during childhood degenerative changes occur in the neurones and some degree of mental subnormality is produced, and the earlier the epilepsy occurs the more marked is the degree of subnormality.

Mental deficiency, insanity and epilepsy, are described as neuropathic factors and often appear two of them together or all three together. In an analysis of a thousand feebleminded children in Manchester (29) there was a family history of mental deficiency, or epilepsy or insanity, in 48%. In 6.8% there was a combination of two or more factors. When more details were obtained of several of the children, a percentage of sixty four showed epilepsy or insanity in their history.

Alcoholism.

Excessive consumption of alcohol would appear from experimental work on animals to play a very adverse part in mental and physical development.(30). But the findings of Prof. Stockard of Cornell University on the harmful effects of alcohol on guinea pigs and their offspring have been contradicted by more recent research. (31).

Langdon Down (30) found 12% of fathers and 2% mothers of mentally defective children were alcoholic and notes how among those of the lower social class, drunkenness becomes a factor of increasing importance. It is probable, too, the excessive indulgence of the alcohol addict is correlated with an unstable mental equilibrium, which means the affected individual is neuropathic.

Tuberculosis & Other Debilitating Diseases.

Deterioration of physical health tends to lower nervous tone and the capacity to stand mental and emotional stress. There seems to be no convincing evidence that mental defect is the direct result of tuberculosis. (32). Tredgold (33)

finds, however, that antecedent tuberculosis occurring alone, is unusual, an abnormal mental state being generally present too.

Syphilis.

Syphilis can be transmitted from the mother to the new-born infant, but that the spirochoete actually damages mental processes is doubtful in many cases. Shuttleworth (34), says that the role of parental syphilis is surprisingly small - less than 2%, but he remarks, however, in the same article, "Taking all into consideration I am inclined to think that inherited syphilis is a more frequent factor in the production of mental defect and abnormality in childhood than can be demonstrated from institutional statistics." A figure as low as 1.01 per cent is given by Dr. Fletcher Beach at Darenth. (34).

Childbirth.

The emotional and physical life of the pregnant woman has been said by some writers to have an important bearing on the mentality of the unborn child, especially at the two extremes of the reproductive period.

Insufficient nutrition of the expectant mother may influence adversely the mental processes of the unborn child, but probably only to the extent of mental retardation. "Premature birth, apart from cerebral haemorrhage, is not associated with mental deficiency." (35). Without a defective hereditary influence a prolonged or very difficult labour may influence the mentality of the newly-born child through gross intra-cranial haemorrhages. Dr. John Thomson (36) grouped 952 mentally defective children into groups (1) Primary, (2) Secondary. The secondary group, consisting of 407 children contained these figures:-

Birth Injury certain..... 150
Birth Injury possible..... 34

These statistics give a proportion of 36.8% for birth injuries. Out of all the cases examined by Thomson (primary or secondary) the percentage for birth injuries is 15.7%.

Consanquinity of Parents.

Unless there is a decided neuropathic taint, subnormality does not occur in the children of cousins who have married.

Post-Natal Affections.

Post-Natal affections contribute to the number of mentally defective children. Infective conditions damage the neurones before they are developed and produce varying degrees of mental insufficiency. Meningitis or Encephalitis may follow on influenzal or pneumococcal infections, and in tropical countries, a malarial infection does great damage. A polio-encephalitis or an Encephalitis Lethargica may damage the cerebral cells and produce mental subnormal states.

Deficient Secretion of the Endocrine Glands.

Deficient secretion of the Endocrine Glands is associated with mental deficiency. Cretins may be found in this country, but are more common in certain mountainous areas of Central Europe. In Dr. Thomson's group of 952 children (36), there were forty five classed as cretins and two classed as pituitary defect.

In the Lincoln children examined, all these factors which have been described were enquired into and noted.

IV.

THE CAUSATIVE FACTORS OF MENTAL SUBNORMALITY CONSIDERED IN RELATION TO THE INTELLIGENCE QUOTIENTS OF THE LINCOLN CHILDREN.

In the children mentally examined and reported on in this thesis, it was possible in 220 children, (95 boys and 125 girls), to get a fairly accurate knowledge of the home life and the mental and physical condition of the parents and of the previous generation. Any factors thought to have a bearing on the mental retardation of the child were noted and analysed.

In the enquiries into the family histories of these children intelligence tests were not applied to the parents. The term mental retardation in the family history was entered in the notes only when it was apparent from the conversation with the parents or by the neglected condition of the home that one or both parents were definitely subnormal. It is used to include all grades of mental subnormality. The information supplied by the school attendance officer regarding many of the parents and grandparents was invaluable. He could often say that they were backward at school or were always at the slum level. Teachers too, gave histories regarding the scholastic abilities of some of the parents. The teachers could relate stories relative to emotional instability in the character of parents or even grandparents. The following factors in

the inheritance were recorded:-

Mental Retardation.
Insanity.
Epilepsy.
Tuberculosis.
Abnormalities of Pregnancy & Birth.
Syphilis.

These factors are considered individually, and all the other contributory factors to mental subnormality, apart from the factor under discussion, are grouped under the heading "Other Causative Factors".

Mental Retardation.

As mental retardation in the inheritance has been found by many writers to bear a marked influence on the mental intelligence of the child one has taken this factor first for individual consideration.

Out of the 220 children, 42 were found in whom mental retardation was present either in parent or grandparent. Where, however, "Other Causative Factors" are included, the number rises to 120.

These figures, and their relationship to the intelligence quotient, are submitted in Table I and II.

The tables state whether mental retardation was present in the father's side or the mother's side, or in both sides of the family.

TABLE I.

TABLE SHOWING INTELLIGENCE QUOTIENTS OF CHILDREN WHOSE PARENTS OR GRANDPARENTS WERE MENTALLY RETARDED.

Intelligence Quotients.	Under 50	50-59	60-64	65-69	Under 70	70-74	75-79	80-84	85-89	Over 90	Total.	Mental retardation on
				1	1	2	1	2			6	Father's side.
GIRLS.		1		2	3	3	3	1	2		12	Mother's side.
	1	3	1	1	6						6	Both sides.
	1	4	1	4	10	5	4	3	2		24	Total.
		1		1	2		3	1			6	Father's side.
				1	1	1	2				4	Mother's side.
BOYS.		2	1	2	5		3				8	Both sides.
		3	1	4	8	1	8	1			18	Total.
BOYS & GIRLS.	1	7	2	8		6	12	4	2		42	Total.
TOTAL BOYS & GIRLS.		1		2	3	2	4	3			12	Father's side.
		1		3	4	4	5	1	2		16	Mother's side.
	1	5	2	3	11		3				14	Both sides.
	1	7	2	8	18	6	12	4	2		42	Total.

TABLE II.

TABLE SHOWING THE INTELLIGENCE QUOTIENTS OF CHILDREN WHOSE PARENTS OR GRANDPARENTS WERE MENTALLY RETARDED, AND WHO SHOWED AT THE SAME TIME "OTHER CAUSATIVE FACTORS" IN THEIR HISTORY.

	Intelligence Quotients. Under -50	50-59	60-64	65-69	Under 70	70-74	75-79	80-84	85-89	Over 90	Total.	Mental retardation.
		3		2	5	4	2	3	1		15	Father's side.
GIRLS.	1	4	3	7	15	6	7	7	2	1	38	Mother's side.
	3	7	1	1	12	2					14	Both sides.
	4	14	4	10	32	12	9	10	3	1	67	Total.
	2	3		1	6	1	3	1			11	Father's side.
BOYS.	2	3	1	5	11	7	4		1		23	Mother's side.
	3	2	2	4	11	3	5				19	Both sides.
	7	8	3	10	28	11	12	1	1		53	Total.
BOYS & GIRLS.	11	22	7	20	60	23	21	11	4	1	120	Total.
TOTAL BOYS & GIRLS.	2	6		3	11	5	5	4	1		26	Father's side.
	3	7	4	12	26	13	11	7	3	1	61	Mother's side.
	6	9	3	5	23	5	5				33	Both sides.
	11	22	7	20	60	23	21	11	4	1	120	Total.

Deductions from Tables I & II.

In a group of 220 children there were 42 who showed mental retardation in their history. When, however, other causative factors were taken into account, 120 children are included.

If we confine our figures to children with intelligence quotients under 70, i.e., the mentally defective children, we find that 18 children showed mental retardation in their inheritance, while 60 showed mental retardation and "other causative factors". Therefore when we have a group of mentally defective children in whose inheritance there is mental retardation we shall expect to find that 65 to 70 per cent of them will show "other causative factors" as well.

Where the mental retardation is from one side of the family only 60 per cent of such children will have an intelligence quotient over 70.
If all "other causative factors" are excluded 75 per cent will rise above the mentally defective standard, i.e., Intelligence Quotient over 70.
On the other hand, where the mental retardation is present in both sides of the family, nearly 70 per cent of such children will have an intelligence quotient under 70.

Insanity.

In considering insanity as a causative factor in the production of mental retardation, it was found that of the 220 children examined, only ten could trace their subnormality to this cause alone, though a larger number, namely thirty-five, showed "other causative factors" as well.

TABLES IIIa & IIIb.

TABLE IIIa. SHOWING THE INTELLIGENCE QUOTIENTS OF CHILDREN IN WHOSE PARENTS OR GRANDPARENTS THERE WAS INSANITY.

TABLE IIIb. SHOWING THE INTELLIGENCE QUOTIENTS OF CHILDREN IN WHOSE PARENTS OR GRANDPARENTS THERE WAS INSANITY, and WHO SHOWED AT THE SAME TIME "OTHER CAUSATIVE FACTORS" IN THEIR HISTORY.

