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Etiological factors in mental retardation : with special reference to the moron group

Kenneth George Chinburg
University of Nebraska Medical Center

THE ETIOLOGICAL FACTORS IN MENTAL RETARDATION WITH SPECIAL REFERANCE TO THE MORON GROUP

by

Kenneth Chinburg

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CHAPTER I

INTRODUCTION

The diagnosis of stupidity is frequently made, justly or unjustly by layman and physician alike. Ideologies are formed and wars fought between classes and between nations on ideas of superiority most of which imply a mental ascendency. The question of intelligence permeates nearly all fields including medicine in full measure. This and my personal acquaintance with the mentally retarded and the eugenic problems associated with them has caused me to inquire as to the causes for mental lack and in particular, that range of human intelligence which society does not fully accept and yet refuses for the most part to care for, the moron. The cause, behavior and problem of these naturally stupid individuals have undoubtedly been a matter of concern and fascination to many people over the centuries and is today still an important problem. The low of intelligence by contrast are flattering to our own mental abilities, provide us with a malicious sort of humor, add to our derogatory vocabulary and often do work we would disdain, however, they clutter up our educational system, drag upon the

economic set up, proliferate beyond their ability to care for, get in trouble with the law of the land and furnish physicians with a number of problems.

A glance at the figures, Osborn ('40) indicates that the number of morons is from one to two per cent of the population indicating there are, using the conservative one per cent, around 1,400,000 of these defectives, most of which are free in the population, in this country. It has been estimated that there are 660,000 cases of diabetes in the United States, Nat'l Health Institute ('35-'36). So we see there are over twice as many morons as diabetics.

To more accurately delimit the moron problem a preliminary definition of mental deficiency is in order. From Kuhlmann ('41), "Mental deficiency is a mental condition resulting from a subnormal rate of development of some or all mental functions." The feeble-minded do not resemble necessarily the normal at another age level because their development does not parallel the normal even if age is neglected. In surveying the importance of this problem we can divide the discussion into the physician's relation to the moron, the incidence and adjustment of the moron and eugenic and social aspects.

PHYSICIANS AND MORONS. The physician is brought up against this problem in two manners. First, as a complicating feature in the handling of abnormality of another part of the individual. Usually diagnosis and treatment require the cooperation of the patient and in so far as his intellectual abilities are deficient, his response will be handicapped often to an exasperating degree. Secondly, the doctor is often called upon specifically, for the mental retardation. About one out of every fifty lives that the general practitioner ushers into the world and cares for thereafter, will be a mental defective. The pediatrician is often consulted by concerned parents. Three of the situational demands upon him will be, "Why is the child retarded?", "Is this hereditary?" and "Will any more of our children be defective?". His treatment and prognosis will be influenzed by his concept of etiology. The neuropsychiatrist has the same problem as the pediatrician and the request for establishing etiology when the diagnosis of mental deficiency is made, for institutional committment either penal, educational or custodial, and in understanding personality disorders complicated by inadequate mentality and as a medical consultant in the social welfare field. The obstetrician

is undoubtedly vexed by these moronic parents who indiscriminately beget babies to plague his nights and raise his taxes.

Schweitzer ('41) sums up the relation between genetics and medicine when he writes, "We are thus brought to the conclusion that in medicine, as elsewhere, the point at issue is not heredity or environment, but rather how much of each. The relative importance of genetic and extrinsic variables in the particular disease is a matter for investigation rather than a priori argument; and the ratio is subject to change or reversal, with increasing knowledge or with changing conditions. However, at any given time, that variable will appear most important which offers the greatest impediment to the control of the given condition.

"This harmonious interrelationship between medicine and genetics is only beginning. Up until now, the physician has been co tent to ignore genetical problems and the geneticist has been aloff from the main currents of medical thought. Consequently, more often than not, studies in medical genetics suffered from inadequate recognition of clinical considerations. In addition, they were usually based on small numbers

and were not controlled for the environment factors which might have contributed to the results." Which again emphasizes the importance of constitution in disease.

INCIDENCE AND ADJUSTMENT OF THE MORON. To appreciate the importance of mental defect to the nation it is necessary to survey the incidence and to evaluate the behavior of this group.

Incidence. Raymond states ('39) that careful surveys show that at least two per cent of all children of school age are sufficiently retarded in their intellectual development to need either institutional care or special educational provision in order to achieve the highest degree of development. It was further estimated that the level of intelligence of approximately fifteen per cent of the total population of the United States does not, and in all probability, will not exceed a mental age of 12 years, and that two per cent of the population is definitely feeble-minded. Another survey, Nat'l Resources Committee ('38), showed that the most comprehensive data on mental defectives are those for drafted men in conjunction with psychological tests and psychiatric examinations. According to these figures the relative frequency of mental defect may be

estimated at twelve per thousand males aged eighteen to thirty. Because of the high death rates characteristic of the mentally deficient, the proportion of children who are so handicapped must be about two per cent. A small proportion only of the feeble-minded are institutionalized, a total of about 100,000 persons in the country. It should be added here that insofar that the idiots and most of the imbeciles cannot care for themselves at all in society, it follows that nearly all of the feeble-minded diagnoses made by the Army were of the moron level.

Adjustment. In regard to the adjustment of the mentally deficient, Baller ('35) has a well controlled study. He took 206 subjects whose clinical examinations indicated definite subnormal mentality, who had had one or more years in "opportunity-room" classes, whose IQ did not exceed 70 and whose age at the time of study was more than 21 and matched these with a control series as to sex, nationality and age (all were from the same school system) but whose IQs were from 100 to 120. The intelligence distributions were as follows.

	Sub-normal		Control	
	Male	Female	Male	Female
Number	126	80	126	80
Mean IQ	60.50	59.00	107.84	105.92
SD of IQ	7.78	8.25	4.92	4.82

Summary of Baller's Findings

	Subnormal	Control
Relocation of subjects (All "break down" per centages are based on the actual number studied in that particular phase) Subjects 21 to 34 years old	95.15%	98.06%
Location at time of study		
Deceased	7.14%	.99%
Feeble-minded institutions	6.65	0.0
Insane hospitals	.51	.50
State reformatory	.51	0.0
County jail	.51	0.0
In Lincoln, Nebr.	59.18	54.95
Out of Lincoln, Nebr.	26.50	43.56
Mean number of siblings	3.72	3.18
In general the family background of the subnormal groups was inferior to that of the controls.		
Mean grade completed (Educational level)	4.39	13.05
S.D. of grade completed	2.87	2.57
Marital status		
Per cent married	42.86	54.95
Per cent divorced	4.08	4.95
Av. no. children per marriage	1.32	.84
Children per 100 subjects	56.60	46.14
Mean age at marriage	21.88	23.46
Conduct records (Per cent with more than minor law breaking charges. Each agency reports its number in relation to the total number studied. May have overlapping)		
Juvenile Court	25.00%	3.96%
Police Court	17.86	6.43
City and County Jail	9.18	1.43
Reformatory Commitment	8.16	1.43
Penitentiary	1.53	0.0

Clinical suggestion of poorer control of sex by subnormals.

(Baller's Findings)

	Subnormal	Control
Employment		
Unemployable	9.03%	0.00%
Employment totaling less six months	51.47	7.45
Employment lasting six to twelve months	19.75	36.65
Relatively permanent employment	19.75	55.90
None of the subnormals were in professional, or business-managerial positions and only a few reached skilled trades.		
Economic status		
Confined in institutions	8.24%	.50%
Totally dependent on relatives	8.24	0.0
Partially self supporting	56.59	15.08
Wholly self supporting	26.93	84.42
Per cent of total aided by relief agencies	38.46%	15.58%

It is not to be presumed that the carrying out of values to hundreths indicates great reliability in the prediction of the performance of another feeble-minded group under similar circumstances but rather that this is simply a statistical consequence when tabulated figures are converted to per centages.

Adjustment.

Using the criteria of being wholly self supporting and records free of breaches of the law or of violation of accepted standards of ethics it was found of the subnormal that 21 per cent of the males and 29 per cent of the females were well adjusted. In trying to

determine the basis for this better adjustment it was found that age was no factor, that the difference in IQ between the groups was only about four points in favor of the better adjusted group. Of the well adjusted males 44 per cent were married as against 34 per cent of the remainder; hardly a significant difference. Baller writes, "The only answer that seems to be permissible in replying to the question regarding the factors which condition the success of mentally subnormal men is that, outside the tendency for successful adjustment to be associated with an advantage in measured intelligence, no clearly defined relationships can be discovered between special traits or influences and favorable outcomes. That certain individuals have had more success in meeting the problems of social adjustment is evident, but beyond saying that there exists in these cases certain fortunate combinations of many factors in highly variable patterns, it does not seem safe to go with the evidence available."

In the female group two important factors in adjustment were found; namely marriage, and training and supervision in personal appearance and domestic duties. Of the well adjusted, 90.5 percent were married

while only 50 per cent of the remainder were married. Of the superior group 86 per cent had had domestic and or appearance training while only 23 per cent of the remainder had such training. Obviously the entire basis for the success of these women cannot be based on these two factors for the very accomplishment of marriage and training implies an adjustment better than the expected for this group. The best explanation appears to be that marriage and training developes a basically sound moron into a well adjusted individual.

It is unfortunate that Baller did not go into the family environment and childhood history of each of the subnormals in an effort to pick up significant factors in the developmental stage that would influenze the adjustment of these people. The outstanding weakness in the whole study is that while the subnormals and controls were matched for sex, nationality, age and were from the same city and school system there was no attempt to have comparable home backgrounds for the two groups so there results this admixture of environmental differances and a more precise differential in intelligence. A survey of the subjects' families showed that the fathers of the controls had a distinct higher mean on the occupation range than the fathers

of the subnormals and that the families of the controls were much freer of serious economic straits, character deviations and law breaking than the parents of the subnormals. From this it must be inferred that if the two test groups were under similar environments, the differences between the two would not be so great, however, no one is implying that a good environment will make a normal person out of a moron.

Baller in his review of the literature points out a considerable number of results which have considerable variation, however, with all the variables and uncontrollables in this type of measurement such findings do not seem unreasonable. Baller's work fits into the range of these conclusions and because of his controls and methods, his conclusions are apparently well founded and represent a typical example of a moron group which provides background for a definition and social evaluation of mental retardation.

Another study one by Palmer ('41) is interesting because it gives all the mentally deficient in an isolated population, that of Kauai Island in the Hawaiian group. There were 174 cases which were divided as follows.

21.% Idiots and Imbeciles
44.8 Morons
33.9 Borderline

About half of the group were from 12 to 21 years old with a fourth above and a fourth below this range. Sex was equally divided. Racially they were of Japanese, Filipino, Portugese, Peurto Rican, Hawaiian, only two Caucasians and some miscellaneous. The first five were of about equal number with a Japanese predominance. The findings are as follows.

Physical

26% Major physical defects; more frequent among the idiots and imbeciles

14% Incompetent and need help in physical needs; primarily the lowest mental groups

Function

74% Had or does attend school regularly

27% Behavior problems

25% Of those over 12 years are gainfully employed

23% Minor crimes

18% Major crimes

Crime more frequent among the higher intelligent.

25 mothers had 99 children

Family background

25% Of families on relief

83% Of families with six children or more

33% Of cases had defective or delinquent siblings

Care and handling

10% Need institutionalization

47% May need institutionalization

15% Will probably adjust satisfactorily

(No mention is made of the remainder per centage in the care and handling group. It is probably expected that the remainder will adjust poorly but few will need institutionalization)

To give some concrete examples of moron function some quotation of moron answers from Harris ('44) who tested 150 morons as screened out by Navy entrance exams and he gives these responses as representative. "Who is President?" "Gene Talmadge," from nineteen year old Georgian. Who was President before Roosevelt brings answers like Lincoln, Washington, Wilson. They lack geographical information, not knowing where London or Berlin is for example. They have an inadequate number concept, usually under estimating grossly, such things as distance and population. To problems like, "If lost in a forest how would you get out?", they suggest, "Going back the way you came", or "Ask a policeman",; or in what way are wood and alcohol alike, an answer came that they both can knock you out.

Doll ('34) characterized the mentally deficient by writing, "The feeble minded as a class are not aggressively antisocial, nor are they aggressively promiscuous in their sex relations. On the contrary, the feeble-minded are passive and timid as a class. Their suggestibility, their ingenuousness and their lack of foresight make them easy victims of social circumstances. They do not seek unsocial lives. Rather, their lives are made unsocial because of their

inability to cope with the difficulties of modern social life."