Intelligence Quotients.		Under 50	50-59	60-69	70-79	80-84	85-89	Over 90	Total.	
IIIa.						1	2	7	10	
IIIb.	GIRLS.		1	3	1	3	1	2	11	Insanity on Father's side.
			2	1	4	1		5	13	Insanity on Mother's side.
			3	4	5	4	1	7	24	Total.
	BOYS.			2	3			1	6	Insanity on Father's side.
		2			1	1	1		5	Insanity on Mother's side.
		2		2	4	1	1	1	11	Total.
TOTAL BOYS & GIRLS.			1	5	4	3	1	3	17	Insanity on Father's side.
		2	2	1	5	2	1	5	18	Insanity on Mother's side.
		2	3	6	9	5	2	8	35	Total.

Deductions from Tables IIIa & IIIb.

From Table IIIa. it seems insanity alone in the inheritance is not productive of mental deficiency in the children. It may produce dullness.

Table IIIb. shows that the addition of "other causative factors" reduces the intelligence quotients of children. It resembles Table II. They both show that in a group of children with abnormal factors in their inheritance probably 70 per cent will have more than one abnormal factor.

It does not appear to matter whether the insanity comes through the father or through the mother. The numbers are seventeen and eighteen respectively. There were five children whose father or mother had been insane. Two out of the five children had normal family history and their intelligence quotients were over 90. Details of the other three of the group of five are submitted:-

L.P. age 11 years.	Intelligence Quotient 68.	Father used to be in asylum - has always been dull. Mother - Epileptic.
V.W. age $13\frac{2}{12}$ years.	Intelligence Quotient 67.	Father's Mother used to be in asylum. Father had shell-shock, was in asylum for a time. Mother - very dull.

D.M. age 10½ years. Intelligence Quotient 71. Father - ~~old~~ aged 73 - inclined to be simple. Mother - died in asylum. Menopausal Insanity. Mother's Mother committed suicide.

Epilepsy.

In the case of Epilepsy occurring as the sole abnormal factor in the parent or grandparent only three children fell into this category. Where "other causative factors" in addition to Epilepsy are taken into account the number of children in the group is twenty-eight.

TABLES IVa & IVb.

IVa. SHOWING THE INTELLIGENCE QUOTIENTS OF CHILDREN WHOSE PARENTS OR GRANDPARENTS WERE EPILEPTICS.

IVb. SHOWING THE INTELLIGENCE QUOTIENTS OF CHILDREN WHOSE PARENTS OR GRANDPARENTS WERE EPILEPTICS, AND WHO SHOWED AT THE SAME TIME "OTHER CAUSATIVE FACTORS" IN THEIR HISTORY.

Intelligence Quotients.

	Under 50	50-59	60-69	70-79	80-89	Over 90	Total.
IVa.					1	2	3
IVb.		2	6	11	7	2	28

From these figures in Table IVa. it would not appear as if Epilepsy alone in the inheritance would adversely affect the intelligence quotients of children. The numbers are too small, however, to make definite deductions.

Table IVb. shows to what a great extent Epilepsy is associated with other factors contributing to mental retardation.

Tuberculosis.

Out of the 220 children examined there were thirty-nine where there was a definite history of "Consumption" either in the parents or in the grandparents. But other causative factors were present too in thirty-three children.

In only six of the group was a tubercular diathesis found apart from "other causative factors".

The figures are in agreement with the findings of Tredgold.(37). He says:- "A history of antecedent tuberculosis rarely occurs alone; in four fifths of my own cases it was accompanied by a definite neuropathic inheritance, while in the remaining one fifth other conditions, usually alcoholism, were present".

TABLES Va & Vb.

Va. SHOWING THE INTELLIGENCE QUOTIENTS OF CHILDREN IN WHOSE INHERITANCE THERE WAS "CONSUMPTION".

Vb. SHOWING THE INTELLIGENCE QUOTIENTS OF CHILDREN IN WHOSE INHERITANCE THERE WAS "CONSUMPTION", BUT WHO SHOWED AT THE SAME TIME "OTHER CAUSATIVE FACTORS" IN THEIR HISTORY.

Intelligence Quotients.

		Under 50	50-59	60-69	70-79	80-84	85-89	Over 90	Total.
Va.	GIRLS.				1		1	1	3
	BOYS.						3		3
	Girls & Boys.				1		4	1	6
Vb.	GIRLS.	3	3	2	9	6	1	4	28
	BOYS.		4	1	3		2	1	11
	Girls & Boys.	3	7	3	12	6	3	5	39

The six children with T.B. diathesis and no "other causative factors" are an interesting group:-

1. C.A. - girl age 11, 9/12. Intelligence Quotient 80. This child has had Rheumatic Fever and now shows valvular Heart Disease. There is tuberculosis in the father's family. Father is a joiner. Rest of family history good.

2. G.W. - boy age 12, 2/12. Intelligence Quotient 80. Father a labourer - died of T.B. when boy was four years old. Mother's family history good. The boy has always been delicate - did not start school till over 6 years of age. He has congenital deformity of one foot.

3. F. W. - boy age 12, 1/12. Intelligence Quotient 82. Father and Mother both died of tuberculosis His nutrition is below normal. Family history shows no neuropathic factors.

4. M.H. - girl age 9, 4/12. Intelligence Quotient 94. Mother died of tuberculosis when child was one year old. Lives with Aunt. Father of average intelligence - labourer. Home conditions very poor.

5. N.F. - girl age 8, 7/12. Intelligence Quotient 75. Mother's mother died of pulmonary tuberculosis. Father - a fireman on railway - was never bright at school. Father's brother has been convicted of larceny and imprisoned. This brother's children are dull at school and troublesome too. The child was late in walking, talking, and very late in acquiring clean habits.

6. E. W.- boy age 12. 1/12. Intelligence Quotient 82. Father - a publican - tends to over-indulgence in alcohol. Mother - tuberculosis in her family. The boy has a sister and brother tubercular, and he himself attends the T.B. Dispensary as a pre-tubercular case.

NOTES ON TWO OTHER CHILDREN
IN TABLE Vb ARE SUBMITTED.

H.S. - boy age 5, 7/12 - Intelligence Quotient 50. A Mongol. He is the youngest of seven - the father and mother aged 39 and 38 respectively at the time of his birth. The father had pulmonary tuberculosis some years before this child was born. He is a skilled tradesman. Mother's history is good.

L.B. - boy aged 8, 11/12. Intelligence Quotient 58. He is an interesting case. He speaks thickly and the tonsils are enlarged. He was late in speaking and in acquiring clean habits. He was 1½ years old before walking. The teacher's report on his first year at school is "dull". When six years of age, he developed what was diagnosed as meningitis. There is tuberculosis in the Mother's family. The father - a joiner - is "nervy" and highly strung. The teacher confirms the story that since his illness the child has shown marked mental deterioration.

Examination of the six children of tubercular history shows that the children themselves tended to be subnormal physically, and the poorer physical condition might affect the intelligence quotient.

In case 5 the intelligence quotient is the lowest of the group. One must bear in mind the father was of a dull type, and the child's lower intelligence quotient would be affected by this factor in the inheritance.

From Table Va. and Vb. we may conclude that tuberculosis is not directly concerned in the production of mental retardation. When it is found in association with other causative factors, mental subnormality due to the "other causative factors" is aggravated.

Alcoholism.

In view of the difficulty of defining alcoholism, and of the association of over-indulgence, with "other causative factors", one does not feel justified in concluding any relationship between mental retardation in the child and alcohol-drinking in the parent.

Abnormal Pregnancy. Abnormal Labour.

From the 220 cases under consideration there were twenty-eight where a history was obtained of some abnormal condition during the pregnancy or at the confinement.

This figure included children with "other causative factors" in their inheritance. There were seventeen children where the abnormality of pregnancy or of the confinement was the only apparent contributory cause to the child's mental retardation.

TABLE VI.

TABLE SHOWING THE INTELLIGENCE QUOTIENTS OF CHILDREN WHOSE MOTHER GAVE A HISTORY OF PHYSICAL DISABILITY DURING PREGNANCY OR OF ABNORMAL LABOUR.

		Intelligence Quotients.									
		Under 50	50-59	60-64	65-69	70-74	75-79	80-84	85-89	Over 90	Total.
ABNORMAL PREGNANCY.	GIRLS.	1	1		1						3
	BOYS.	2	2	1		1	1				7
		3	3	1	1	1	1				10
ABNORMAL LABOUR.	GIRLS.		1							1	2
	BOYS.		3		1					1	5
			4		1					2	7
ABNORMAL PREGNANCY AND LABOUR TOGETHER.	BOYS & GIRLS.	3	7	1	2	1	1			2	17

TABLE VII.

TABLE SHOWING THE INTELLIGENCE QUOTIENTS OF CHILDREN WHOSE MOTHERS HAVE A HISTORY OF ABNORMAL PREGNANCY OR OF ABNORMAL LABOUR, AND IN WHOSE INHERITANCE OTHER FACTORS CONTRIBUTING TO MENTAL RETARDATION WERE PRESENT.

		Intelligence Quotients.									
		Under 50	50-59	60-64	65-69	70-74	75-79	80-84	85-89	Over 90	Total.
ABNORMAL PREGNANCY + "OTHER CAUSATIVE FACTORS".	GIRLS.	3	1		2	1		1		2	10
	BOYS.	3	2	1		1	1			1	9
		6	3	1	2	2	1	1		3	19
ABNORMAL LABOUR + "OTHER CAUSATIVE FACTORS".	GIRLS.		1							1	2
	BOYS.		3		2		1			1	7
			4		2		1			2	9
ABNORMAL PREGNANCY & LABOUR + "OTHER CAUSATIVE FACTORS" IN THE INHERITANCE.	GIRLS & BOYS.	6	7	1	4	2	2	1		5	28

It is interesting to compare the Tables VI and VII with the table of all the children examined. (Appendix A.II).

Among the group of the 220 children, one hundred and thirty-seven, i.e., 66.2 per cent, had Intelligence Quotient over 70.

In the twenty eight children on Table VII, only ten, i.e., 35.7 per cent, had an Intelligence Quotient over 70, and in the seventeen children on Table VI - where other causative factors are excluded - four, i.e., 23.5 per cent, had an Intelligence Quotient over 70.

These figures are submitted in Table VIII.

TABLE VIII.

Intelligence Quotients.	No.of children in general group.	Children in Table VI.	Children in Table VII.
Over 70.	137	4	10
60-69	36	3	5
50-59	33	7	7
Under 50.	14	3	6
	220	17	28

TABLE VIII shows the mental grades of all the children examined, and of those children in whose history there was abnormal pregnancy or labour, first alone, secondly with other causative factors.

Table VIII shows that while in the general group fewer children of the lower grades of intelligence were examined, yet among children whose mental retardation has been affected by abnormal pregnancy or confinement, the balance between children examined and children affected is altered at the lower levels. Proportionally, more children are affected. It is evident that it is at the lower mental levels that abnormalities of pregnancy or of labour play a part. This is especially noticed in the group of children with intelligence quotients between 50 and 59, i.e., the lowest grade of feebleminded.

The figure seven for the group intelligence quotient 50-59 remains constant, irrespective of other causative factors in the production of mental retardation. It appears then that among the lowest grade of feebleminded children there is a definite percentage, probably twenty to twenty-five, whose retardation is related solely to abnormalities of pregnancy or of labour. It is noticeable too, that boys tend to be more affected than girls. This may be explained by the fact that male infants are generally larger at birth than females, and that

this larger size may give rise to a "difficult" labour, and consequently a greater tendency to intracranial haemorrhage.

Instruments were used in seven cases. The intelligence quotients of these seven children were 95, 75, 67, 92, 51, 50, and under 50. The two children with intelligence quotient 50 and intelligence quotient under 50, are described on the next page. The three boys, intelligence quotient 51, 67, and 75, had mental retardation in their inheritance. The few figures obtainable do not point to instruments being a cause of mental retardation.

K.M. - boy age 7½ - with Intelligence Quotient under 50. Wassermann negative. Father a skilled workman - good history. Mother - good history - always healthy. She had five miscarriages, then at sixth pregnancy lay in bed practically all the pregnancy - had instrumental delivery - K. M. born. Had seventh pregnancy two years later - states she was very much healthier during this pregnancy - had instrumental delivery - child with Intelligence Quotient 90 and looks healthy.

R.L. - boy age $8\frac{5}{12}$ - Intelligence Quotient 50. He is an only child. Family history good. Mother had very long labour - instrumental delivery - died in puerperium.

The following cases are interesting:-

E.M. - boy age $13\frac{8}{12}$ - only child. Intelligence Quotient 54. Father - electrician - good history. Mother - good family history. Had eclampsia and several fits in last three months - also acute bronchitis - was in bed during last three months - normal delivery.

L.C. - girl age 14 yrs. Intelligence Quotient 58. Father healthy - good history. Mother healthy - was 42 when this child was born. This is the youngest of a big family - all others appear average. Mother's mother was many years in asylum. Mother attributes child's condition to the fact she kept trying abortifacients during first six months of the pregnancy.

H.K. - girl age 5½.- A Cretin - Intelligence Quotient under 50. Father a labourer - family history good. Mother - anaemic, lethargic type - said she had a fright during later months of her pregnancy. Family history good.

Syphilis.

A Wassermann Reaction test was done on the blood of a hundred children. In two cases the children, who were suffering from Interstitial Keratitis, were attending the V. D. Clinic. A positive reaction was obtained in ten cases, while five gave a doubtful reaction. The Intelligence Quotient of the two cases of Interstitial Keratitis were:-

M.E. - boy age $13\frac{10}{12}$ - Intelligence Quotient 52.

M.P. - girl age 10 - Intelligence Quotient 73.

TABLE IXa.

TABLE SHOWING THE INTELLIGENCE QUOTIENTS OF THE TEN CHILDREN WITH WASSERMANN REACTION POSITIVE.

	Intelligence Quotients.					
	Under 50	50-59	60-69	70-79	80-89	Over 90.
BOYS.		1	1	2		1
GIRLS.				2	3	
TOTAL.		1	1	4	3	1

TABLE IXb.

TABLE SHOWING THE INTELLIGENCE QUOTIENTS OF FIVE CHILDREN WITH WASSERMANN REACTION DOUBTFUL.

BOYS.						
GIRLS.				2	2	1
TOTAL.				2	2	1

TABLE Xa.

SHOWING THE INTELLIGENCE QUOTIENTS OF TEN CHILDREN WITH WASSERMANN POSITIVE, THE OTHER CAUSATIVE FACTORS IN THEIR INHERITANCE, CONSIDERED SEPARATELY.

Intelligence Quotients	50-59	60-69	70-79	80-89	Over 90	Total.
History of mental retardation in parents.	1	1	4	1		7
Epilepsy in parents.				2		2
Tuberculosis.					1	1

TABLE Xb.

SHOWING THE INTELLIGENCE QUOTIENTS OF FIVE CHILDREN WITH WASSERMANN DOUBTFUL AND WHO SHOWED OTHER CAUSATIVE FACTORS IN THEIR INHERITANCE.

Mental retardation in parents.		1	2	1	4
Epilepsy in parents.		1			1

It is evident from Tables Xa. and Xb. there is no child out of ten children, whose blood was found positive, where congenital syphilis was the sole abnormal factor in his inheritance.
The father of one boy was suffering from tuberculosis and the boy's intelligence quotient is over 90.
The mother of one of the girls was dull mentally, but the girl's intelligence quotient was 90.
From so few figures one does not feel justified in concluding that the presence of congenital syphilis is a factor to be reckoned on in the production of a low intelligence quotient. The figures do suggest the probability of "other abnormal factors" being always present.

An analysis of the term "other causative factors" shows that in some cases only one other abnormal factor may be present, in other cases two or more may occur in the family history. Among the 220 children under investigation there were seventy eight where only one defect was found. They were arranged as follows:-

Defect.	Number of Children. Intelligence Quotient Under 70.	Over 70.	Total.
Mental retardation.	18	24	42
Insanity.	-	10	10
Epilepsy.	-	3	3
Tuberculosis.	-	6	6
Abnormal Pregnancy & Labour.	13	4	17
Syphilis.	-	-	-
	31	47	78

The child with only one adverse factor in his inheritance tends to have an intelligence quotient over 70. An exception, however, is in the group associated with abnormalities of pregnancy and labour. Even mental retardation occurring alone in the family history makes a much lighter imprint on the child's mental processes.

When these children with only one causative factor are removed from all the children examined, there are 142 left for consideration. Among them two, and sometimes three or more factors, are present, all of which have an effect on the mental intelligence. They are arranged as follows:-

Defect.	Number of children. Intelligence Quotient Under 70.	Over 70.	Total.
Mental Retardation + Other Factors.	60	60	120
Insanity + " "	11	24	35
Epilepsy + " "	8	20	28
Tuberculosis + " "	13	26	39
Pregnancy & Labour + " "	18	10	28
Syphilis + " "	2	8	10
	112	148	260

That means that in the 142 children left there are several with two or more defects in their inheritance, and the children appear in more than one group of causative factors. The following tables illustrate how defects may be found together in the child's history.

TABLE XI.

SHOWING EPILEPSY + CERTAIN OTHER FACTORS IN THE INHERITANCE.

Defects.	Intelligence Quotients. Under 50	50-59	60-69	70-79	80-89	Over 90	Total.
Epilepsy + Mental Retardation.		2	5	7	2		16
Epilepsy + Mental Retardation + Tuberculosis.		1		1			2
Epilepsy + Mental Retardation + Insanity.			2		1		3
Epilepsy + Tuberculosis + Insanity.					1		1

TABLE XII.

SHOWING INSANITY + CERTAIN OTHER FACTORS IN THE INHERITANCE.

Insanity + Tuberculosis.	2	1	1		1	5
Insanity + Epilepsy + Syphilis.				1		1
Insanity + Mental Retardation.	1	3	4	2	1	12
Insanity + Mental Retardation + Epilepsy.		1				1

TABLE XIII.

SHOWING TUBERCULOSIS + CERTAIN OTHER FACTORS IN THE INHERITANCE.

Tuberculosis.	Intelligence Quotients. Under 50	50-59	60-69	70-79	80-89	Over 90	Total.
Tuberculosis + Epilepsy.	1			4	3	1	9
Tuberculosis + Insanity.		2	1	1		1	5
Tuberculosis + Mental Retardation.	1	2	1	2			6

Tables XI, XII and XIII, show how various neuropathic factors may be present even in one child's family history. The lower the child's intelligence quotient the more probability there is of more than one abnormal factor being present. In a child with a history of tuberculosis and a low intelligence quotient a close investigation will reveal the presence of neuropathic taint. At the lower grades too, mental retardation in the inheritance become more and more apparent. One exception is, however, the children whose mother gives a history of abnormal pregnancy or labour.