From these representative studies it certainly can be concluded that the moron is seriously handicapped in meeting the normal demands of society, and that consequently he becomes a problem to this same society.

EUGENIC ASPECT. In evaluating this problem it becomes important to know what the natural trend of the situation is and what therapeutic measures might be expected to accomplish. To determine whether mental defect is increasing in number is difficult to ascertain. There appears to be an important causal relation between parents intelligence and that of their offspring and that in recent decades the groups lower in native mentality have the highest fecundity and thereby are increasing the problem. This aspect will be taken up more thoroughly in the discussion on the origins of morons. To the eugenicist the etiology of the mentally defective is extremely important, constituting one of the fundamental bases in his field. The ideal and importance of eugenics is summed up by Osborn ('40) when he writes, "Eugenics in a democracy seeks not to breed men to a single type, but to raise the average

level of human variations, reducing variations tending toward poor health, low intelligence, and anti-social character, and increasing variations at the highest levels of activity. It is evident that, under present conditions, individuals who vary most in the direction of high intellectual range and more than usual activity tend to have smaller families than do their more commonplace fellows. If eugenics should fail in the attempt to correct this condition, or be perverted to other ends, much that is highest in our civilization would disappear." The interests of euthenists are stated by Waddington ('39) when he writes, "Similarly, it is very probable that a much greater improvement in intelligence could be produced by measures of social amelioration than by any eugenical steps which are within the bounds of probability."

So we see that the moron creates problems in a number of fields; that the physician is often involved in the difficulty; that society is definitely affected by this group and that a solution rests in bettering both the genetic situation and the environment.

CHAPTER II

HISTORY

To gain an accurate understanding of the present day attitude towards the factors in the etiology of feeble-mindedness it is necessary to survey the history of thought in this field.

GREEK ROMAN. As so often we start with the immortal Greeks who have something to say about almost everything. They practised infanticide, Plato recognizing the hereditary viewpoint and Aristotle emphasized the economic reasons for doing away with these defectives. The Romans apparently gave nodding acceptance of the Greek ideas but weren't so active in destroying defective infants but rather kept them around for menial tasks and amusement.

MIDDLE AGES. Following Deutsch's ('37) discussion there is next the supernaturalistic ideas of the middle ages. Those feeble-minded that misbehaved were children of the devil and treated as such while those who were mild and benign were regarded as the Children of God or "innocents" who walked on earth while their souls were in heaven; a convenient excuse for being a numbskull. The more rational at the time

considered them doomed from birth as human animals lacking all human traits and dealt with these individuals as they did with their live stock.

RENAISSANCE. Along with the general initiation of modern science in the latter part of the eighteenth century, a more humanistic and scientific attitude towards the defective arose, sponsored primarily by the French students of mentality. Their interests led them towards care and training and marked the beginning of modern handling of the feeble-minded. However, there was no clear appreciation of how these aments came about except that they were just born that way or failed to develop in their ordinary environment.

EARLY MODERN. Deutsch's next period is the early studies on heredity initiated by Darwin's, Origin of the Species in 1859 and ending about 1900. Following Darwin is Galton's work on the origin of genius and then in 1887, Dugdale put forth his study of the degenerate family, The Jukes, which was the first in a series of genealogical studies. Preservation of the defectives was obviously anti-Darwinian; Galton showed that great men were free of mental defect in their background and the Jukes intimated what a terrific

price degeneracy was for the population. Consequently further studies in this field became a necessity.

ALARMIST ERA. This period started about 1900 and lasted to around 1920. It has four important factors and was characterized by the condemnation of the feeble-minded.

Mental testing. In 1905 Simon and Benet came out with their intelligence test, the "perfect means" of diagnosing mental defect particularly as the test was revised and standardized, giving confidence to those making a label of feeble-mindedness. Goddard in 1908 to 1910 gave the mental test to his patients at the Vineland Training School for defectives and in 1910 the American Association for the Study of the Feeble-minded adopted his classification of the defectives into; 1, idiots, mental age through two years; 2, imbeciles, mental age three through seven years and 3, morons of eight through twelve years mental age. He set the demarcating line between normal and deficiency at twelve years because the highest score group at Vineland was at this level. When the Goddard criteria were applied to large groups such as the Army mental tests it was found that 47.3 per cent of the recruits were mentally defective. Truly an appalling

state of affairs. Intellectual circles grew fearful of the swamp by the feeble-minded. Obviously, the difficulty came from the selective admittance to Vineland where people were sent who were stupid and troublesome. Because the mildly subnormal often have adjustment difficulties, we expect to find them represented at Vineland and consequently they would raise the upper limit of the test level criterion for defect. Furthermore there was little guarantee that the groups at the training school were representative but it was the easiest approach at the time. It seems characteristic of this period to credulously believe any study that pointed to the feeble-minded as the root of all social evil. One suspects the educated enjoyed having someone to blame for most of the human problems.

Heredity. In 1900 Mendel's laws of heredity were rediscovered. Interest in inheritance was strong and here was the genetic basis for feeble-mindedness. Goddard ('14) wrote, "It is clear from the data already presented that feeblemindedness is hereditary in a large percentage of the cases and that it is transmitted in accordance with the Mendelian formula". He goes on further to write, ('15), "Thanks to the investigations already made, we now know that in

two-thirds of the cases, feeble-mindedness is caused by feeble-mindedness, that is to say, feeble-minded parents transmit their mental defect to their offspring. It therefore follows that if we could prevent reproduction among the feeble-minded, we could reduce mental defect to one-third of its present proportions." Later he repudiated this statement

Genealogical studies. They all arrived at the same conclusion, that mental defect was inherited and was the cause of much of human degeneracy. In the recheck of these tales, it was found that the investigaters were permitted very lax criteria in diagnosing a person as feeble-minded. These people started out with the presumption that anyone who didn't follow the ways of civilization was mentally defective and thereby they selectively picked up as subnormals all who caused trouble and missed the factors of low cultural level and personality disturbance as factors in the etiology of mal-behavior.

Eugenics. Now that it was known from whence came the superior people and how the defectives got here, eugenics was the sensible expression of these ideas. People became so sold on the idea of genes that nearly every social, physical and mental difficulty was

traced to inheritance and at least ninety per cent of feeble-mindedness was due to bad germ plasm. Fernald ('13) reflects the general attitude of the times by writing, "The feebleminded are a parasitic, predatory class, never capable of self-support or of managing their own affairs. They cause unutterable sorrow at home and are a menace and danger to the community. Feebleminded women are almost invariably immoral, and if at large usually become carriers of venereal disease or give birth to children who are as defective as themselves. . . . Every feebleminded person, especially the high-grade imbecile, is a potential criminal, needing only the proper environment and opportunity for the development and expression of his criminal tendencies." Fernald later changed his opinions in a true scientific spirit. However, these attitudes led to the passage of a number of laws aimed at the control of the defectives but due to the change in ideas and the difficulty of enforcement, these legal expressions were little used.

MODERN. This period started about 1920 and is continuing through the present. There are several trends of which inheritance and nature-nurture ideas stand out.

Trends. There is a re-evaluation of the old and the addition of a wealth of new material. One trend is the criticism of the mental test, with the recognition that the earlier tests had a lot of environmental factor in them or tested only certain faculties of the intelligence predominantly. Intelligence testing has been steadily improving and the evaluation of the hereditary and environmental factors is becoming more precise. A second trend is the shift away from relying exclusively on the IQ to determine feeble-mindedness but rather a total survey of the individual, especially his social and economic adjustment as affected by his mentality. Thirdly, the genealogical studies have been thoroughly discredited both as to methods of acquiring data and as to their statistical reliability. Fourthly, studies are separating the effect of low cultural level on behavior and that due to hereditary defect. Fifthly, differentiation is being made between the feeble-minded that must be institutionalized and those which are adjusted well enough to care for themselves in a favorable environment.

Inheritance. The modern period in inheritance has consisted of the investigations into the mechanism of

heredity. The biological change in viewpoint is expressed well by Jennings ('25), "From the fact that the 'unit character' changed when a single gene changed it was concluded that in some ill-defined way each characteristic was 'represented' or in some way condensed and contained in one particular gene. There was one gene for eye colour, another for stature, another for feeble-mindedness, another for normal-mindedness, and so on. Every individual, therefore, came into the world with his characteristics fixed and determined. His whole outfit of characteristics was provided for him at the start; what he should be was pre-ordained; predestination, in the present world, was an actual fact. Environment might prevent or permit the hereditary characters to develop; it could do nothing more. Heredity was everything, environment almost nothing. This doctrine of the all-might of inheritance is still proclaimed by the popularizers of biological science.

"But this theory of representative particles is gone, clean gone. Advance in the knowledge of genetics has demonstrated its falsity. . . . Neither eye-colour, nor tallness, nor feeble-mindedness, nor any other characteristic, is a unit character in any such sense.

There is, indeed, no such thing as a 'unit character' and it would be a step in advance if that expression should disappear.

"The genes then are simply chemicals that enter into a great number of complex reactions, the final upshot of which is to produce the completed body. The characteristics of the adult are no more present in the germ cells than are those of an automobile in the metallic ores out of which it is ultimately manufactured. To get the complete, normally-acting organism, the proper materials are essehtial; but equally essential is it that they should interact properly with each other and with other things. And the way they interact and what they produce depends on the conditons.

"Any characteristic requires for its production both an adequate stock of chemicals and an environment adequate for its production through proper interaction of these chemicals with one another and with other things. In these senses all characteristics are hereditary and all are environmental, but no characteristic is exclusively hereditary or exclusively environmental."

Nature-nurture. The study of the relative importance of nature and nurture in intelligence has been and

is a hotly contested point. It is around this aspect that a major portion of this thesis is centered. The primary sources of material have come from; 1, studies of monozygotic twins, 2, correlations between relation, largely between parents and offspring and between siblings and 3, studies of cultural and educational differences as influenzing the intelligence scoring. The twin studies and family correlations all tended to fit together so that by the early nineteen thirties psychologists were pretty much agreed that intelligence was a product of the mutual interaction of heredity and environment; however, the genetic factor was almost the whole factor in producing individual differences in mentality. IQ was constant and little influenzed by nurture.

In the late thirties and early fourties the Iowa group and others came out with experiments showing that intelligence as measured by intelligence tests could be markedly influenzed by stimulation or lack of stimulation to the mind. So much so, as a matter of fact, that one born a moron under ordinary surroundings might be brought to normal intelligence by a very stimulating environment. This caused a great stir among those interested in the problem and in the years

since as well as the present time, a reevaluation of the nature-nurture problem in intelligence has been and is going on.

FUTURE. There are two interesting possibilities for the induction of a new era in the nature-nurture field. One is the discovery of methods of identifying the latent or non-manifest genes and genetic factors so that a complete hereditary chart may be made for each individual and the results from his mating with a mapped out female genetic system, may be predicted accurately. At the present time there is no good way of knowing just where and in what proportion latent factors exist so that forecast becomes guesswork in too many places. The second possibility is that of influenzing the germ cells of the parents or those of the fetus so that these controlling protoplasmic systems can be deliberately modified. Some start has been made in this field with radiation of germ cells of experimental subjects but nothing applicable to the human has as yet come forth. Then of course there are always developments which are not foreseeable. One comes to the general impression that the factors which control intelligence are in for considerable more study and it is expected that good progress will be made.

CHAPTER III

DEFINITION AND CLASSIFICATION

DEFINITION. The terms intelligence and feeble-mindedness need to be presented so that a common basis for discussing etiology is established.

Intelligence. Stoddard's ('43) definition is good. Intelligence is the ability to under take activities that are characterized by 1, difficulty, 2, complexity, 3, abstractness, 4, economy (mental speed and efficiency), 5, adaptiveness to a goal, 6, social value and 7, the emergence of originals (originality and inventiveness), and to maintain such activities under conditions that demand a concentration of energy and a resistance to emotional forces. In accepting such a definition it becomes obvious that the intelligence test alone is not fully adequate to measure this characteristic; however, when taken in conjunction with a history of the individual, the test is very valuable and intelligence can be determined fairly accurately.

Feeble-mindedness. There is considerable variation as to the concept of mental deficiency, however, they are grouped around the idea of low intelligence as psychologically measured and poor adjustment to society

because of their mentality. Tredgold ('37) sets out amentia as, "A state of incomplete mental development of such a kind and degree that the individual is incapable of adapting himself to the normal environment of his fellows in such a way as to maintain existence independently of supervision, control, or enternal support." This is a bit vague and Yepsen ('41) in defining mental deficiency suggests four criteria. First, ineffective integration, the personality is poorly coordinated. Secondly, a greater than normal tendency to react on the affective rather than the cognitive level. Thirdly, a stubborness with lack of mental adaptability and fourthly, a disacuity in differentiating elementary relations. Kuhlmann ('41) emphasizes that the comparison of mental defectives to the intelligence of children is not valid even though they may have the same over all score on an intelligence test, the defective has an unbalanced mental growth and comes to arrest in an uneven manner in contrast to the normal child whose mental growth is regular and progressive.

However, in order to arrive at more preciseness and to emphasize the psychological component of the mental deficiency because of the extensive use of the

intelligence test in studies on mentality, the traditional classification is given.

Feeble-minded	Below 70 IQ
Morons, mental age of 8 through 10 years	50-70 IQ
Imbeciles, M.A. 3 through 7 yrs.	25-50 IQ
Idiots, M.A. 2 or below	Below 25 IQ

Penrose ('41) divides and characterizes the defective groups as follows.

Low grades	High grades
Idiots and imbeciles	Morons and borderlines
0.25% of population	1% of population
Uneducable	Educable
Distinct type	Gradually merges into the general population
No adjustment socially	High amount of failure but are usually able to carry on some constructive function
Not very reproductive	Prolific reproduction

It is necessary to distinguish between amentia and dementia. By amentia is here meant a decrease or disturbance in the development of intelligence, occuring either hereditarily, congenitally, at birth or after, so that a serious impairment of mentality occurs. Any decrease in basic mental ability occuring after full maturation of intelligence is dementia. Because the growth of intelligence is essentially completed at fourteen to sixteen years of age, the etiological

factors for feeble-mindedness must act in this phase of life.

Evaluation of definitions. The definition of mental deficiency must be primarily psychological because setting up of some over all adjustment standard divides those of the same psychological performance into the adjusted and the maladjusted and thereby, necessitating a name for each group. There is the tendency to rate anyone well adjusted as not feeble-minded but this appears to be an imposition upon the term which the psychologists were the first to attempt a precise definition. Furthermore, adjustment is dependent on important other things than intelligence and therefore, to use this standard in an intellectual concept does not appear consistent. Consequently, the feeble-minded should be defined psychologically, using the adjustment performance to validate and supplement the intellectual classification by psychological testing.

CLASSIFICATION. The second phase of this chapter deals with the etiological classification of mental defect. It should be pointed out here that the moron concept has no sharp borders so that on the top side it shades out into the borderline individuals and on the lower side, into the imbecile group. Furthermore

the causes of mental deficiency are not respectors of neat precise classifications of mentality but may function across demarcation lines. Therefore, it becomes necessary to discuss in general the etiologies of all the mentally subnormal and because of the special interest in the moron, to emphasize the etiological factors important to this group.

Potter's classification. Published ('30), it divides deficiency into three main sources.

A. Constitutionally Mentally Deficient

1. Familial type in which there is direct or collateral ancestral defect. (It is this factor which is very important in the etiology of morons)
2. Mongolian type, which is characterized physically by flattened skull, oblique and narrow palpebral fissures, depressed nose, fissured tongue, short hands, paddle feet and so on.
3. Congenital diplegic type, in which there may be bilateral rigidity and spasticity and probably related to defects in myelinization.
4. Microcephalic type, due to or accompanied by cerebral hypoplasia.
5. Oxycephalic type, in which the high, narrow skull is usually due to premature synostosis of the coronal sagittal sutures.

6. Cretinous type, in which the growth defects, both physical and mental, are due to a deficiency of thyroid secretion.
7. Hypophyseal type, which is due to an insufficiency of pituitary function with dystrophy, frequently of the Frohlich type.
8. Hypoplastic type, in which the general hypoplasia cannot be attributed to any one endocrine gland.
9. Constitutional syphilitic type, which apparently results from the blastophthoric effect on the germ cell.
10. Undifferentiated type, which accounts for a large number of cases not definitely classifiable etiologically. (A number of morons who appear in "good" families, fall here.)

B. Reactional types, which are not constitutional but are the result of an organic reaction based upon mechanical, chemical and bacterial factors.
   1. Post-traumatic conditions, usually cerebral lesions due to injury, especially birth injury.
   2. Post-encephalitic type, occurring after acute infectious diseases and especially following epidemic encephalitis.

3. Hydrocephalic type, which is almost always secondary to inflammations about the aqueduct of Sylvius, the foramina of Luschka and Magendie or the subarachnoid cisterns.
4. Infantile cerebral syphilis, in which the pathology may be meningo-vascular or parenchymatous; the intellectual defect usually depends upon the location and extent of the lesions.

C. Degenerative mental deficiency types.

1. Diffuse sclerosis, in which there may be diffuse or patchy proliferation of the neuroglia of the cortex; distinct changes in motor and reflex activity are observed.
2. Nodular sclerosis, which involves proliferation of a nodular type.
3. Amaurotic degeneration.

This classification is rather unwieldy and does not lend itself well to a discussion of the moron causation.

Sherman's classification. Published ('45), it presents a clinical classification for etiological purposes that is simplified and emphasizes important elements. There are eight types.

1. Hereditary type, in which there is usually little, if any, organic disturbance. The diagnosis is generally made because no organic or environmental causes are discovered. Since feeble-mindedness is not a unit character of heredity, it is supposed that various germ plasm disturbances may be the specific cause for the failure of intelligence to develop at the normal rate.
2. Structural defectives, which includes the birth injuries, hydrocephalics and microcephalics.
3. Physiological defectives, which includes cretins, hypopituitary types and the severe nutritional disturbances.
4. Pathological types such as cerebral lesions due to infectious diseases, the post-encephalitics, the tuberous sclerotics, and the post-meningitis conditions.
5. Sensory defects, such as blindness and deafness which may be the basis of mental deficiency, although in most cases only retardation, rather than deficiency results.
6. Environmental types, the surroundings of the individual are so meager in mental stimulation that his intellectual capacities are not developed

adequately. (Around this point considerable controversy has developed in recent years and this factor will be taken up more thoroughly in the section on etiological factors.)

7. Mongolian idiots, which are considered due to incomplete intrauterine development.
8. Hereditary pathological types, such as amaurotic family idiocy.

These classifications give a basis upon which to proceed in discussing the etiological factors in mental deficiency. To meet the need for emphacizing the causitive factors for morons, it is necessary to reorganize the classification. This modified grouping will be used as the outline in discussing etiology.

CHAPTER IV

ETIOLOGY

This chapter will be divided into three main parts; namely, introduction and organization, nature-nurture factors and specific factors.

INTRODUCTION AND ORGANIZATION

It may be seen that the causes of feeble-mindedness may be grouped under nature-nurture or primary factors and under specific or secondary factors. The nature-nurture or primary defectives are the inferior deviates of the normal mechanism of heredity and are significantly modified in intelligence by the quality of their environment. The specific or secondary feeble-minded are the result of causes that are usually associated with mental retardation, have a characteristic method of producing mental defect and are usually accompanied by some physical findings of abnormality or pathology. The important causes of moronicity are not as numerous as those for the entire feeble-minded group. To emphasize the moron factors, only those causes directly related and of numerical consequence will be discussed. Because of the importance of the

nature-nurture complex in morons, it will be given a separate section and the rest of the etiologies will be grouped under secondary factors.

The organization of the material is outlined as follows, in greater detail than the table of contents.

Outline of Etiology

A. Nature-nurture
    1. Familial factors
        a. Parent-child correlations
        b. Foster children studies
            1'. Foundation studies
            2'. Environmental emphasis
            3'. Review
        c. Twins
        d. Feeble-minded groups
            1'. Institution data
            2'. Environmental influence
            3'. Feeble-minded mothers
    2. Group factors
        a. Survey
            1'. Racial
            2'. Regional
            3'. Socio-economic
                a'. Paternal vocation
                b'. Parental education

b. Future

1'. Birth rates

2'. Environment

3. Genetic mechanisms

a. Sex-linkage

b. Blending

c. Hurst's theory

d. Dominance

1'. Regression

2'. Offspring variation

e. Partial dominance

1' Theory

2' Validating theory

3' Evaluation

B. Specific causes

1. Structural

a. Birth injuries

b. Hydrocephalus

c. Microcephalus

2. Physiological

a. Cretins

b. Epilepsy

3. Pathological
    a. Encephalitis
    b. Syphilis
4. Mongol
5. Rare types

NATURE-NURTURE

It is thought that the major share of morons are a product of the normal multifactorial mechanism of intelligence of which they form part of the lower ranges and the factor of adversive mental environment. This essentially boils down to the nature-nurture problem in intelligence, about which Stoddard ('39) writes, "It is essential to think of the contributions of heredity and environment, not as mutually exclusive or diametrically opposed, but rather as close-coupled factors whose impingement is mutually interacting. Environment does not act upon heredity (who would say that heredity acts upon environment?): rather various combinations of factors and forces, with different origins, produce measurable results in child development." Therefore, in the study of the etiology of morons it is necessary to study nature and nurture together for their total effect on the individual and to make a quantitative evaluation of each factor in various situations.

Nature-nurture studies may be divided into familial factors, group factors and genetic mechanisms. By familial is meant the relation of the intelligence of the ancestors as transmitted to the offspring through

heredity and family environment and also, those environments which are substitutes for the home situation; that is, foster homes, orphanages and institutions. Those influenzes on intelligence that affect large numbers are group factors such as race, geographical region of residence, socio-economic levels and fertility factors.

Because of the vastness of the literature in this field and the natural limitations of this thesis, citations will be limited primarily to summaries and representative studies by recognized authors, in an effort to present the highlights and significant points in this area of study.

FAMILIAL FACTORS. Evidence from the familial studies may be divided into parent-child correlations, foster children studies, twins and data on feeble-minded groups.

Parent-child correlations. Outhit's ('33) correlations for parent and child intelligence are typical of the results from this type of study. Her group consisted of 51 families with 279 children, 257 of which were tested; there were four or more children per family and all offspring, were three years or older. This group consisted of English, literate,

non-psychopathic and non-debilitating diseased people who were obtained from organizations such as churches, schools and so on.

Her correlations were:

Single parent to single child	.50	
Mid parent to single child	.545 ±.072 to .731 ±.049	
Mid parent to mid child	.802	±.033
Mid brother to mid sister	.736	±.045
Husband to wife.	.741	±.042

The offspring tended to regress towards the mean of the population; that is, the children of parents which deviate from the mean, do not themselves deviate as much as the parents. The offspring variability according to the parental deviation from 100 IQ did not change much, that is, the standard deviation of the children from parents of low intelligence was about the same as that from parents normal or superior in intelligence and furthermore, the children from each parental group, showed as much variability as one would find in a sample for the population as a whole for intelligence. The regression equation shows then, for example, the .50 correlation between single parent and single child, that a parent with a 70 IQ would have children with a mean IQ of 85 and a S.D.

of around 13 IQ points.

It must be remembered that these results show the combined effect of parental heredity and parental environment. To separate these factors, the study of foster children provides a situation where the environment may be quite different from that anticipated if the child were to remain with the parents.

Foster children studies. These are divided into the early foundation studies, the recent emphasis on environment and a review.

Foundation. In 1928 the National Society for the Study of Education came out with their Twenty-Seventh Yearbook on Nature and Nurture, a summary of all the important work and findings on this problem to date of publication. The first volume was devoted to the influenze of nature and nurture upon intelligence. From this I would like to quote two summaries as representative of the opinion at that time and which still stand as landmarks in the nature-nurture question, as iluminated by foster child studies.

Freeman et al ('28) after the study of 671 children divided into various hereditary and environmental groups, made the following summary.

"The main problem of this investigation was the measurement of the effect of environment upon the intelligence of foster children. This summary includes only a brief statement of the more important comparisons made and the conclusions which seem to be warranted.

"1. A group of children were tested before placement and then retested after several years of residence in a foster home. A comparison of their ratings on the two tests gave evidence of a significant improvement in intelligence as measured by intelligence test scores. A study of certain sub-groups showed that the children in the better foster homes gained considerably more than did those in the poorer homes. Furthermore, the children who were tested and adopted at an early age gained more than those adopted at a later age. These facts appear to indicate that an improvement in environment produces a gain in intelligence.