PHYSICAL DEFECTS IN RELATION TO MENTAL RETARDATION.

Learning to Speak.

Learning to Walk.

Learning to control the Sphincters.

Defects of Speech.

Defects of Hearing.

Defects of Vision.

Defects of Throat and Nose.

Details of the following physical attainments are submitted:-

a. Learning to Speak.

b. Learning to Walk.

c. Acquiring control of the sphincters.

Each factor is considered in turn.

On 273 out of the 323 children whose intelligence quotients were estimated, it was possible to get data relative to the physical states, (a) learning to speak, (b) learning to walk, (c) acquiring control of the sphincters.

a. Learning to Speak.

Speech and intelligence are closely related. Speech means the ability to utter articulate sounds. The age at which the child can articulate the sounds and understand spoken language depends on his intelligence.

W. Preyer, Professor of Physiology at Jena, (44) recorded his observations on his own child, a boy. At fourteen to fifteen months, the child could use a number of individual words and by the nineteenth month understood their meaning. Rapid progress was made after that. At the twenty-third month, spoken judgment was noted. In the twenty-fifth month, progress was extra-ordinary.

In questioning the mother or anyone who had been in contact with the child in his early years, one endeavoured to keep this picture of Preyer's child as an example of the normal child.

The responses were arranged in four groups:

NORMAL: able to use words at 15 months and making short sentences at 20 months to 2 years.

LATE: using only words of one syllable before two years and making short sentences by three years.

VERY LATE: not using many words before three years or being so indistinct as to be unintelligible.

NO SPEECH: i.e. not yet making articulate sounds.

One girl,whose intelligence quotient was 95, had a cleft palate which made her speech very defective.

TABLE XIV.

TABLE SHOWING THE INTELLIGENCE QUOTIENTS OF 273 CHILDREN GRADED ACCORDING TO THE TIME AT WHICH THE CHILDREN LEARNED TO SPEAK.

	Speech acquired.	Intelligence Quotients. Under 50	50-59	60-69	70-74	75-79	80-84	85-89	Over 90	Total.
GIRLS.	Normal.		2	11	12	18	23	10	16	92
	Late.		11	13	9	6	3	1	2	45
	Very Late.	6	5	2		1			1	15
	No speech acquired.	2								2
		8	18	26	21	25	26	11	19	154
BOYS.	Normal.			4	11	13	15	5	6	54
	Late.		3	6	7	7	5	2	3	33
	Very late.	11	11	6		1				29
	Nil.	3								3
		14	14	16	18	21	20	7	9	119
BOYS & GIRLS.	Normal.		2	15	23	31	38	15	22	146
	Late.		14	19	16	13	8	3	5	78
	Very late.	17	16	8		2			1	44
	No speech acquired.	5								5
		22	32	42	39	46	46	18	28	273

TABLE XV.

SHOWING THE FIGURES OF TABLE XlV CONVERTED INTO PERCENTAGES.

ACQUISITION OF SPEECH.		Intelligence Quotients. Under 50	50-59	60-69	70-74	75-79	80-84	85-89	Over 90	Total.
GIRLS.	NORMAL.		11.1	42.3	57.2	72.	88.5	90.0	84.2	
	LATE.		61.1	50.	42.8	24.	11.5	10.	10.5	
	VERY LATE.	75.	27.8	7.7		4.			5.3	
	NO SPEECH ACQUIRED.	25.								
BOYS.	NORMAL.			25.	61.2	62.	75.	71.5	66.7	
	LATE.		21.5	37.5	38.8	33.3	25.	28.5	33.3	
	VERY LATE.	78.8	78.5	37.5		4.7				
	NO SPEECH ACQUIRED.	21.2								
GIRLS & BOYS.	NORMAL.		9.3	35.7	59.	67.4	82.6	83.5	78.5	
	LATE.		43.8	45.3	41.	28.2	17.4	16.5	17.9	
	VERY LATE.	77.3	50.	19.		4.4			3.6	
	NO SPEECH ACQUIRED.	22.7								

These children were divided into the four grades of intelligence - normal, dull or backward, feebleminded, and idiot or imbecile.

TABLE XVI.

TABLE SHOWING THE INTELLIGENCE QUOTIENTS ARRANGED IN FOUR GRADES AND THE FIGURES IN PERCENTAGES OF WHEN EACH GROUP "LEARNED TO SPEAK."

ACQUISITION OF SPEECH.	Intelligence Quotient under	Imbecile or idiot. 50	Feeble-minded. 50-69	Dull or Backward. 70-89	Normal. Over 90.
GIRLS.	NORMAL		26.	77.	84.2
	LATE	.	57.	21.2	10.5
	VERY LATE	75.	17.	1.8	5.3
	NOT ACQUIRED.	25.			
BOYS.	NORMAL		13.3	66.6	66.7
	LATE		30.	31.8	33.3
	VERY LATE	78.5	56.7	11.6	
	NOT ACQUIRED.	21.5			

Deductions from Tables XIV, XV, and XVI.

The later age at which boys learn to talk is worthy of note. These figures confirm the generally accepted findings for children of normal intelligence, namely: that in "learning to understand words and to speak, girls are as a rule earlier than boys". The tables show that this ruling continues to hold good as the Intelligence quotient becomes lower, right down to the lowest mental strata. Among the feebleminded, 83.7 per cent of the girls were speaking by three years of age, yet only 42 per cent of the boys had reached that standard.

Even allowing for discrepancies in the mother's statement, there is found, as might be expected, a definite correlation between delay in acquiring speech and lack of intelligence.

b. Learning to Walk.

Records at Infant Welfare Clinics show that the average baby can stand with support at about a year and without support at fifteen months. It walks alone about a month later.

'Learning to walk' was divided into four periods:

NORMAL: walking by 16 months.

LATE: walking by the age of 2¼ years.

VERY LATE: walking after the age of 2¼ years.

NOT WALKING at time of examination.

TABLE XV11.

TABLE SHOWING THE INTELLIGENCE QUOTIENT OF 273 CHILDREN GRADED ACCORDING TO THE TIME AT WHICH THE CHILDREN LEARNED TO WALK.

		Intelligence Quotients.								
		Under 50	50-59	60-69	70-74	75-79	80-84	85-89	Over 90	Total.
WALKING.										
GIRLS.	NORMAL.	-	2	14	15	16	20	9	15	91
	LATE	2	12	9	6	9	6	2	4	50
	VERY LATE	4	4	3	-	-	-	-	-	11
	NOT WALKING	2	-	-	-	-	-	-	-	2
		8	18	26	21	25	26	11	19	154
BOYS.	NORMAL	-	-	7	13	14	15	7	7	63
	LATE	4	5	7	5	7	5	-	2	35
	VERY LATE	8	9	1	-	-	-	-	-	18
	NOT WALKING	2	-	1	-	-	-	-	-	3
		14	14	16	18	21	20	7	9	119
BOYS AND GIRLS TOGETHER.	NORMAL	-	2	21	28	30	35	16	22	154
	LATE	6	17	16	11	16	11	2	6	85
	VERY LATE	12	13	4	-	-	-	-	-	29
	NOT WALKING	4	-	1	-	-	-	-	-	5
		22	32	42	39	46	46	18	28	273

TABLE XV111.

SHOWING THE FIGURES OF TABLE XV11 CONVERTED INTO PERCENTAGES.

LEARNING TO WALK.		Intelligence Quotients. Under 50	50-59	60-69	70-74	75-79	80-84	85-89	Over 90	Total.
GIRLS.	NORMAL.	-	11.1	53.8	71.4	64.	76.8	81.8	78.9	
	LATE	25.	66.6	34.6	28.7	36.	23.	18.1	21.2	
	VERY LATE	50.	22.2	11.5	-	-	-	-	-	
	NOT WALKING	25.	-	-	-	-	-	-	-	
BOYS.	NORMAL	-	-	43.75	72.2	66.6	75.	100.	77.8	
	LATE	28.5	35.6	43.75	27.8	33.3	25.	-	22.2	
	VERY LATE	57.1	64.2	6.25	-	-	-	-	-	
	NOT WALKING	14.2	-	6.25	-	-	-	-	-	
BOYS AND GIRLS TOGETHER.	NORMAL	-	6.3	50.	71.8	65.2	76.1	88.9	78.6	
	LATE	27.3	53.1	28.1	28.2	34.8	23.9	11.1	21.4	
	VERY LATE	54.5	40.6	9.5	-	-	-	-	-	
	NOT WALKING	18.2	-	2.4	-	-	-	-	-	

These children are divided into the four grades of intelligence - normal, dull or backward, feebleminded, and idiot or imbecile.

TABLE XIX

TABLE SHOWING THE INTELLIGENCE QUOTIENTS ARRANGED IN THE FOUR GRADES AND THE FIGURES IN PERCENTAGES OF WHEN EACH GROUP "STARTED TO WALK."

	Intelligence Quotient under	Imbecile or idiot. 50	Feeble-minded 50-69	Dull.or Backward. 70-89	Normal. Over 90
LEARNING TO WALK.					
GIRLS.	NORMAL	-	36.4	72.3	78.9
	LATE	25.	47.7	27.7	21.2
	VERY LATE	50	15.9	-	-
	NOT WALKING	25	-	-	-
BOYS.	NORMAL	-	23.4	74.2	77.8
	LATE	28.6	40.	25.8	22.2
	VERY LATE	57.1	33.3	-	-
	NOT WALKING	14.3	3.3	-	-

Tables XVll, XVlll and XlX show there is a definite correlation between "learning to walk" and the degree of mental intelligence. The poorer a child's mental processes, the longer will he be in walking. There is very little difference in the sexes.

c. Acquiring Control of the Sphincters.