"2. A comparison was made between the intelligence of siblings, that is, brothers and sisters who had been reared in different foster homes. The correlation between their intelligence was found to be lower than that usually found for siblings raised together. The usual coefficient of fraternal resemblance is about

.50, but it was found that for siblings separated before either of the pair was six years of age the correlation was only .25. When the comparison was made for those whose foster homes were of different grade, the correlation was found to be only .19. These facts make it appear that a part of the resemblance between siblings reared together is due to the influence of a similar environment.

"3. A group of siblings was divided into two groups by putting into one group the member of each pair who was in the better foster home and into the other group the one in the poorer home. The mean I.Q. of the group in the poorer homes was found to be 86, while that of those in the better homes was 95. An analysis of the conditions of adoption made it seem unlikely that there was any marked tendency for the brighter member of a pair of siblings to be taken into the better foster home. A random formation of two groups from pairs of siblings would give groups of equal intelligence. The superior intelligence of the siblings in the better homes appears, therefore, to give evidence that the character of the home affects the child's intelligence to a marked degree.

"4. Two unrelated children reared in the same home

were found to resemble one another in intelligence. The correlations between the intelligence of such unrelated pairs ranged from .25 to .37. This resemblance is probably due for the most part to the similarity of their environment.

"5. The available information on the own parents of the foster children indicated that a large percentage were of defective mentality. If heredity were the only factor in the determination of intelligence, it would be expected that their children would be decidely below the average. It was found, however, that their mean I.Q. was practically equal to the standard for children in general. Only 3.7 per cent rated below 70, and these were those placed at relatively late ages. These facts seem to point quite clearly to the influence of environment upon intelligence.

"6. In the case of 26 children studied, both parents were rated as feeble-minded, If intelligence were inherited according to the Mendelian law, all of these children would be feeble-minded. It was found, however, that only four had an I.Q. below 70 and these only slightly below. The average I.Q. of 81 for these 26 children is higher than would be expected according to the Mendelian law, but is considerably below that

of the entire group of children studied. These facts appear to indicate that heredity and environment are both influential factors in the development of intelligence.

"7. The school progress of the children studied compares very favorably with that of the children in several large school systems.

"8. In various groups comparisons were made between the intelligence of the children and the grade of foster home in which they had been reared. For the entire group of 401, the correlation between home rating and intelligence was found to be .48. The correlation between the intelligence of the children and the intelligence of their foster parents as measured by the Otis test was found to be .37. In the case of the children who had been tested before adoption, an initial correlation of .34 with home rating was raised to .42 after a period of residence in the foster home. These correlations would indicate that the character of the home is an important factor in the development of the child's intelligence.

"9. The influenze of the home is further shown by the fact that there is a correlation between early placement and intelligence and a slight relationship

between the child's intelligence and the length of time he spent in the foster home.

"10. A large percentage of the children studied had parents who were morally defective. In spite of this poor heredity, however, few cases of serious misbehavior were found among the foster children. It seems probable, therefore, that environment has been an important factor in determining their conduct.

"11. In interpreting certain data of the study it was necessary to know whether the apparent effect of good home environment could be accounted for by a selection of initially bright children by superior foster parents. The analysis of the data led to the conclusion that selection was not a large factor in the relationships. In the extreme cases in which the children were given a mental test before adoption, the correlation between this initial I.Q. and home rating was .34. In over eighty percent of the cases no test was made before adoption. Furthermore, a survey of the circumstances of adoption indicated that the intelligence of the child is not usually taken into account as a major consideration. Finally, for certain groups in which it would have been least possible to estimate the intelligence of the child

the correlation with home rating is as high as for other groups."

In the same Yearbook, Burks ('28) in a similar study as Freeman et al, on 214 foster and 105 control children, and 342 foster and 206 control parents makes the following summary.

"By methods which have permitted the effects of environment to be studied separately from those of heredity in conjunction with environment, this study has sought to evaluate the factors conditioning the intelligence of a group of white American school children living in ordinarily variable circumstances. The main conclusions thereby reached are as follows:

1. Home environment contributes about 17 per cent of the variance in I.Q.: parental intelligence alone accounts for about 33 percent.

2. The total contribution of heredity, that is, of innate and heritable factors, is probably not far from 75 to 80 percent.

3. Measurable environment one standard deviation above or below the mean of the population does not shift the I.Q. by more than 6 to 9 points above or below the value it would have had under normal environmental conditons. In other words, nearly 70 per cent

of school children have an actual I.Q. within 6 to 9 points of that represented by their innate intelligence.

4. The maximal contribution of the best home environment to intelligence is apparently about 20 I.Q. points, or less, and almost surely lies between 10 and 30 points. Conversely, the least cultured, least stimulating kind of American home environment may depress the I.Q. as much as 20 I.Q. points. But situations as extreme as either of these probably occur only once or twice in a thousand times in American communities. Home environment in the most favorable circumstances may suffice to bring a child just under the borderline of dullness up over the threshold of normality, and to make a slightly superior child out of a normal one; but it cannot account for the enormous mental differences to be found among human beings.

5. With regard to character and personality traits, upon which the data presented are less reliable and less objective than those upon intelligence, the indications are that environment is at least as potent as in the case of intellectual traits--possibly much more potent." It is well to note the impressions of the investigaters as to the associations of intelligence and social adjustment for there is implied in the concept

of the feeble-minded, that he is predisposed to maladaptation to a normal environment.

Environmental emphasis. The next contribution to the heredity environment problem came from the Iowa group led by such people as Stoddard, Wellman, Skeels and Skodak. This work came out in the later thirties and played an important part in stimulating the National Society for the Study of Education to devote its Thirty-ninth Yearbook of 1940 to intelligence. The Iowa and related material emphasized the importance of environment, especially early in development, as a factor in the development of intelligence. They reported such things as a nursery school bringing the tested intelligence of children from inferior stock to a mental level significantly above that of the normal mean. They showed that an impoverished environment seriously retarded mental development. They felt that in previous studies of children, that the environment was not adequate to bring out the true possibilities of intelligence. This precipitated quite a debate which had not yet abated. The Iowa studies have not been whole heartedly accepted and there seems to be some valid criticisms of their methods and results.

Review. Rather than citing all the Iowa data, contra studies and mutual criticisms, let us look at the conclusions made by an authority in the field after reviewing the important studies on foster children and institutional environments through 1940, which includes the important Iowa studies and Leahy's study.

Woodworth ('41) made the following conclusions on foster children. Improved environment can raise the intelligence of children an average of five to ten points although there are weaknesses in all studies allowing a possibility of explaining away this gain and also an increase of gain from a better environment. Secondly, the cultural level of the home is more important than the economic, in the child's mental development. Thirdly, the difference between homes, the inter-family variation in environment, is a minor factor, about a fifth of the variation of intelligence in the community. The basis of this is probably the leveling effect of schools, social mixing and so on. The inter-family variation in heredity is of about the same magnitude as inter-family environmental differences in intelligence variation. The genetic and environmental causes that create sibling differences are more potent than those causing family differences. Fourthly, a

large share of the children from the rather vague social group that produce foster children, have about average heredity as demonstrated when groups of these children reach normal intelligence under a stimulating environment. While it has been assumed that these parents are of inferior hereditary stock much of this opinion is based on socio-economic status of the parents. There has not been a thorough investigation of this reproducing group, especially to determine the relative importance of environment in producing the socio-economic-intellectual inferiority of this group. Consequently, the interpretation must proceed from the childre, who are well studied, back to the parental group. The second weakness in conclusions about foster children is that the samples never include all of the children of the given parents and there is no way of knowing just how this elimination has distorted the results. It is thought that selection tended to discard the least promising children. It may be safely concluded that in spite of the good showing of the studied and stimulated children of inferior parents, these offspring will not compare in intellectual quality as a group with those of superior parents.

Twins. One of the things seen from these studies is that gross correlations between parents and offspring and between foster parents and adopted children, does not give any direct quantitative value to either heredity or environment. Therefore, one of the factors must be held constant while the other varies. This condition is met in identical twins.

Osborn ('40) made these conclusions after reviewing the studies on identical twins, "Large differances in educational environment set up differances in the intelligence of twins whose heredity is identical. But on the other hand, good environment cannot entirely overcome inadequate hereditary capacities; and an adequate heredity may supply potentials which even a poor environment cannot hold down. The study of identical twins reared apart indicates that heredity sets limits, in a continuous succession of different levels, to the intellectual development of normal people, even within the great middle group of the distribution. In this very potent manner, heredity is a factor in causing individual differences throughout the entire population." This opinion is essentially concurred in by Carter ('40) in his review of the twin studies.

Woodworth ('41) in an extensive review of the

literature on twin studies reached these conclusions. There are two probable deductions although the smallness of the sample does not make either conclusion sure. In the first place, radical differences in education can create substantial differences in intelligence, so far as intelligence is measured by our tests. Differences in IQ as great as the standard deviation of the population have been found in several instances, that is around fourteen points, corresponding to large differences in educational advantages.

The second result is that the differences between identical twins reared apart are remarkably small except in those cases where the contrast of educational advantages was very great. For the majority of the separated identicals the IQ difference was no greater than for identicals reared together. When identicals are subjected to environments differing about as much as those of the children in an ordinary community, such identical twins differ much less than the children of such a community. Therefore the differences found among the children of an ordinary community are not accounted for, except in small measure, by differences in homes and schooling. Consequently those morons who came by the normal mechanism of inheritance

for intelligence and from parents with good homes and participating in a normal community, these morons must be due almost entirely to the hereditary mechanism.

Feeble-minded groups. Next in the contribution to the problem of etiology is study of the feeble-minded themselves. While it would be thought that herein would lie a direct approach to causation there actually are few good studies on adequate numbers aimed specifically at nature-nurture mechanisms. The ordinary psychological studies usually include a broad range of intelligence. However, there is some very worthwhile material in this phase and comes from institution data, studies on the influence of environment and feeble-minded mothers.

Institution data. Penrose ('38) in a study of 1,280 cases of mental defect in England found a Residual Group of 308 cases which was made up largely of the higher grades of mentality in the feeble-minded institution. This group was formed by all the cases for which there was no specific cause; that is, all those with mongolism, endocrine disturbances, congenital syphilis, neurological abnormalities, skeletal defect, epilepsy and rare types which constituted the Clinical Group, were not included in the Residual Group.

The mean IQ of this Residual Group was 52 while that of the Clinical Group was 44. The former group had a higher percentage of feeble-minded parents and siblings and a lower environment than the latter group. Parental IQ means were 89 and 96 respectively. The distribution of parental intelligence for the Residual Group is as follows.

Intelligence	Parents
Mean IQ	89
Superior	.2%
Normal	59.6%
Borderline	20.1%
Moron	14.6%
Imbecile	.5%
Idiot	0.0%
Unclassified	5.0%

It appears from this study that the primary or nature-nurture mild defectives come predominantly from parents with the normal, borderline and moron ranges of intelligence. The siblings of the Residual Group have a mean IQ of 90, approximating that of their parents. These facts suggest that this type of feeble-mindedness comes primarily from the deviates in heredity

and are not produced by direct descent of manifest inferiority. This mechanism will be taken up in the discussion on hereditary hypotheses for intelligence.

Paterson and Rundquist ('33) found that a large percentage of individuals admitted to an institution for the feeble-minded and of applicants likewise, came from the lowest occupational categories. They studied 823 admissions and 516 applicants for admission and compared them with a random sampling of 866 adult males in Minneapolis. The results in per centage were as follows.

Occupational Category	Percent in Admissions	Percent in Random Sample
I	.4	3
II	4.1	8
III	8.1	30
IV	31.5	27
V	17.0	27
VI	38.9	5

They also found that the idiot and the imbecile levels were distributed comparably to the random sample, but that the higher grade feeble-minded persons were contributed largely by the lower occupational levels. They believed, "that low-grade feeble-mindedness is

caused, for the most part, by accidental, pathological, non-hereditary factors which would be distributed more or less at random among the various classes of society whereas simple feeble-mindedness is transmitted by biological heredity." They did not emphasize the low environmental factor in the lowest occupational group as a factor in producing morons.

Environmental influenze. In view of the studies on raising IQ by environment it would be well to look into a study of environment on defective children. Kephart ('40) reports such a study carried out in the Wayne County Training School for high grade moron and borderline children. They were divided into those without brain damage and those with brain damage, each group being studied in the home of origin and while in the training school.

Fifty children without brain injury were studied whose mean IQ on admission was 67.6. It was found that in their native homes, the six to seven year old group gained only 8.3 months mental age per year. The rate of gain progressively decreased with age so that the thirteen to fourteen year olds gained onthe average of only 3.4 months MA per year. The IQ loss then at six to seven years was about three-fourths point

per year and this increased to about two and one-fourth points per year for the twelve to fourteen year olds. It can be projected therefore, that many of the older children started out normal or near normal and that the younger children if allowed to remain in their own homes would sink lower in intelligence.

These same children were transfered to the more favorable environment of the institution were they lived for an average of 4.81 years. The eight to nine year old period had an average increase of 3.75 IQ points. As the age of the children increased the amount of IQ gain decreased so that the twelve year olds showed no change and the sixteen year olds lost an average of two points. Thus it is seen that the depressing effects of the original homes can be halted by a training school.

Another study on 139 children without brain damage, who had an initial test mean IQ of 66 at a mean age of 13.8 chronologically and an average residence of 4.4 years in the school, showed an average gain of 4.12 IQ points.

The study on 51 children similar in origin and test performance but with brain damage showed much less rapid falling of IQ in the home environment but

no appreciable change in this decline by transfer to the institution. This supports the hypothesis that we have here two distinguishable types of mental defectives.

These training school changes in intelligence were not marked but neither was the differance in environment very great. Consequently a study of a more stimulating surrounding was needed and this was provided by a cottage teaching situation of good stimulation with emphasis on constructive achievement. The study was on sixteen boys, fifteen to eighteen years of age with a mean IQ of 66.3, ranging from 48 to 80. The average test retest interval (the duration under cottage teaching) was 1.5 years and produced a mean IQ of 76.4, an increase of 10.1 IQ points. Only one case regressed, a minus three points; the range of advance was from two to twenty-two points. 81 per cent gained five or more points. The control group showed no gain.

These studies show directly that morons can be produced from the borderline group by a poor environment and that stimulating training can raise some of the morons into the borderline class.

Feeble-minded mothers. Two studies will be cited in this group. Speer ('40) made a study of the children of feeble-minded and normal mothers. The experimental group consisted of 68 children from feeble-minded mothers. The IQ of the mothers ranged from 38 to 64 with a mean of 49. The control group consisted of 57 dependent children whose mothers were not feeble-minded. The fathers for both groups as a class were inadequate and largely in unskilled labor. All the children were placed in boarding homes.

It was shown that in both groups that the longer that the children remained in their own home, which for both groups represented an impoverished environment, the lower were their intelligence quotients. Of the normal group, those which were placed at zero to two years, had a mean IQ of 97. IQ declined with each older group so that the twelve to fifteen year olds when taken from their homes averaged 82 IQ. For the experimental group, those placed at zero to two years had an IQ of 100. As age increased at placement, IQ declined so that the twelve to fifteen year olds had a mean of only 53 IQ. Quite a change.

In interpreting this, it would be best to disregard the 100 IQ for the experimental group aged

zero to two because IQ in this age is quite unreliable. The three to five year olds give more reliable results and are reported here at a mean of 84. It would appear then that feeble-minded mothers and common labor fathers produce children of IQ grouped around 80 with a standard deviation of about 12 IQ points and that these homes exert quite a depressing effect, so much so that psychological morons are produced from the dull normals.

Stippich ('40) in another study of the children of feeble-minded mothers, made the following summary and conclusions.

"Forty-eight children whose mothers were feeble-minded and who had been placed in boarding homes or institutions before one year of age were compared with 29 children who had also been separated from their mothers before their first birthdays, but whose mothers were of normal intelligence. . . . Although the number of cases was small, statistically reliable differences in intelligence were found between the children of the Control Group and those of the Experimental Group who had been placed in comparable environments. Although these boarding homes were inferior to adoptive homes of the usual type, they were similar for the two groups.

"On the basis of tests given between the age of 2.5 to 13 years, marked differences were found between the intellectual level of the children whose mothers were feeble-minded and those of normal parentage. Of the former group, 21 percent tested below 75 IQ; of the latter, none. Fifty-six percent of the cases in the Experimental Group tested below 90 IQ; only 17 percent of the Control Group ranked equally low." The median age of the Experimental Group was five years while that of the Control was three years, nine months.

When comparing the data for the same age group in Speer's and Stippich's study, it is found that they are quite similar. Stippich did not attempt to study the effect of various ages in the home environment.

This completes the section on familial factors.

GROUP FACTORS. In the etiology of morons there are factors characteristic of groups and it has been found that certain classes of people are associated with the origin of morons. By medical example, it is known that tuberculosis is more common among the poor primarily because of low hygienic and medical standards. For an example about morons, the isolated mountain areas where mental stimulation is low, consanquinity common and a tendency towards drainage away of the better elements in the community, the group is predisposed to moron production.

Survey. These group factors as to their recent and present status may be divided into racial, regional and socio-economic. The future of these factors is reflected primarily in the differential birth rate and environmental changes.

Racial. The problem of racial differences in intelligence has always made interesting speculation and study. In America where there are great number of races represented and a sharp color line, this aspect needs to be looked into. Osborn ('40) after a tabulation of intelligence tests on various racial groups made these conclusions. Recent immigrants to the United States on American intelligence tests do not

do as well as the older residents. The children of these immigrants while born and raised in this country do better than the parents but do not measure up fully to the performance by the children of the "natives". The most feasible explanation, of course, is that the cultural background of these people is different from the American and that this interferes with their responding to the questions in the intelligence examination. There is a cultural carry over to their children so they will show the same phenomenon but not to the same degree. Consequently it would appear superficially that moronicity is more common in foreign elements; actually, there probably is no difference in frequency. With no clear cut difference in racial intelligence, differential racial birth rate becomes of no significance.

Boas ('40) makes this summary about intelligence and race, ". . . It has been my good fortune to live for a considerable length of time with uncontaminated primitive tribes, and my own observations show that we find among them the same kind of variations of intelligence and of personalities that we find in our own culture--men and women of unusual intelligence and of unusual strength of character as well as weaklings. This agrees entirely with the reports of others

who have had similar opportunities. . . . Intelligence of a people cannot be measured by the traditional background of their culture, but by the observation of the behavior of individuals interpreted on the background of their traditional culture. . . .

"My conclusion is that the attempts to construe biologically determined differences in the potential intellectuality of different races are ill-founded, the more so, the larger the groups that are involved; that an experimental quanititative determination of racial intelligence encounters practically unsurmountable difficulties; and that our judgment must be based on the observations of individual behavior with due regard to the cultural background that determines the motivation of action."

Race therefore does not play a part in the etiology of morons except insofar as cultural differences may so handicap adjustment to American ways that the individual appears of low mentality.

Regional. Several regional studies have shown that isolated rural groups make a very inferior showing on intelligence tests as compared with groups in the large cities. An example of this is shown by Hirsch ('28) in which he demonstrated that the mean IQ

on the Dearborn Test for 904 school children in 29 county schools in the East Kentucky mountains was 72.5. Children from the same area attending private schools scored an average 84.6 IQ. A genetic interpretation would have to put nearly half of the country children down as hereditary morons which is not in line with other studies on intelligence at all. So undoubtedly, the environmental impoverishment in both country and private school situations is largely responsible for these low results. This of course raises the problem as to the difference in behavior between the moron who is largely hereditarily produced as against the one caused primarily by environmental difficulties. While there are no precise studies on this problem, one gains the impression that the environmentally depressed individual will have an all around performance better than the one with the poor heredity. If a representative sample of the offspring of the depressed country children could be placed in a stimulating environment with their siblings as controls, a critical experiment in nature-nurture effects could be carried out.

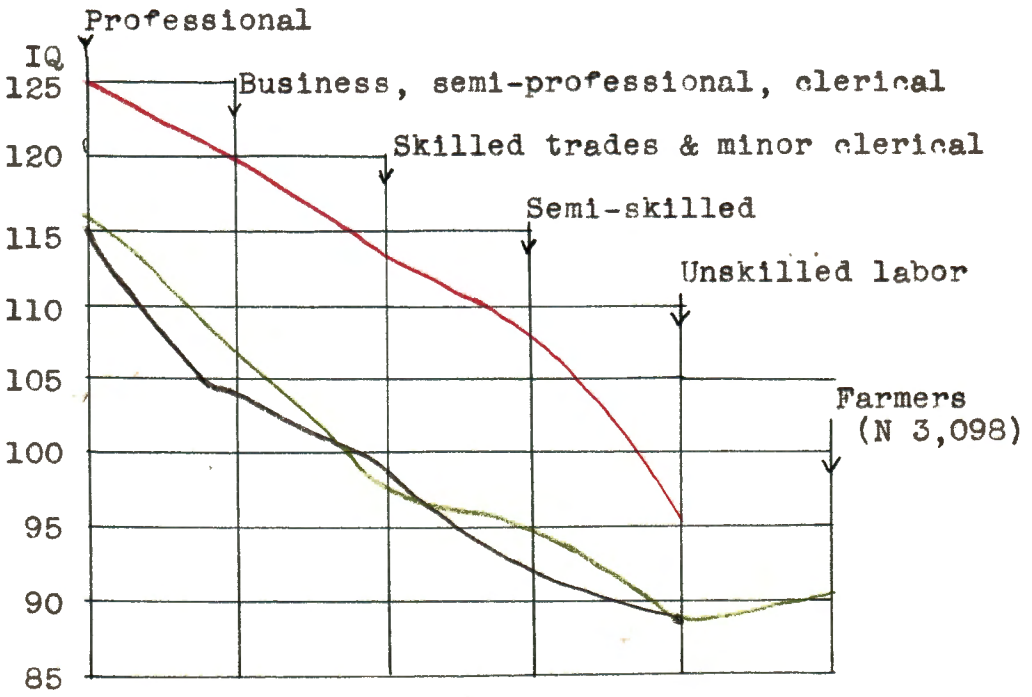
Differences between areas such as northern and southernstates are not great on good intelligence tests.

The differential in culture and quality of environment appear responsible for most of the differences.

Socio-economic. The childrens intelligence may be correlated with the father's occupation and with the educational level of the parents. Socio-economic factors form a complex and two studies will be presented to represent the contribution to moron etiology from this field.

(Paternal vocation) Osborn ('40) has a tabulation showing the importance of paternal vocation as related to children's IQ.

Investigator	School Group	Test
Goodenough	Preschool 18 to 54 mos.	Kuhlman-Binet
Dexter	Elementary Grades 1 to 8	Dearborn Nat'l Intelligence
Haggerty-Nash	Elementary Grades 3 to 8	Hag-Delta 2



Osborn goes on to explain that this does not mean that unskilled laborers for example, are producing primarily inferior intelligence but rather that the children from each of these broad occupational groups form bell shaped distribution curves which are similar except that the means are at different levels. Therefore, morons may come from any occupational group but as the mean sinks the frequency of inadequate mentality increases.

(Parental education) Bayley and Jones ('37) studied the parental education correlations with offspring intelligence in a group of children from infancy to six years. Using a pre-school group the leveling effect of formal education is minimized. They found a lack of relationship until after 18 months of age. At 24 months and after, up to 72 months, the correlations ranged from .40 to .58 with mother's education; from .21 to .53 with father's education and from .38 to .59 with midparent education. They concluded that, "The increasing correspondence between mental score and environmental variables is not necessarily attributable to the influence of the environment; it may equally well be a phenomenon of infant development, that inherited parent-child resemblances

become evident only after a certain stage in the process of maturation has been reached. Evidence can be adduced in favor of each of these interpretations; the probability is that each has some validity, and that the growth of children involves both an increasing assimilation of environmental pressures and an increasing manifestation of complex hereditary potentialities."

Future. For the future of group factors one must turn to birth rates and projected changes in surroundings.

Birth rates. The important birth rate differentials are in the socio-economic and educational factors. Racial fecundity either white black or native foreign does not vary enough to be significant however, the Indians and Mexicans are increasing more rapidly than any other groups and because of their low cultural level this fertility is of some importance in increasing the moron number.