"When the baby is 18 months old, it should rarely dirty itself and never when two years old. The average baby should be able to control its urine during the day at 2 years of age." (40)

The physical attainment - Control of the Sphincters - was divided into periods.

AVERAGE: Where the child had control by the end of the second year.

LATE: Where this control was delayed to three years of age.

VERY LATE: Where the child was of school age before it acquired control.

CONTROL NOT ACQUIRED YET.

TABLE XX.

TABLE SHOWING THE INTELLIGENCE QUOTIENTS OF 273 CHILDREN GRADED ACCORDING TO TIME AT WHICH THE CHILDREN ACQUIRED SPHINCTER CONTROL.

		Intelligence Quotient								
		Under 50	50-59	60-69	70-74	75-79	80-84	85-89	Over 90	Total.
SPHINCTER CONTROL.										
GIRLS.	AVERAGE	-	-	10	14	13	18	7	16	78
	LATE	1	8	13	7	10	8	4	3	54
	VERY LATE	5	8	3	-	2	-	-	-	18
	NOT ACQUIRED.	2	2	-	-	-	-	-	-	4
		8	18	26	21	25	26	11	19	154
BOYS.	AVERAGE	-	-	3	7	14	15	5	7	51
	LATE	-	2	10	8	7	3	2	2	34
	VERY LATE	6	11	2	3	-	2	-	-	24
	NOT ACQUIRED.	8	1	1	-	-	-	-	-	10
		14	14	16	18	21	20	7	9	119
BOYS AND GIRLS TOGETHER.	AVERAGE	-	-	13	21	27	33	12	23	129
	LATE	1	10	23	15	17	11	6	5	88
	VERY LATE	11	19	5	3	2	2	-	-	42
	NOT ACQUIRED.	10	3	1	-	-	-	-	-	14
		22	32	42	39	46	46	18	28	273

TABLE XXI.

TABLE SHOWING THE FIGURES OF TABLE XX CONVERTED INTO PERCENTAGES.

		Intelligence Quotients under 50	50-59	60-69	70-74	75-79	80-84	85-89	Over 90	Total.
SPHINCTER	CONTROL.									
	NORMAL	-	44.4	38.4	66.6	52.	69.1	63.6	84.2	
GIRLS.	LATE	12.5	44.4	50.	33.3	40.	30.8	36.3	15.7	
	VERY LATE	62.5	11.1	11.5	-	8.	-	-	-	
	NOT ACQUIRED.	25.	-	-	-	-	-	-	-	
	NORMAL	-	-	18.7	38.8	66.6	75.	71.1	77.7	
BOYS.	LATE	-	14.2	62.5	44.4	33.3	15.	28.5	22.2	
	VERY LATE	42.8	78.5	12.5	16.6	-	10	-	-	
	NOT ACQUIRED.	57.1	7.1	6.2	-	-	-	-	-	
BOYS	NORMAL	-	31.2	30.9	53.8	58.7	71.7	66.7	82.1	
AND	LATE	4.5	59.4	54.8	38.4	36.9	23.9	33.3	17.9	
GIRLS	VERY LATE	50.	9.4	11.9	7.8	4.4	4.4	-	-	
TOGETHER.	NOT ACQUIRED.	45.5	-	2.4	-	-	-	-	-	

These children are divided into the four grades of intelligence - normal, dull or backward, feebleminded, and idiot or imbecile.

TABLE XX11.

SHOWING THE INTELLIGENCE QUOTIENTS ARRANGED IN THE FOUR GRADES AND THE FIGURES IN PERCENTAGES OF WHEN EACH GROUP ACQUIRED "SPHINCTER CONTROL".

	Intelligence Quotients under	Imbecile or idiot. 50	Feeble-minded 50-69	Dull or Backward. 70-89	Normal. Over 90
SPHINCTER CONTROL.					
GIRLS.	NORMAL	-	41.4	62.8	81.2
	LATE	12.5	57.2	35.1	15.7
	VERY LATE	62.5	11.3	2.	-
	NOT ACQUIRED.	25.	-	-	-
BOYS.	NORMAL	-	9.3	62.8	77.7
	LATE	-	38.3	30.3	22.2
	VERY LATE	42.8	45.	6.6	-
	NOT ACQUIRED.	57.1	6.6	-	-

Tables XX, XXI and XXII show a definite relationship between acquiring control of the sphincters and the mental grade of the child. The mental processes, because of their poor endowment, fail to respond to the muscular stimulus and consequently exert no inhibitory action on the sphincters. Control is more slowly acquired in boys than in girls.

Comparisons are made between the three physical faculties and particularly with the intelligence quotients of the children. The four grades of intelligence, normal, dull or backward, feebleminded and imbecile or idiot are considered in turn. The numbers are taken from the percentage tables XVl, XlX and XXll.

NORMAL GRADE.

	Intelligence Quotient.	Learning to speak at average age.	Learning to walk at average age.	Acquiring control of the sphincters.
BOYS	Over 90	66.7	77.8	77.7
GIRLS	Over 90	84.2	78.9	84.2

When the sexes in these faculties, learning to speak, learning to walk, acquiring control of sphincters, are compared, the girls are shown to have acquired the power earlier than the boys. The figures for walking are, however, much the same.

Speech is the faculty in which the greatest difference between the two sexes is noticed. The figures suggest that only 66.7 percent of the boys of average intelligence start to speak at the average age. Irrespective of sex, the figures are low for normal children.

At the same time, it must be noted that these children were mentally examined, because in

some cases they were physically below normal and their educational ratio was poor; in other cases because they were the siblings of children with a low intelligence quotient. The higher percentage figures for the group Intelligence Quotients 80-84 and Intelligence Quotients 85-89 (71 per cent and 75 per cent of boys talking at average age) are noteworthy. Acquisition of speech in boys is markedly behind their ability to walk and to acquire clean habits. In girls, walking at the average age is more delayed than the faculties of talking and acquiring clean habits.

11. DULL OR BACKWARD GRADE.

	Intelligence Quotient.	Learning to speak at average age.	Learning to walk at average age.	Acquiring Sphincter Control at average age.
BOYS.	70-89	67.3	78.8	62.8
GIRLS.	70-89	76.	73.5	62.8

The figures, generally, are lower than in the higher grade. Among the girls, for each factor, the figure is lower. Among the boys, the figures for learning to speak and learning to walk appear to be slightly higher than for the children of normal grade of intelligence. Reference to tables XV and XVlll will show that the percentages for the group Intelligence Quotients 70-74, namely, learning to speak 61.2 per cent, and learning to walk, 72.2 per cent, are really lower than the

average for the group 70-89, or for the group over 90. The acquisition of these faculties is then directly associated with the innate intelligence of the child. The figure of acquiring clean habits at average age has fallen for both boys and girls. It is now equal in the two sexes.

Table XVI and XVII show figures for the group Intelligence Quotient 70-89 appearing in the third column. That means that certain dull or backward children are not speaking or acquiring sphincter control till a very late period. Walking is not affected.

111. FEEBLE-MINDED GRADE.

	Intelligence Quotient.	Learning to speak at average age.	Learning to walk at average age.	Acquiring sphincter control at average age.
BOYS.	50-69	12.5	21.	9.3
GIRLS.	50-69	26.	32.	41.

All figures are lower than in any higher grades. The numbers who are walking, talking and controlling the sphincters at the average age are very few. Boys for all three factors are much more affected than girls.

If a child, either a boy or a girl, is not talking and making short sentences by three years of age, is not walking by $2\frac{1}{4}$ years and has not acquired clean habits by three years of age, it is very probable he is definitely mentally defective.

One boy is recorded as "not walking now". He was a case of cerebral diplegia.

Two boys and two girls had no sphincter control even at the time of investigation.

IV. IMBECILE AND IDIOT GRADE.

	Intelligence Quotient.	Speaking at average age.	Walking at average age.	Acquiring Sphincter Control at average age.
BOYS.	Under 50	-	-	-
GIRLS	Under 50	-	-	-

No child of this low intelligence had acquired these faculties - talking, walking and clean habits, at the age of children of average intelligence.

The figures for acquiring these faculties late are:-

	Speaking Late.	Walking Late.	Acquiring clean habits late.
BOYS.	-	28.6	-
GIRLS	-	25.	12.5

Walking is attempted at a late period by only a small proportion of the children of very low intelligence.

It is less dependent on the intellectual faculties than either speaking or muscular control of the sphincters.

The figures for acquiring the faculties "very late" are:-

	Speaking Very Late.	Walking Very Late.	Acquiring Clean Habits Very Late.
BOYS.	78.5	57.1	42.8
GIRLS	75.	50.	62.5

The child of lowest intellectual grade acquires these faculties very late and may never acquire them all.

A knowledge of when a child begins to use single words and to understand speech, when he can make short sentences and pass judgment, when he feels his feet and go off walking alone, when he can control his sphincters, gives valuable evidence of the child's innate mental intelligence.

It is especially diagnostic of mental deficiency if acquisition of all faculties, talking, walking and clean habits, is delayed, and not merely one of them.

This information is valuable at Infant Welfare Clinics. Early recognition of mental defect gives opportunities for early treatment. The figures in the previous pages emphasize the far-reaching control of the brain over the body and shows how the muscles in carrying out certain actions are dominated by the mental processes.

Physical Defects.

a. Defects of Speech.

b. Defects of Vision.

c. Defects of Hearing.

d. Presence of Tonsils & Adenoids.