The National Health Survey furnished material on about 600,000 females age 15 to 44 years, residing in over 80 cities giving a representative sample of the urban population. From this Karpinos and Kiser ('39) put forth some important tabulations on fertility, as related to income and education of these women.

Birth Rates

	Fertility rates for all women 15 to 44	Reproduction Net Rates
Annual Family Income		
All incomes		.70
$3,000 and over	55	.42
2,000 to 2,999	73	.55
1,500 to 1,999	85	.63
1,000 to 1,499	107	.75
Under 1,000		.96
Non-relief	116	
On relief	175	
Educational Attainment		
College	69	.52
High School	95	.68
7th or 8th Grade	125	.86
Under 7th Grade	146	.97

Because low mentality is associated with inferior economic conditions and poor educational background it is to be expected under greater fertility by this group that moronicity will increase. However, there are no adequate studies to determine the distribution of births according to the intelligence of the parents in the low economic and low education groups. Consequently, they may be reproducing uniformly, or from the low hereditary elements primarily or from the superior genetic elements. Furthermore there are substantial indications that with the further spread of birth control, which appears inevitable, social class differences in births will narrow.

Consequently, the evaluation of the future of the socio-economic and the education factors in the etiology of morons is somewhat in doubt and will have to await further studies and developments.

Environment. As to the future of the environmental factors it would appear from the general trend towards socialization, the recent emphasis especially by the Iowa studies on the importance of mental stimulation in intelligence and the promise of national prosperity that children will have greater opportunity for good environments and those with poor native endowment will receive more attention to their developmental needs. Therefore, while the hereditary factor in moron production appears to be increasing somewhat, there is a counter balancing agent in the improvement of environment.

This finishes the section on group factors.

GENETIC MECHANISMS. In view of the conclusion that the larger part of intelligence is the result of hereditary mechanisms it becomes necessary to look into the genetic hypotheses involved in the nature-nurture problem. Conrad and Jones ('40) have a condensed discussion of this topic from which most of this section will be taken. There are five main theories:

sex linkage, blending, Hurst's theory, dominance and partial dominance.

Sex-linkage. Several studies have shown a disproportionate greater per cent of boys than girls at the extremes of intelligence which suggest some correlation between intelligence and sex, at least at the extremes. But intelligence is not inherited as a purely sex-linked characteristic for these reasons; "(a) purely sex-linked inheritance would imply a definitely higher mean for males than females (which is not found), and (b) purely sex-linked inheritance would . . . . imply certain correlational relations, which are not observed. . . . If sex-linkage occurs in the inheritance of human intelligence, it apparently involves too small a number of genes observably to disturb the autosomal statistical relationships, even if it should increase the proportion of very bright males."

Blending. "In inheritance of the type known as 'blending', the heterozygote, or hybrid, is, on the average, intermediate between the two parents. The theory of blending accords well with certain observed facts; namely, the fact that offspring intelligence correlates equally with intelligence of the superior

versus the inferior of two parents. . . . and also equally (when allowance is made for the difference in parental variability) with the more deviate versus the less deviate of an unselected adult group. . . . There are, however, two salient facts of familial resemblance with which the blending theory is at variance." They are the regression phenomenon and the failure to predict the sibling or parental correlations.

According to the blending theory if one parent had an IQ of 70 for example and the other 90, their offspring would be expected to cluster around 80 IQ. Actually the children of deviates from the norm tend to approach the mean of the population so in our example the children would have a mean of greater than 80. This is regression.

"Furthermore, the blending theory does not lead to the parental or sibling correlations actually observed unless one assumes (what is generally contrary to the fact) that mating is completely nonselective." Actual marital coefficient for intelligence is around .52.

". . . the parent-offspring correlation, p, as computed by his [Fisher 1918] formula, would be .72, whereas our actual parent-offspring r is not .72,

but .49. The blending theory evidently leads to a value of p, the parental correlation, far in excess of the value actually observed.

"The blending theory fails equally to predict the sibling correlation. For the sibling correlation (symbolized by f), the formula as given by Fisher would yield f equals .71, but our actual sibling r is not .71; it is .49. Again, the blending theory leads to a value far in excess of the value actually observed. According to Fisher's formulas, then, the blending theory fails by a very wide margin, to predict either the parental or the sibling r's. Nor can this failure be assigned to Fisher's failure to consider other than random environmental influences. The effect of systematic environmental differences, correlated with the individual's native level of intelligence, should ordinarily be expected to raise parental and sibling r's above the genetic level (or, at any rate, not to lower them below the genetic level). If this be so, then the taking into account of systematic environmental differences in the formulas could not lower the expected r's according to the blending theory, but might raise them--to a level even farther above the actual, empirical value of .49.

"Both, then, on the ground of failure to predict the empirical sibling or parental r's, and the failure to predict or explain the phenomenon of regression, an unqualified blending theory of human inheritance of intelligence is seriously deficient. . . . 'Blending' may, in truth, play some part in such inheritance; but the blending theory by itself is clearly inadequate"

Hurst's Theory. This hypothesis involves a major pair of genes, Nn, and five minor pairs of genes, Aa, Bb, Cc, Dd and Ee. Any individual with NN or Nn is normal, that is N is a dominant gene for normal intelligence. The minor pairs serve to modify the major pair only when it is nn so that as long as there is an N in the majors, the minors have no influence. When the condition is nn, the minors determine the intelligence so that a (nn) (aa,bb,cc,dd,ee) would be the lowest intelligence in this system and a (nn) (AA,BB,CC,DD,EE), would be the highest intelligence with all the ranges in between being made by various combinations of the minor genes.

"According to Hurst's theory, when two nn individuals mate. . . the offspring should, on the average, be equal to the midparent. We know however, that unless the midparent be at the mean, the average offspring is typically not at the midparental, but at

a regressed value. . . . Since Hurst. . . had not put his theory to an independent test, and since the theory is not in accord with the known facts of regression, it is impossible to accept Hurst's statement that the theory fits the facts."

Dominance. There are two considerations, regression and offspring variation.

Regression. "One of the defects of the 'blending' theory of inheritance, as has been noted, is its failure to predict or explain the phenomenon of regression. Regression can be readily explained, however, by the supposition of recessive allelomorphs of dominant genes. [An allelomorph is one of a pair of genes through which alternative pairs of mendelian characters are inherited.] If extreme individuals (whether bright or dull) carry a large proportion of recessive (or partially recessive) genes for a multiple-factor trait, the offspring of such individuals may be expected, on the average, to suffer regression toward the mean and the greatest regression to be shown by offspring from the most recessive-laden (most extreme) parents. In terms of current genetic theory, the phenomenon of regression seems to require the assumption that proximity to the mean is an essentially dominant

characteristic."

To test the theory of dominance it is helpful to compare the theoretical with the actual. "The correlation between husbands and wives in the present sample (Fisher's u) is .52. Applying this figure in Fisher's own formulas for p, and f, and assuming, for simplicity, that c-1 equals 1.00 (meaning absence of environmental effects), and c-2 equals 2/3 (meaning perfect dominance), we find that f equals .532 and p equals .507." This approximates the actual values and supports the theory.

Offspring variation. Another phase of this problem must be considered. Based on the fact of regression, proximity to the mean is an essentially dominant characteristic. "If this is so, then, particularly with homogamous mating, we may expect that offspring from the relatively dominant parents at or near the mean should display comparatively little variation. The greatest variation of offspring should be expected not perhaps at either extreme of intelligence--the extremes of intelligence may be approaching recessive homozygosity, which, in connection with homogamy, might result in restricted variation of offspring--but somewhere between the central tendency of the group and

the extremes."

Support for this corollary of dominance is not forthcoming from actual studies which ". . appear definitely contrary to the theory of complete dominance, and, in proportion, also to the theory of incomplete or partial dominance. This conclusion is, of course, dependent on the assumption that parents farther away from the race-mean are definitely more recessive laden than parents at or near the mean."

Partial dominance. If complete dominance is not adequate, what about a modification?

Theory. The correlational consequences of differing degrees either of dominance or homogamy can be determined from Fisher's formulas. "The general hypothesis underlying his formulas is that, in the absence of systematic, differential,environmental influences, only three factors need be considered in order to predict or explain the correlations between relatives; namely, the marital coefficient (u), random effects of environment (e-1), and the degree of dominance (e-2). Apart from the intricacies of the mathematical derivations, Fisher's method is to find, on the basis of the marital correlation (u), the parental correlation (p), and the sibling or fraternal correlation

(f), the values of the two constants, c-1 and c-2, such that the parental and sibling correlations are reproduced with minimal error. These values of c-1 and c-2 are then applied in other formulas, to predict other ancestral and collateral correlations, such as the grandparental, the avuncular, and the cousinship. If the predictions of these other relations are correct (within the sampling error), it may properly be said that Fisher's hypothesis and formulas have proved adequate in those respects, though not necessarily in all other respects."

"The significance of Fisher's method, from the point of view of the heredity-environment issue in human intelligence, is that it undertakes to account for the observed familial correlations on what is virtually a purely hereditary basis. The only environmental effects recognized in Fisher's formulas are the random influences represented by c-1--'random' in the sense that they are uncorrelated with the hereditary value of the trait in question; that is, with the value of the trait in a 'standard' normal environment. . . in the case of human intelligence, which is presumably only moderately sensitive to a rather wide variety of differential environmental factors,

substantial counterbalancing of random influences is to be expected. If this be so, then c-1, the only environmental factor in Fisher's formulas, is likely to be of only slight significance.

"Since, in the sample we are using, systematic environmental factors have not exerted any observable differential influence. . . it appears reasonable to suppose that the net effect of the random environmental factors must be very small, particularly since such random factors, . . are likely to be substantially counterbalancing. It appears fairly safe, then, to assume that the value of c-1 is not very far from 1.00 (which is the value c-1 takes in the complete absence of random environmental effects), and probably not below, say, .95."

Validating theory. "With the value of c-1 thus independently approximated, three tests of the adequacy of Fisher's formulas become possible.

1. We may compute the value of c-2 from the formula for the parental correlation, p, and predict the fraternal correlation, f; the correspondence between predicted and actual values of f is a test of the adequacy of the method. . . .

2. We may compute the value of c-2 from either (a) the formula for the parental correlation, p, or (b) the formula for the fraternal correlation, f: agreement of the values of c-2 from these two calculations would be confirmatory of Fisher's theory.

3. With the aid of the product of c-1 c-2 (computed from the formula for p), we may calculate the value of c-1 from the formula for f; agreement of the calculated value of c-1 with our independent estimate of its value provides the last test of the theory."

The tests.

"1. By using the formula for parent-offspring correlation, we find c-2 equals .679. Applying this value of c-2 in the formula for the fraternal correlation, we find f equals .507, which is in good agreement with the empirical value, .49. . . . We seem justified in concluding, then, that the fraternal correlation has been predicted, with qualified success, on the basis of Fisher's formulas. It must be noted, however, that such success as the formulas have had in the present instance springs not from application of the concept of incomplete dominance--our value of c-2, .679, is practically identical with that for perfect dominance, or 2/3--but rather from the full

and explicit recognition in Fisher's formulas of the influence of the marital coefficient, u.

"2. From the formula for the parental correlation we find c-2 equals .679, as before. From the formula for the fraternal correlation, we compute c-2 equals .637. These two values, .679 and .637, are in reasonably fair agreement.

"3. As a final test, we calculate the value of (c-1 c-2) from the formula for p, and thence the value of c-1 from the formula for f. . . . From such calculations we obtain c-1 equals .88, a value definitely below our independent estimate of the value of c-1, but by no means so far below as to justify casual dismissal. Our conclusion is, as before, that the present data provide partial, but certainly not unqualified, support for Fisher's formulas and their underlying theory."

Evaluation. Further observations on Fisher's theory seem indicated. "First, the theory offers little help on the dilemma presented earlier, for if Fisher's c-2 equals 1.00 (representing perfect blending), the objection concerning regression applies; if c-2 equals 2/3 (representing perfect dominance), the objection concerning constancy of offspring

variability applies; whereas if c-2 is intermediate (representing incomplete dominance), the objection concerning regression may be met, but that concerning offspring-variability is not. Second, the assumption by Fisher of a very large number of factors or genes, 'sufficiently numerous to allow us to neglect certain small quantities' will probably appear questionable to some geneticists, who may consider this assumption of greater statistical convenience than biological verisimilitude. Third, and finally--what is perhaps ultimately most important--Fisher's theory seems to lack close contact with what have been thus far the two mainstays of the science of genetics; namely, cytological research and experimental breeding, nor has his theory produced helpful suggestions for such scientific work."

"After all possible criticisms have been made, we must conclude that, at least as applied in the present instance, the Fisher formulas do have fair predictive power, that they do succeed moderately well in accounting for the observed familial relations in terms solely of the three factors, u (the marital correlation), c-1 (random environmental effects), and c-2 (degree of dominance)."

SPECIFIC CAUSES

Specific or secondary etiological factors are divided into structural, physiological, pathological, mongolism and rare types.

STRUCTURAL. The three important structural defects for morons are birth injuries, hydrocephalus and microcephaly.

Birth injuries. Dayton ('30) in a review of over 20,000 retarded cases, found no significant increase of abnormal labor in feeble-minded groups over that of normal groups. He further concluded that abnormal labor was probably important in children whose IQ was below 29 or 80 to 90 rather than the usual types of mental deficiency. Consequently this factor is very small in the moron group. Sherman ('45) states that decreased mentality results chiefly from gross hemorrhage and that the evidence for punctate hemorrhage is not sufficient to establish it as a cause. Cerebral anemia he did not consider as being of any significance in mental defect.

Hydrocephalus. This conditon if marked will produce mental damage, however, the unarrestd cases usually are dead by the fourth year of life. Those which arrest early show no interferance with development.

There are a few which arrest between these levels but the numbers are not very siginificant in relation to the total amount of feeble-mindedness.

Microcephalus. Sherman ('45) goes on further to point out that microcephalics are usually imbeciles or idiots, so this factor is not important in the etiology of morons.

PHYSIOLOGICAL. There are two main types, the cretins and the epileptics.

Cretins. This conditon while uncommon, the group itself has a high per centage of morons. Bruch and Mc Cune ('44) reported the following findings after a study on twenty-three cretin children. All but two of the patients were considered adequately treated. Their mean IQ was 62.2; eleven out of twenty-three were in the 50 to 70 IQ group and they ranged from IQ 21 to 109. As to the effect of therapy and intelligence they reported:

Number	Continuity of therapy	IQ
16	Regular	68.4
7	Irregular	61.0
	Age at starting therapy	
13	Before one year of age	64
4	Between one and three years	59
6	After the third birthday	60

While there was no control of untreated cretins

it is presumed that they would be considerably lower in intelligence. Consequently, therapy started somewhere along in the course of the disease tends to keep the IQ up and thereby produce a mean in the moron range. As to their progress under treatment, part of them had a regular but slow mental development, others came to an early arrest of mentality and a few grew along the line of normal intelligence. We may conclude than that congenital hypothyroidism is an important specific factor in moronicity.

Epilepsy. Lennox ('41) writes about the incidence of mental defect in the epileptics as follows, "Of 1,640 clinic and private patients with 'essential' epilepsy, 67 per cent were classed as mentally normal, 23 per cent as slightly subnormal, 9 per cent as definitely deteriorated and 1 per cent as markedly deteriorated." Thus it is seen that the incidence of moronicity is definitely higher in the epileptics than the general population. He divides the causes of this mental deficiency into five groups; associated congenital, brain injury, seizures, drugs and environmental.

Primary hereditary mental defect may occur independently of epilepsy; however, it is recognized that the greater the mental defect the higher the incidence

of epilepsy. Of a representative group of infants mentally abnormal at birth, the incidence of epilepsy in their relatives was twice that of normal infants. Apparently in some cases both the epilepsy and defective mentality have their origins in defective heredity and are not mutually dependent.

About brain injury Lennox writes that if the person's mental endowment is good, the brain can endure an extraordinary amount of damage without serious effect on mentality even though epilepsy may be produced.

Seizures are important in the etiology of mental defect. The grand mal, psychic seizures, status epilepticus and mixed types will damage mentality while petit mal is innocuous. "Among patients who seemed mentally normal at birth, but had had more than 1,000 grand mal convulsions, 46 per cent were mentally normal, whereas among those who had had more than 1,000 petit mal, 83 per cent were normal. . . .Status epilepticus is often accompanied by depressed mentality." The age of onset of seizures made no difference in the mentality; however, the longer the duration of epilepsy the greater the number affected so that by fifteen years or more of epilepsy, 55 to 70 per cent were subnormal, Lennox ('42)

Drugs of a sedative nature will slow down mentality to the point of appearing deficient; however, with cessation of the drug, intelligence is restored. Due to his epilepsy the patient may receive psychological and social mistreatment so that he lives in a mentally impoverishing environment resulting in a loss of mental keeness.

PATHOLOGICAL. The important pathological types are encephalitis and syphilis.

Encephalitis. From Dawson's ('31) report on 53 cases of encephalitis lethargica may be gathered up the following facts. Their testing prodeedures started after the disease had started so in order to get some idea of the mental level from which the patients started he matched 29 patients with 29 siblings and found the sibling IR or IQ to be 96.93.

First IQ test gave mean of	83.87
27 patients tested less than 12 mos. after start of disease	88.55
26 tested 12 to 72 mos. after start of disease	79.00
Second test gave mean IQ of	73.82
Mean test retest interval 25.8 mos. Range 8 to 68 mos. 25% within 18 to 30 mos.	
21 or 39.6 per cent had IQ less than	70
38 or 71.7 per cent had IQ less than	80
Lowest IQ	43

From this data it can be concluded that encephalitis lethargica reduces the intelligence of normal people markedly, so much so that about two-fifths of them fall in the feeble-minded group which is turn is divided into morons and imbeciles, there being no idiots, here.

Dawson summarizes his work by writing, "In view of variations in the length of the periods during which the patients were under observation and in the length of the intervals between the onset of the illness and the first test, and of the intervals between the tests themselves, in view also of the slight variations in I.R. [IQ], that are present with normal development, it does not seem possible to draw anyting more than a general impression from these tables, the impression that about 20 per cent. escaped without any apparent deterioration of intelligence, that most of the patients suffered a greater or less arrest of mental development, that some after their arrest seemed to resume at a lower level (i.e. they maintained their new I.R.), that some made no progress whatever, and that the general characteristic of the group as a whole was a very serious arrest. It should be repeated that on account of our ignorance of the I.R.s of the

patients before the onset of their illness we cannot tell with certainty the actual amount of the deterioration due to the illness."

Sherman ('45) concluded that epidemic encephalitis results in a large proportion of children under six years of age becoming mentally retarded to all degrees. If the attack is after the six to seven year age, there is little retardation. Personality changes are more common than intellectual regression.

Syphilis. Dayton ('25) in a study of 9,183 mental defectives found that 5.4 per cent have positive Wassermanns while 16,156 non-defective children had 4.3 percent with positive Wassermanns. An analysis of 60 cases with positive Wassermanns showed that 50 per cent of the cases other factors existed which might have caused the mental deficiency. He therefore, concluded that congenital lues is not of great importance as a causative factor in feeble-mindedness. Paddle ('34) wrote that of those defectives with congenital lues about fifteen per cent were morons.

MONGOLS. The mongols have a median IQ of 40 to 50 with a few up into the moron range and uncommonly below 30 IQ. Tennies ('43) stated that only 1.7 per cent of mongols reach the moron level. Their mental growth

is balanced and regular; they have easy going personalities which aids adjustment but their motor coordination and function is poor. They constitute about five per cent of the institutional population for the feeble-minded. There actual frequency has not been accurately established as Sherman ('45) pointed out.

RARE TYPES. This classification constitutes a waste basket for the uncommon causes of mental deficiency. Of these we may mention amaurotic family idiocy who are all below the moron level; diffuse sclerosis were the mental retardation is overshadowed by the neurological findings; tuberous sclerosis which is very rare and they usually die young; cerebral palsy in which true mental depression is uncommon; pituitary insufficiency; and oxycephaly; and oligophrenia phenylpyruvica.

CHAPTER IV

CLINICAL APPLICATION

A study of the etiological factors in mental retardation may be applied to determining the cause of mental defect in patients, explaining the situation to the parents and in the therapy.

DETERMINING ETIOLOGY. In handling mental defectives as in the rest of medicine there is the common problem of establishing the cause for a single case. Obviously, statistical proceedures are of little help, however, a study of etiology should lead to a rational approach to this problem. The patient, usually a child, is brought to the doctor because he appears retarded or abnormal. A history and physical with a mental status will usually bring out whether the child is really retarded or has some sensory and or motor loss or an emotional disturbance. If deficient, the mental level can be approximated and any specific causative agents can usually be diagnosed readily. This to be followed by any necessary laboratory confirmation. If a specific cause is found, psychometric examinations are indicated to give more accuracy in evaluating the patient. If the individual shows nothing

but primary mental deficiency, psychological examinations are to be given. The intelligence of the parents and the mental growth value of the child's surroundings should be estimated for their contributory element in retardation. From this evidence and a knowledge of etiology a satisfactory explanation of the patients lack of mentality can usually be given and rational care and treatment instituted.

PARENTAL ADVISE. The parents naturally wonder if something is wrong with their constitution and if they contributed to their childs deficiency. Fortunately most parents of the feeble-minded are normal or superior and to these people a moron or worse can be explained as a deviation or "accident" in heredity or the result of disease as a "natural" occurance. They should understand that they may have more children with full expectancy of their being normal because of the unusualness of deficiency from this group in relation to the total number of offspring. In those parents where the mother is syphilitic; where they are of defective or subnormal mentality themselves; or where there is a strong familial lineacy, unusually high frequency of defect in the family tree or consanquinity there cannot be the frank "go ahead" on more children.

The syphilitics must, of course, be treated. For those of mild subnormal mentality, advice on fecundity because of the etiological factors in the intelligence of their offspring would be more philosophical than scientifically conclusive. For the moron group and a few of the imbeciles who are capable of reproducing while in society, the nature-nurture elements result in children with a mean IQ around 80 and about a tenth to a fifth of them feeble-minded, mostly in the moron group. From these results and the low socio-economic status associated with low mentality it appears wise to at least partially restrict reproduction in this group. Those parents who have strong familial tendencies towards mental defect, the risks involved for further children must be pointed out to them and the final decision left up to the parents.

THERAPY. An understanding of the etiology forms the basis upon which to proceed with treatment. In the nature-nurture morons it can be concluded that training has a significant improvement effect on intelligence and thereby, presumably on the total adjustment. However, it is also seen that the primary factor in retardation is hereditary which for the individual is immutable and consequently not to much

can be expected from environmental or therapeutic measures so that protective or custodial measures may be needed. In the specific factor group, cretins, epileptics and syphilitics stand out as diseases for which treatment is specific and necessary to allay mental retardation. In those conditions for which there is no specific therapy, this fact must be gotten over to the parents, and proper training and custodial care instituted. It should be added that social science needs an understanding of the origin of the mentally inferior so that their social welfare work may be intelligently applied.

The physician, of course, uses the utmost tact in presenting these rather unsympathetic facts of etiology so that emotionalism will not sweep away the possibility of a rational constructive attitude towards the defective and any subsequent children.

CHAPTER VI

SUMMARY AND CONCLUSIONS

SUMMARY

The aim of this thesis has been to present and evaluate the important etiological factors in mental retardation with special emphasis on the causative agents for morons. The problem has been divided into an introduction, history, definition and classification, etiological factors, and clinical application.

INTRODUCTION. "Natural" stupidity is an important problem to physicians, educators, eugenicists and finally to society in general. About two per cent of the population is mentally deficient and about half of these are morons. There are twice as many morons in the country as there are diabetics. Most of the mildly retarded are free in the community trying to make an adjustment. It is seen that only about one-fifth of this group made an adequate adjustment; however, as training and care are improved the adjustment is bettered.

HISTORY. The Greecians and Romans had a practical attitude towards the feeble-minded. The Middle Ages

were supernaturalistic about the matter. Then science became curious about mentality along about the eighteenth century. Then followed the modern periods starting with Darwin's, Galton's, Dugdale's and other studies in the latter half of the nineteenth century. Then came the Alarmist era from 1900 to 1920 when the feeble-minded were blamed for everything. Following this, a more realistic evaluation of the causes and consequences of mental defect; a process still going on. However, it may be safely concluded that the hereditary and environmental causes of feeble-mindedness have been fairly well described but in many cases the exact mechanism of etiology is not clear. The future offers further elucidation on etiological mechanisms.

DEFINITION AND CLASSIFICATION.