In the 323 children examined, speech, vision, and hearing, were tested, and the throat and nose inspected.

Age makes a difference in estimating the number of defects. Among normal children there is a steady decrease in the number of physical defects, with the exception of bad vision, from the age of six to fifteen years. (42).

The majority of the children examined and reported on in this thesis were between eight and twelve years of age.

Speech Defects.

The speaking voice of all the children under examination (183 girls and 140 boys) was observed at the time of the mental test.

If the words were clearly and distinctly spoken, the speech was classed "Normal". Where a few of the later developed consonants (such as r, l, and sh, s, ch, and y) were not well pronounced, but where the spoken language was still quite intelligible, the children were classed as speech "slightly defective", but where even the early acquired consonants like the labials and linguals p, b, m, and t, d, n, or the still later acquired k, g, and ng sounds were defective, the speech was marked "very defective". Indistinct forms of speech, like a thick accent, when the words were ill-~~or~~ also ill-defined, ~~or~~ and slurring ~~or~~ and stammering, were noted.

TABLE XXIV.

SHOWING THE INTELLIGENCE QUOTIENTS OF 183 GIRLS AND 140 BOYS GRADED ACCORDING TO THEIR MODE OF SPEECH.

	Intelligence Quotients.									
GIRLS. SPEECH.	Under 50	50-59	60-64	65-69	70-74	75-79	80-84	85-59	Over 90	Total.
Normal.	3	15	8	16	19	25	29	16	18	149
Slightly defective.	3	1	1	1	3	2				11
Very defective.	3	1	1	2						7
Thick.			1	1	2	1	1		1	7
Slurring.		1	1		1					3
Stammering.					1		2			3
Nil.	2									2
Cleft Palate.									1	1
	11	18	12	20	26	28	32	16	20	183
BOYS.										
Normal.	1	5	2	15	14	22	18	6	10	93
Slightly defective.		1		1	2		2	1		7
Very defective.	6	7	2	2	1					18
Thick.		2		1	1	1		1	1	7
Slurring.	1				1	1				3
Stammering.	3			1	1		2	2		9
Nil.	3									3
	14	15	4	20	20	24	22	10	11	140

TABLE XXV.

TABLE SHOWING THE INTELLIGENCE QUOTIENTS OF THE 323 CHILDREN (183 GIRLS & 140 BOYS) GRADED ACCORDING TO THEIR MODE OF SPEECH.

	Intelligence Quotients.									
SPEECH.	Under 50	50-59	60-64	65-69	70-74	75-79	80-84	85-59	Over 90	Total.
Normal.	4	20	10	31	33	47	47	22	28	242
Slightly defective.	3	2	1	2	5	2	2	1	-	18
Very defective.	9	8	3	4	1	-	-	-	-	25
Thick.	-	2	1	2	3	2	1	1	2	14
Slurring.	1	1	1	-	2	1	-	-	-	6
Stammering.	3	-	-	1	2	-	4	2	-	12
Nil.	5	-	-	-	-	-	-	-	-	5
Cleft Palate.	-	-	-	-	-	-	-	-	1	1
	25	33	16	40	46	52	54	26	31	323

TABLE XXVI.

SHOWING SPEECH DEFECTS EXPRESSED AS PERCENTAGES OF THE NUMBER OF CHILDREN FOUND IN EACH MENTAL GRADE.

Intelligence Quotients.	No. of Girls.	SPEECH. Normal.	Slightly defective.	Very defective.	Thick.	Slurring.	Stammering.	Not acquired.	Cleft Palate.
GIRLS.									
Over 90.	20	90	—	—	5	—	—	—	5
70-89	102	87'2	4'9	—	4'9	0'9	2'9	—	—
50-69	50	78	6	8	4	4	—	—	—
Under 50.	11	27'2	27'2	27'2	—	—	—	18'1	—
BOYS.									
Over 90.	11	90'9	—	—	9'09	—	—	—	—
70-89	76	78'9	6'5	1'3	3'9	2'6	6'5	—	—
50-69	39	56'6	5'1	28'2	7'6	—	2'5	—	—
Under 50.	14	7'1	—	42'8	—	7'1	21'4	21'4	—

Deductions from Tables XXIV, XXV, and XXVI.

As the intelligence quotients become lower speech defects become more apparent among the children. In every mental grade the percentage of children with normal speech falls as the grading falls. At the same time, the percentage figures of speech slightly defective or very defective rises. Thick speech is found in all the grades. Slurring of words, apart from actual defect of speech, is present among the high grade feebleminded.

The difference in the figures for boys and girls is very definite. For normal speech in every grade of intelligence the percentage figure for boys is below that of girls. In the feebleminded group only 8% of girls had very defective speech, yet as many as 28% of boys were affected. These figures for speech defects follow on those of learning to speak, where a similar difference in the sexes was present.

Stammering.

Stammering is much commoner among boys. The figures were:-

3 cases of stammering among 183 girls.
9 cases " " " 140 boys.

Since 1924, a Stammerers' class from which feebleminded

children are excluded has been conducted in Lincoln. In reporting on the progress of twenty-four boys and nine girls who had attended, it was found all the girls were much improved but four out of the twenty-four boys showed only slight improvement. These four boys had an intelligence quotient between 70 and 89.

There is a definite correlation between speech and mental intelligence.

Vision.

The usual Snellen's test type card was used, normal vision being marked as 6/6 6/6.

Where it was doubtful if the child knew the letters, the sight-testing card displaying the animals was used. Vision was divided up into sections.

TABLE XXVII.

TABLE SHOWING THE INTELLIGENCE QUOTIENTS OF 183 GIRLS AND 140 BOYS GRADED ACCORDING TO VISUAL DEFECTS.

GIRLS.

Vision.	No.of children.	Intelligence Quotient. Under 50	50-69	70-89	Over 90
Normal.	98	1	28	57	12
6/9	34	2	7	21	4
6/12	21	1	6	13	1
6/18-6/9 or 6/12	7	-	3	3	1
6/24-6/9 or 6/12	11	-	4	6	1
6/18-6/18 or 6/24	-	-	-	-	-
6/36-6/9 or 6/12	-	-	-	-	-
6/36 in both eyes.	6	4	-	2	-
Squint.	6	3	2		1
TOTAL.	183	11	50	102	20

BOYS.

	No.of children.	Intelligence Quotient. Under 50	50-69	70-89	Over 90
	62	4	16	34	8
	27	2	8	17	
	16	1	5	8	2
	15	1	6	8	-
	5	1	-	4	-
	1	-	-	1	-
	6	2	1	2	1
	5	3	1	1	-
	3	-	2	1	-
	140	14	39	76	11

TABLE XXVIII.

SHOWING THE DEFECTS OF VISION EXPRESSED AS PERCENTAGES OF THE NUMBER OF CHILDREN FOUND IN EACH MENTAL GRADE.

GIRLS.

No. of girls.	Intelligence Quotient.	Vision normal.	6/12-6/12	6/18-6/6 or 6/9 6/24-6/6 or 6/9	6/18-6/18 or 6/24-6/6 6/36-6/6	6/36 or worse or 6/36-6/9	Squint.
20	Over 90	80	5	10			5
102	70-89	76'4	12'7	8'8		1'9	
50	50-69	70	12	14			4
11	Under 50	27'2	9'09			36'3	27'2
BOYS.							
11	Over 90	72'7	18'1		9'09		
76	70-89	67'1	10'5	15'8	3'9	1'3	1'3
39	50-69	61'5	12'9	15'4	2'5	2'5	5
14	Under 50	42'8	7'1	14'2	14'2	21'5	

The number of children with defective vision varies in the Annual Reports, some giving as high a percentage as twenty six, others about twenty. In Lincoln in 1927, examination of the vision of the intermediate and leaver groups showed 16.1% had defective vision. In the children specially investigated in this thesis, vision in the group over intelligence quotient 90 was found to be defective in 20% of girls and 27.3% of boys. The numbers were, of course, very small and not to be compared with the figures of routine inspections. Vision was found to become poorer as the Intelligence Quotient became lower, and the figures give very defective vision is a more distinctive feature among mentally defective boys than among mentally defective girls.

Hearing.

The hearing of all the children (183 girls and 140 boys) was tested. It was taken first at the usual 20 ft. distance used in testing at routine inspections. Hearing at this distance was marked normal. A whisper heard only at a distance of 15 ft. was marked "Hearing slightly defective".

A whisper heard at a distance of 5 ft. was marked "Hearing very defective". Where the average speaking voice close to the ear was not heard, a note was made "No hearing". Where there was, or had been recently, Otitis Media, the letters O.M. were inserted.

Out of 140 boys, there were eight, i.e., 5'9% who had Otitis Media in their history.

Out of 183 girls, there were four, i.e., 2'17 affected. The Intelligence Quotients of the cases of Otitis Media were:-

Intelligence Quotients.	No.of Girls.	No.of Boys.	Total.
Over 90.			
70-89	3	5	8
50-69	1	2	3
Under 50		1	1

In the Annual Reports to the Board of Education the percentage of cases referred for treatment of ear disease is about one to two per cent, the figures being generally the same for the eight and the twelve year old groups.

TABLE XXIX.

SHOWING THE INTELLIGENCE QUOTIENTS OF 183 GIRLS AND 140 BOYS GRADED ACCORDING TO THE FACULTY OF HEARING.

GIRLS.

HEARING.	Intelligence Quotients. Under 50	50-59	60-64	65-69	70-74	75-79	80-84	85-89	Over 90.	Total.
Normal.	7	16	11	17	26	24	29	15	20	165
" O.M.						1	1			2
Slightly defective.	2	1	1	2		3		1		10
" O.M.				1			1			2
Very defective.		1					1			2
" O.M.										-
Nil.	2									2
TOTAL.	11	18	12	20	26	28	32	16	20	183

BOYS.