Definition. The mind of the mentally defective does not grow in the same manner or extent as that of the normal child. There is unbalanced development and uneven arrestation so that psychologically IQ runs from around 70 on down, with the moron group at 50 to 70 IQ and functionally, their mentality is usually not adequate to meet the normal socio-economic demands.

Classification. Feeble-mindedness may be divided

into three groups; the constitutionally deficient, the reactional types which are not constitutional but due to mechanical, chemical and bacterial factors, and the degenerative types. The etiology of morons may be divided into two parts; the primary or nature-nurture groups which are the inferior deviates of the normal mechanism of mental inheritance and or those depressed by poor environment, and the secondary or specific groups which result from a precise cause usually directly associated with feeble-mindedness.

ETIOLOGY. The causative factors in morons are many and complex. So much so that at present no precise mathematical relations can be set up between cause and result, however, there are some strong trends and concepts that can be relied upon.

Nature-nurture. The traditional familial, group and genetic factors.

Familial. Parent-child correlations, foster children studies, twins and feeble-minded groups all point to the dual nature-nurture origin of intelligence and the importance of this factor in producing morons. The herediatry element, however, is by far the more dominant in producing individual differences in those situations where the environment is within the broad

range of normal. Heredity accounts for about four-fifths of the variation in intelligence. Environment becomes an important factor in morons when it has a low mental stimulation value, resulting in as much as twenty points depression of IQ, however, values around ten or less are more common. Thus it is seen that the surroundings may push a subnormal or borderline into moronicity. As to the converse, children taken from poor environments may have their IQs raised by education as much as it is possible to depress them. That is, after IQ loss by inadequate environment or failure to develop properly from this cause, training can bring the IQ to the level at about which it would have been had the child had a normal environment. Thus heredity establishes a mean about which the environment may cause fluctuation.

Group factors. It is seen that as parental intelligence and or parental education and or socio-economic status and or community quality declines, the incidence of morons increases significantly. Racial influences on true intelligence are nil. The evidence points to the conclusion that morons come primarily from the normal and borderline parental groups; that morons and imbeciles contribute a minority number of their

kind to the next generation, probably less than a fifth; and that superior intelligence begets very few morons. The lower half of the occupational levels are the background for most feeble-minded and the lowest or unskilled labor group contributes much more than its proportionate share. The low socio-economic groups and the low education groups with which low intelligence is associated are reproducing remarkably faster than the other groups. It is presumed that the hereditary factors for moronicity are increasing, however, no conclusive study has been made. Better environment for all is expected to raise IQ.

Genetic mechanisms. There are five theories on the genetic basis of mentality. They are; sex linkage, blending, Hurst's, dominance and partial dominance. The most appropriate explanation for the usual multifactorial transmission of intelligence is that of partial dominance which accounts for regression but is somewhat weak in explaining the constancy of offspring variation no matter where the parental mean is. The theory accounts for the results but does not explain the precise biological mechanism.

Secondary or specific factors. These elements are not as numerically important in moronicity as the primary factors. The important conditions in this group are birth injuries, hydrocephalus, microcephaly, cretinism, epilepsy, encephalitis, syphilis and mongolism. Each condition has its own etiology or etiologies. Cretinism, epilepsy and encephalitis are important factors for morons. There are a number of rare types of mental defect. The immediate mechanism in causing the mental retardation is usually more apparent than that in nature-nurture. These conditions usually have characteristic physical findings and are readily diagnosed. They provide a clear cut cause for mental deficiency.

CLINICAL APPLICATION. The study of etiology suggests a method of approach in determining the cause of mental deficiency in a patient. This has been outlined. Etiological knowledge and the study of the patient and his family enables one to explain to the parents the cause of the defect and to made certain recommendations to the parents and society about handling and treating the retarded and about having more children in view of the likelihood of defect in them.

In final summary then, it is seen that the causes of feeble-mindedness and morons in particular, are multiple and complex and while the problem is not fully solved there is sufficient information to give a working concept of etiology and adequate basis for constructive recommendations to parents and society.

CONCLUSIONS

1. Aim of thesis--to determine the causes of feeble-mindedness with emphasis on the etiology of the moron group.

2. Feeble-mindedness is an important problem with a long history.

3. Morons and their lessers are caused by the nature-nurture complex or by specific factors.

4. Heredity is around four-fifths of the nature-nurture factor and the total cause in several specific etiologies.

5. Environment causes fluctuations around the hereditary mean.

6. Certain diseases produce feeble-mindedness characteristically.

7. Somewhat more than half of the parents of the feeble-minded have normal or greater mentality.

CHAPTER VII

EVALUATION

In studying the literature on a topic and assembling various portions of material into a paper, one comes to conclusions about the literature, the method of approach and the adequacy of the dissertation. These of course cannot be placed in the body of the thesis itself. The considerations involved may be divided into an analysis of the particular topic chosen for a thesis and an appraisal of thesis writing in general.

EVALUATION OF TOPIC. This may be broken down into its disadvantages and the advantages.

Disadvantages. There are several of these; namely, irreducibility of the topic, large mass of literature, inconclusiveness of the studies, space-time limitations to the dissertation and lack of personal background.

Irreducibility of the topic. This results from the diffuseness in classification of retardation. One cannot limit the paper to one psychological class of the feeble-minded because they merge into the classes on each side and the literature tends to deal with the entire mentally deficient group making separation

by IQ levels unfeasible. The best that can be accomplished is to emphacize one group as has here been done for the morons. The most basic division of etiology is that of nature-nurture and specific factors. Nature-nurture forms a complex which to comprehend, must be treated as a whole. The specific factors permit good division but with a primary interest in morons which are largely nature-nurtured determined, the specific causes become a minor factor. Furthermore in order to get a clinical application of etiology it is necessary to include all the important causes of the condition. The fundamental determining factor in this indivisability is that these individuals present one outstanding difficulty to those interested; namely, mental retardation and this complaint must be taken up in all its ramifications to satisfy the people involved as to the cause of the low mentality.

Large mass of literature. This is a corollary of the ramifications involved in the topic but also, a result of the nature of the problem. First of all it is an important and pressing situation deserving of extensive investigation. Secondly, the origin of mental retardation is a complex phenomenon for which the tools of study are not to adequate or closely applicable to the real situation. For example, the

intelligence test cannot measure certain mental phenomenon such as imagination or concentration, nor can it separate hereditary from environmental components nor can it be said to have close correlation with the effectiveness of mental activity in the real situation of life. However, this tool is the best available for measuring intelligence. With this interest, complexity of the question and variability in methods, differences in opinion are natural and every one is anxious to get in his contribution and viewpoint on the situation and that leads to voluminous literature.

Inconclusiveness of studies. This follows from the factors named in the preceeding paragraph. For example, in socio-economic studies while there are correlations between offspring IQ and parental factors such as education and income, the investigaters have not pushed on to show the inter correlations between offspring IQ, parental socio-economic standing and parental IQ for the same large group as yet to my knowledge. Such incompleteness leads to compilation of studies in an effort to compensate for defects in individual projects, to wandering through the literature in search of material that is conclusive and from which a thesis may be supported and to being

vague and putting in reservations in making conclusions.

Space-time limitations. To really go into the problem thoroughly it would be necessary instead of presenting primarily conclusions of authorities, to tabulate all the data of any consequence. This would enable one to make a direct analysis on the basic material and to compare and contrast the opinions and criticisms of recognized people in the field. Such an approach would go way beyond the time and space limitations of this thesis.

Lack of background. The last weakness is my lack of personal experience in research in the field and a lack of a broad clinical background in feeble-mindedness. To set ones self up as a judge of research methods and material, never having done any work in the field, seems to me to be an unwarranted assumption. Printed material cannot substitue for or present all the multitude of detail and sensory perceptions which one gains by actually participating in a problem and which are really necessary for a good appreciation of the worth of reported research. This same criticism applies to the lack of contact with clinical cases.

From disadvantages we now go to the several advantages of the topic.

Advantages. These are; present debate about nature-nurture, importance of mental retardation, active research in the field, recognized researchers and authors, information sources are well written, and personal interest and revision of ideas.

Present debate about nature-nurture. Intellectual activity has always been an important and interesting problem. The scientific study of intelligence is really rather recent and there remains a number of questions and refinements to be worked out. The heavy emphasis placed on the importance of a stimulating mental environment in the development of intelligence by the Iowa workers and others has brought renewed interest, research and debate on the nature-nurture problem and in so far that most of these environmental effects were on those on the lower side of intelligence the question of moronicity from nature-nurture has been brought into focus. Consequently, there is plenty of recent material upon which to gather for a thesis.

Importance of mental retardation. The frequency and serious consequences of mental retardation makes this topic of importance to all physicians and particularly those specialists involved in the care of children or the mentally abnormal. Its sociological

aspect has probably kept it from as full recognition by the medical profession as it needs, and therefore, some emphasis on the feeble-minded situation is indicated. The negative differential birth rate and tendency towards socialization makes this problem of general interest.

Active research in the field. The factors mentioned in the two preceeding paragraphs have resulted in this being an active problem with a substantial amount of recent research which however, was interrupted somewhat by the war. This activity provides a good literature background for the topic.

Recognized researchers and authors. There is a sizeable and active group of recognized researchers and authors in the field. By finding out who the "big" people are by the amount of material put out, where it was published, what other men thought of it and what it looked like to me, I was able to get reliable information about the concepts in the problem and to by pass a lot of material without having to wade through it for any possible real contribution that a neophytic or sporadic author might have.

Information well written. The research material on the whole is well written. Statements are usually clear. Research set up and data are understandable

and the prose is good.

Personal interest and revision of ideas. The opportunity to explore a particular topic of interest is always welcome. In this particular problem there was a real need to penetrate the haziness of ideas gathered here and there in the academic course of events, to collect enough reliable knowledge so that well founded conclusions about the etiology of feeble-mindedness and especially moronicity can be made.

EVALUATION OF STUDENT THESIS WRITING. Involvement in a group academic process naturally leads to some reflection and generalities about the situation. There are some problems and proposed solutions.

Problems. There appears to be two handicaps that most senior students meet in trying to put out a worth while dissertation. These are a lack of research and clinical experience and a lack of supervision.

Lack of experience. As was pointed out in the disadvantages of this particular thesis topic, considerable personal contact with the research methods and with the actual clinical cases is really necessary before one can fully evaluate research material or gain an interpretive background greater than the ordinary reader.

Lack of supervision. While it is to be presumed that one has an advisor it seems unlikely that under the present system the student gathers much more than a few "tips" on where to find material and some ideas on how to organize his particular topic. That really is all that the staff man has time for. Essentially the student is on his own. He flounders about in the library. Whether he learns much about evaluating, organizing and presenting medical literature on his own is problematical.

Solutions. There are two, the graduate school approach and direct instruction in evaluating and presenting literature.

Graduate school approach. These defects in approach to the problem could be remedied by a course of training or apprenticeship which correlated the known facts with research going on and with the necessary amount of clinical material. This to be followed by some actual research of limited scope done by the student under supervision. Then he would be in position to write a thesis of some significance.

This of course brings up the problem of the worthwhileness of putting out a thesis on a topic by a medical school senior who usually has no opportunity for graduate type work on his dissertation. It surely

cannot be concluded that, unless he does some actual research, that he will contribute anything new to the field. It seems unlikely that his analysis and review of the literature will be very unique and I doubt that his organization of the matter would produce any revolution in the customary presentation of the problem. It can be concluded then that his work will probably be of little use to anyone except the man who hopes to get a quick resume of the literature on a topic from a digest by some student.

The aims of this process must be then to permit the student to acquire particular knowledge on a restricted topic, to learn how to review and present literature and to experience the labor involved in producing a presentable expression of information gathered. In view of the minor supervision and the fact that even after his work is completed there is little opportunity for a thorough constructive criticism and suggestions for improvement of his ability in this type of effort, it appears that the student gets mostly information and labor out of the situation.

Direct instruction in evaluating and presenting literature. The alternate solution arises, can students be stimulated to extensive reading in a topic

they are interested in by other methods than thesis writing? Can the ability to analyze and evaluate articles and books and to express the knowledge and opinion gained be better developed by an organized class and laboratory course led by a master in the field, than by the present approach? The experience of other groups on this matter should be looked into and if it is found that there is no conclusive opinion, as I suspect, I think that an experimental group on how to read and evaluate medical publications and how to write and present papers should be formulated.

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