Normal.	13	14	1	19	16	19	21	9	10	122
" O.M.			1	1	2	1				5
Slightly defective.		1	2		1	3		1	1	9
" O.M.	1					1				2
Very defective.					1					1
" O.M.							1			1
TOTAL.	14	15	4	20	20	24	22	10	11	140

TABLE XXX.

SHOWING HEARING DEFECTS EXPRESSED AS PERCENTAGES OF THE NUMBER OF CHILDREN FOUND IN EACH MENTAL GRADE.

Intelligence Quotient.	GIRLS. Number.	Hearing normal.	15ft.	5ft.	Nil.	BOYS. Number.	Hearing normal.	15ft.	5ft.	Nil.
Over 90.	20	100'				11	90'9	9'09		
70-89	102	94'1	4'9	0'9		76	89'4	7'8	2'6	
50-69	50	88	10	2		39	92'3	7'6		
Under 50.	11	63'6	18'1	18'1		14	92'1	7'1		

Good hearing and Intelligence appear to be quite independent of each other, this is especially noticed in the figures for boys. The two cases of very defective hearing were girls of the lowest grade, one an idiot, the other an imbecile.

In the Annual Report of the Chief Medical Officer to the Board of Education for 1930, the mental and physical condition of children in two areas, (1) a good area, (2) a demolition area, are described. While the children of poorer mentality were in the demolition area the hearing defects were the same in both areas, namely 1%. (45).

Presence of Tonsils & Adenoids.

The throat and nose of all children were examined and tables were made showing the presence of tonsils or adenoids, or both. Their presence was marked as in the routine inspections of school children, i.e., Enlarged Tonsils & Adenoids, Tonsils enlarged, Adenoids present. Even small enlargements of tonsils without any symptoms were recorded.

In the Annual Report of the Chief Medical Officer to the Board of Education for 1927, the incidence of enlarged tonsils and adenoids found at routine inspections is 60.9 per 1000 - other throat and nose defects 6.4 per 1000.

As the figures vary so much in different areas the figures are compared with those from the Annual Reports for Lincoln in 1927 and 1928.

TABLE XXXI.

SHOWING THE INTELLIGENCE QUOTIENTS OF 183 GIRLS AND 140 BOYS GRADED ACCORDING TO THE CONDITION OF THE PHARYNX.

GIRLS.	Intelligence Quotients.									
	Under 50	50-59	60-64	65-69	70-74	75-79	80-84	85-89	Over 90	Total.
Throat & Nose Normal.	4	11	2	13	11	17	20	9	18	105
Tonsils & Adenoids.	3	6	6	3	9	4	6	5	2	44
Tonsils.	3	1	2		2	3	2	1		14
Adenoids.	1		2	4	4	4	4	1		20
BOYS.										
Throat & Nose Normal.	3	4	2	12	14	16	15	7	10	83
Tonsils & Adenoids.	5	6	1	3	1	4	3	1		24
Tonsils.		1		1	2	2	1	2		9
Adenoids.	6	4	1	4	3	2	3		1	24

TABLE XXXII.

SHOWING THE CONDITION OF THE THROAT & NOSE OF ALL THE CHILDREN IN THE FOUR GRADES OF INTELLIGENCE.

GIRLS.

Intelligence Quotient.	Throat & Nose normal.	Tonsils & Adenoids.	Tonsils.	Adenoids.	Total.
Over 90.	18	2	—	—	20
70-89	57	24	8	13	102
50-69	26	15	3	6	50
Under 50.	4	3	3	1	11
	105	44	14	20	183

BOYS.

Over 90.	10	—	—	1	11
70-89	52	9	7	8	76
50-69	18	10	2	9	39
Under 50.	3	5	—	6	14
	83	24	9	24	140

TABLE XXXIII.

SHOWING IN PERCENTAGES THE RESULTS OF AN EXAMINATION OF THE THROAT & NOSE AT ROUTINE INSPECTIONS IN 1927 AND 1928 IN LINCOLN, AND ALSO DURING THE MENTAL TESTING OF THE CHILDREN IN THIS THESIS.

	Enlarged Tonsils and Adenoids.	Tonsils.	Adenoids.	Percentage not affected.	No.of children examined.
Annual Report 1927.	15.8	1.9	1.3	81.	2950
" " 1928.	16.7	2.1	1.12	80.08	3732

GIRLS.

Intelligence Quotients.	Throat & Nose normal.	Tonsils and Adenoids.	Tonsils.	Adenoids.
Over 90.	90.	10.	—	—
70-89	55.8	23.5	7.8	12.5
50-69	52.	30.	6.	12.
Under 50.	36.	27.	27.	9.09

BOYS.

Over 90.	90.09	—	—	9.09
70-89	68.42	11.8	9.1	10.5
50-69	46.1	25.6	5.1	23.9
Under 50.	21.4	35.		42.8

It is noticeable that the presence of enlarged tonsils or adenoids or both in the children who were mentally tested and found to be normal is less than that ~~was~~ found at the routine inspections. The big difference in the numbers must be taken into consideration, and the majority of the children mentally tested were over eight years of age, while the figures from routine inspections include the entrant group too. It is in this group one expects to find a big proportion of enlarged tonsils or adenoids.

As the intelligence level becomes lower the percentage of defects of the throat and nose rises.

It occurs in both sexes; the presence of both enlarged tonsils and adenoids is the defect most often found. Adenoids appear to be more common in boys.

Occupation of the Father.

In view of its possible relationship to the child's home life, the occupation of the father was noted.

A knowledge of the father's occupation is said to be of value in understanding a person's moral and social attitude. This information has been entered in the thesis to show from what class of the community the children came.

Among the 137 children whose fathers were labourers, 81 had an inheritance of mental retardation. There were eleven children with an intelligence quotient under 59 whose parent was a skilled tradesman, and seven of the children are in the group of children whose retardation is probably the result of an abnormal pregnancy or labour in the mother.

TABLE XXXIV.

TABLE SHOWING OCCUPATIONS OF FATHERS OF THE GROUP OF 220 CHILDREN.

	Intelligence Quotients. Under 50	51-59	60-64	65-69	70-74	75-79	80-84	85-89	Over 90	Total.
Labourer.	6	21	6	17	22	21	20	12	12	137
Skilled Tradesman.	4	7	2	4	4	7	5	3	6	42
Dead.	2	3		2	4	3	2		2	18
In Asylum.				2						2
Physically unable to work.		1				1		1		3
Soldier.				1			2		1	4
Illegitimate.	2	1		2	4	4	1			14
	14	33	8	28	34	36	30	16	21	220

SUMMARY
AND
CONCLUSIONS.

Summary and Conclusions.

This thesis is based on an examination by the writer of 323 children attending elementary schools in the City of Lincoln. The examination consisted of a physical examination and the application of the Stanford Revision of the Binet Simon tests.

The ages of the children were from six to thirteen years.

The social and economic problems of mental subnormality have been discussed.

In two hundred and twenty children information was obtained of their family history. Mental retardation, insanity, epilepsy and syphilis, abnormalities of pregnancy and labour, and tuberculosis, were noted. Each factor in the inheritance was considered first alone, then in combination with the other factors which are grouped under the heading "Other causative factors". Factors like epilepsy, insanity, tuberculosis, were not proved, when found alone, to affect the mental intelligence of the child, though when together or combined with factors like mental retardation they had an adverse effect.

Mental retardation in the parents or grandparents was shown to be one of the most instrumental factors in the production of mentally subnormal children. In the grade, idiots and imbeciles, the percentage is 78.5. This figure becomes lower and lower, and falls to 4.1% among the normal children. When "other causative factors" are excluded, the figures among the feebleminded, the borderline and the Dull Groups, still show the imprint of an inheritance of mental subnormality. Where mental defect is present in both sides of the family the children tend to be in the feebleminded grade or even lower, whereas if the defect is from one side only, the probability is that the intelligence quotient of the child will be 70 or over, but still below normal.

Out of the two hundred and twenty children, seventy-eight had only one abnormal factor which might influence his mental intelligence. These children were for the most in the grade, intelligence quotient over 70. Where, however, this one abnormal factor was due to the mother having had an abnormal pregnancy or confinement, the intelligence quotients of the children approximated to 50. Tables are given showing how two or more causative factors are found in one child.

A positive Wassermann was present in ten out of a hundred children whose blood was examined. "Other causative factors" in the history were present, however.

Grave physical disturbances during pregnancy and a severe labour affects the unborn child to such an extent as to cause a state of mental subnormality bordering on imbecility. This was distinctly noticeable when all other causative factors were excluded. When abnormal pregnancy and labour were considered alone it was found thirteen out of seventeen children had an intelligence quotient under 70, and of the thirteen, seven were grouped, intelligence quotient 50-59. Even when "other causative factors" are considered the group of thirteen was raised only to eighteen, and the total number of children affected to twenty three. Boys were more affected than girls. The use of instruments to facilitate delivery does not, as far as can be ascertained from the evidence available in the present enquiry, harm the mental processes of the infant.

In 273 children enquiries were made at what age the child learned to speak, to walk, and to control the sphincters. The results were arranged

in four periods - at the normal time, late, very late, not acquired, and a comparison was made between the period and the intelligence quotient of the child. There is a definite correlation between these three physical attainments and the mental intelligence of the child, a delay co-inciding with a poorer mental intelligence. Learning to speak and acquiring sphincter control, tended to be delayed to a greater extent than learning to walk. In learning to speak and to acquire sphincter control, girls showed attainment at an earlier age.

A physical examination of the 323 children was made at the time of the mental testing. Vision and hearing were examined as at the routine school medical inspection. The throat and nose were inspected. The speech of the child during the examination was observed.

Physical defects, with the exception of those of hearing, become more prevalent as the intelligence quotient falls. Speech defects are commoner among boys than among girls,- irrespective of the mental grade.

A table giving the occupation of the father shows that most of the children were from the labourer class.

CONCLUSION.

From a study of the data of the present investigation, the following conclusions are offered:

1. Mental retardation in the inheritance plays a definite part in lowering the intelligence quotient of the child. The effect is more marked if the mental retardation is present on both sides of the family.

2. Epilepsy, tuberculosis and insanity make little impression when occurring alone in the family history, but if any one of them is combined with other causative factors, the intelligence quotients are adversely affected. Among the lower grades of mentally defective children, it is common to find two or more abnormal factors in the inheritance.

3. Abnormal pregnancies or a difficult labour may produce a low-grade feeble-minded child.

4. Syphilis, combined with other causative factors, lowers the intelligence quotient.

5. The age at which a child learns to speak, to walk and to control the sphincters is a guide to his intelligence. As the intelligence quotient becomes lower, so is the age of acquiring these faculties delayed. Speech and sphincter control show a more definite relationship to innate intelligence than does walking. Girls show a quicker response than boys.

6. Speech defects become more common as the intelligence becomes poorer. Boys are more affected than girls.

7. Visual defects increase in number at the lower grades of intelligence.

8. There is no correlation between hearing and intelligence.

9. Defects of the pharynx, such as enlarged tonsils or adenoids prevail to a greater extent among subnormal and mentally defective children.

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Appendix A1.

Intelligence Quotients.	Boys.	Girls.	Totals.
Over 90	11	20	31
80 - 89	32	48	80
70 - 79	44	54	98
65 - 69	20	20	40
60 - 64	4	12	16
50 - 59	15	18	33
Under 50	14	11	25
	140	183	323

Appendix A2.

Group of 220 children.

Intelligence Quotients.	Boys.	Girls.	Totals.
Over 90	8	13	21
80 - 89	15	31	46
70 - 79	31	39	70
65 - 69	12	16	28
60 - 64	4	4	8
50 - 59	16	17	33
Under 50	9	5	14
	95	125	220

APPENDIX B.

Stanford Revision of the Binet Simon Tests.

Year III. (6 tests, 2 months each)

1. Points to parts of body. (3 of 4.)
   Nose: eyes: mouth: hair.
2. Names familiar objects. (3 of 5.)
   Key, penny, closed knife, watch, pencil.
3. Pictures, enumeration or better. (At least 3 object enumerated in one picture)
4. Gives sex.
5. Gives last name.
6. Repeats 6 to 7 syllables. (1 of 3)

A1. Repeats 3 digits. (1 success in 3 trials. Order correct.)

Year IV. (6 tests, 2 months each)

1. Compare lines. (3 trials, no error)
2. Discrimination of forms. (Kuhlmann) (Not over 3 errors)
3. Counts 4 pennies. (No error)
4. Copies square. (Pencil. 1 of 3.)
5. Comprehension, 1st degree. (2 of 3.) (Stanford addition.) "What you must you do": "When you are sleepy?" "Cold?" "Hungry?"
6. Repeats 4 digits. (1 of 3. Order correct.) (Stanford addition)

A1. Repeats 12 to 13 syllables. (1 of 3 absolutely correct, or 2 with 1 error each)

Year V. (6 tests, 2 months each.)

1. Comparison of weights. (2 of 3)
   3-15: 15-3: 3-15.

2. Colors. (No error)
   Red: yellow: blue: green.

3. Aesthetic comparison. (No error)

4. Definitions, use or better. (4 of 6)
   Chair: horse: fork: doll: pencil: table.

5. Patience, or divided rectangle. (2 of 3 trials 1 minute each)

6. Three commissions. (No error. Order correct)

A1. Age.

Year VI. (6 tests, 2 months each)

1. Right and left. (No error)
   Right hand: left ear: right eye.

2. Mutilated pictures. (3 of 4 correct)

3. Counts 13 pennies. (1 of 2 trials, without error).

4. Comprehension, 2d degree. (2 of 3) "What's the thing for you to do":

   (a) "If it is raining when you start to school?"
   (b) "If you find that your house is on fire?"
   (c) "If you are going some place and miss your car?"

5. Coins. (3 of 4)
   Nickel: penny: quarter: dime.

6. Repeats 16 to 18 syllables. (1 of 3 absolutely correct, or 2 with 1 error each)

A1. Morning or afternoon.

Year VII. (6 tests, 2 months each)

1. Fingers (No error). Right: left: both.

2. Pictures, description or better. (Over half of performance description:) Dutch Home: River scene: Post-Office.

3. Repeats 5 digits. (1 of 3, order correct)

4. Ties bow knot (Model shown. 1 minute) (Stanford addition)

5. Gives difference (2 of 3). Fly and butterfly: stone and egg: wood and glass.

6. Copies diamond (Pen. 2 of 3).

Al. 1. Names days of week (Order correct. 2 of 3 checks correct).

Al. 2. Repeats 3 digits backwards (1 of 3).

Year VIII. (6 tests, 2 months each)

1. Ball and field (Inferior plan or better). (Stanford addition)

2. Counts 20 to 1 (40 seconds. 1 error allowed).

3. Comprehension, 3d degree (2 of 3). "What's the thing for you to do":

   (a) "When you have broken something which belongs to some one else?"
   (b) "When you are on your way to school and notice that you are in danger of being tardy?"
   (c) "If a playmate hits you without meaning to do it?"

4. Give similarities, two things (2 of 4). (Stanford addition) Wood and coal: apple and peach: iron and silver: ship and automobile.

Year VIII (continued):

5. Definitions superior to use (2 of 4).
   Balloon: tiger: football: soldier.

6. Vocabulary, 20 words (Stanford addition.
   For list of words used, see record booklet).

A1. First six coins (No error).

Year IX. (6 tests, 2 months each)

1. Date (Allow error of 3 days in c, no error in a, b, or d).
   (a) day of week: (b) month: (c) day of month: (d) year.

2. Weights (3, 6, 9, 12, 15. Procedure not illustrated. 2 of 3).

3. Makes change. (2 of 3. No coins, paper, or pencil) 10 - 4: 15 - 12: 25 - 4.

4. Repeats 4 digits backwards (1 of 3) (Stanford addition).

5. Three words (2 of 3. Oral. 1 sentence or not over 2 co-ordinate clauses)
   Boy, river, ball: work, money, men: desert, rivers, lakes.

6. Rhymes. (3 rhymes for two of three words. 1 minute for each part)
   Day: mill: spring.

Al. Months. (15 seconds and 1 error in naming. 2 checks of 3 correct).

Year X. (6 tests, 2 months each)

1. Vocabulary, 30 words. (Stanford addition)

2. Absurdities. (4 of 5. Warn. Spontaneous correction allowed.) (Four of Binet's, one Stanford.)

3. Designs. (1 correct, 1 half correct. Expose 10 seconds.)

4. Reading and report. (8 memories. 35 seconds and 2 mistakes in reading.) (Binet's selection)

5. Comprehension, 4th degree. (2 of 3. Question may be repeated.)
   (a) "What ought you to say when some one asks your opinion about a person you don't know very well?"
   (b) "What ought you to do before undertaking (beginning) something very important?"
   (c) "Why should we judge a person more by his actions than by his words?"

Year X. (continued):

6. Names 60 words (Illustrate with clouds, dog, chair, happy.)

Al. 1. Repeats 6 digits (1 of 2. Order correct). (Stanford addition).
Al. 2. Repeats 20 to 22 syllables (1 of 3 correct, or 2 with 1 error each).
Al. 3. Form board (Healy). (3 times in 5 minutes).

Year XII. (8 tests, 3 months each)

1. Vocabulary. 40 words. (Stanford addition)

2. Abstract words (3 of 5).
   Pity: revenge: charity: envy: justice.

3. Ball and field. (Superior plan)
   (Stanford addition).

4. Dissected sentences. (2 of 3. 1 minute each).

5. Fables. (Score 4: i.e., two correct or the equivalent in half credits) (Stanford addition). Hercules and Wagoner: Maid and Eggs: Fox and Crow: Farmer and Stork: Miller, Son, and Donkey.

6. Repeats 5 digits backwards (1 of 3).
   (Stanford addition)

7. Pictures, interpretation. (3 of 4. "Explain this picture.") Dutch Home: River Scene: Post-Office: Colonial Home.

8. Gives similarities, three things. (3 of 5)
   (Stanford addition)
   Snake, cow, sparrow: book, teacher, newspaper: wool, cotton, leather: knife-blade, penny, piece of wire: rose, potato, tree.

Year XIV. (6 tests, 4 months each)

1. Vocabulary, 50 words. (Stanford addition)

2. Induction test. (Gets rule by 6th folding)
   (Stanford addition).

3. President and king. (Power; accession; tenure. 2 of 3)

4. Problems of fact. (2 of 3) (Binet's two and one Stanford addition).

5. Arithmetical reasoning. (1 minute each. 2 of 3) (Adapted from Bonser.)

6. Clock. (2 of 3. Error must not exceed 3 or 4 minutes). 6.22. 8.10. 2.46.

A1. Repeats 7 digits. (1 of 2. Order correct)