THIS is a study—sociological, medical and statistical—of inequalities between the economic classes of England and Wales. It deals in particular with the widespread belief that the great decline in the total infantile death-rate during the between-wars period has been accompanied—thanks to our extensive and advancing social services—by a flattening of the gradient of inequality between the classes.

Mr. Titmuss, by the application of the simple but ingenious statistical devices described in the text, arrives at the unexpected and deeply disturbing conclusion that this agreeable view has no foundation in fact. Inequalities between the classes have increased steadily in the present century and are now greater than ever before. In short, our maternal and infant welfare services have proved inadequate to the problems they were designed to solve: and it is evident that new and differently conceived measures are called for, not merely a multiplication of those on which we have depended hitherto.

In these pages Mr. Titmuss marshals the relevant data, makes a precise diagnosis, analyses causes, and proposes remedies. As in all his writings, he displays a rare talent for clarifying medical problems for the sociologist, sociological problems for the doctor, and both these and statistical problems for everyman. His recommendations merit the closest study of doctors and legislators—in fact of all who by their exertions, or even by their votes, could ensure for the nation's children the chances of healthy survival now enjoyed only by a favoured minority.

BIRTH, POVERTY AND WEALTH

By the same author

PARENTS REVOLT (with K. Titmuss)

POVERTY AND POPULATION

BIRTH, POVERTY AND WEALTH

A STUDY OF INFANT MORTALITY

by

RICHARD M. TITMUSS

" Lords and Commons of England, consider what nation it is whereof ye are and whereof ye are the governors . . . ." — MILTON

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FOREWORD

The new-born child feels the impact of all the forces in his environment. His chances of survival and healthy development depend of course on his congenital equipment, but only in part; to a very large measure they turn on such external influences as the wealth of his parents and their capacity to take advantage of the medical knowledge and social services available for his welfare. The sum total of all these factors—of inborn susceptibilities and resistances and external supports and stresses—finds expression in the infant mortality rate, the trend of which thus provides, as Mr. Titmuss shows in these pages, an instrument of precision in the measurement of human progress. He also shows that correctly applied, by the simple but most ingenious methods described in the text, this sociological device yields information that is new, unexpected and deeply disturbing.

About the statistical data themselves there can be no dispute. They are drawn from authoritative sources and, in this particular, Mr. Titmuss's only achievement has been in the skill and patience with which he has integrated material scattered through official reports and the other documents named in his impressive bibliography. Briefly, what they amount to is, first, that the rate of infant mortality in Great Britain is highest in the poorest economic groups and lowest in the well-to-do, falling progressively, group by group, with every step up the social scale; secondly, that in the between-wars period

the rates have fallen in every group; and thirdly, that the present figures, though representing a considerable improvement on the past, shew up badly against those prevailing in some other countries—for instance, New Zealand or, to come nearer home, pre-war Holland.

All this, taken at its face value, would seem to offer some grounds for satisfaction, if not for complacency. It suggests that if our maternal and infant welfare services and other measures for safeguarding infant health have not developed as far as they should—and no informed person believes that they have—they at least are on the right lines and capable, in the ordinary process of growth, of producing the desired ends. What we need is not, it seems, new and differently conceived measures but rather a multiplication of those that have served us so well in the past.

This agreeable conclusion finds no support in Mr. Titmuss's pages. The question with which he is concerned—beginning his study where most others leave off—is whether the welcome decline in the absolute rates of infant mortality has been accompanied by a change in the gradient of inequality between the different social and economic classes. It would hardly seem necessary to examine statistics for an answer, and Mr. Titmuss is possibly the first to have done so. Even on the most pessimistic assessment of the achievement of our maternal and child welfare services, and of the consequences that could be expected from the extension to all classes of knowledge and opportunities that formerly were accessible mainly to the well-to-do, it could be assumed that class differences in infant mortality have at least remained constant; and in fact doctors, statisticians and public health workers in general have taken the more encouraging and apparently more reasonable view that the gap between the classes has become narrower with the years.

Unfortunately, neither assumption accords with the facts now revealed in Mr. Titmuss's analysis of the recorded figures. The absolute infantile death rates among the poorer groups have indeed declined; but relatively to those in the economically better-favoured groups, they are higher, far higher, than ever before.

This is the basic theme of *Birth, Poverty and Wealth*: the increase of class inequalities, as measured by a most sensitive index, in a period which we had supposed to be one of levelling up of social advantages and opportunities. In these pages Mr. Titmuss marshals the relevant data, examining a considerable body of statistical evidence with the integrity, detachment and equipment of a scholar, makes a precise diagnosis, analyses causes, and proposes remedies. His book is thus in the first instance a masterly statement of facts; but as these facts concern the preventable deaths of young children, he may perhaps be excused for regarding them, and hoping that the reader will regard them, as something more than material for a statistical study.

MAURICE NEWFIELD

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AUTHOR'S ACKNOWLEDGEMENTS

The first draft of this study of inequality was written in the strutted basement of a London house during the bomb-littered winter of 1940–41. The circumstances of the war delayed its publication but also gave me opportunities for revision and amplification of the material for which I am very thankful. It would in any case have been impossible to produce an up-to-date study until after 1938, for it was only then that the Registrar-General's 1931 Occupational Supplement—probably the most valuable Report of its kind ever produced by any government—was published.

My purpose has been to examine past and present rates of infant mortality, and in particular class differences in the chances of death and life, as a necessary preliminary to a survey of the tasks that lie ahead—tasks that must be undertaken if we are to justify the labour and sacrifices of those who have made all things possible. I have been helped and encouraged to complete this task by Major J. N. Morris, R.A.M.C., Dr. Aubrey Lewis, Dr. Maurice Newfield and, as in all such work, by my wife's unfailing patience and assistance. In the presentation of so much statistical matter in an easily assimilable form I have received valuable help from Dr. Newfield, who has also yielded to my persuasion to contribute a foreword. To all who have helped me I am very grateful.

The research work which forms the basis of my study was carried out under a grant from the Leverhulme Trustees and I also received a most generous additional

grant from the Council of the Eugenics Society. I must make it clear, however, that neither they nor my friends are in any way committed to my conclusions. For these and for the collation of the data from which they are derived I take the full responsibility myself.

R. M. TITMUSS

London, *May*, 1943

CHAPTER I

A MEASUREMENT OF HUMAN PROGRESS

" A strict investigation of all the circumstances of these children's lives might lead to important discoveries and may suggest remedies for evils of which it is difficult to exaggerate the magnitude."

DR. WM. FARR, *Supplement to the XXVth Annual Report of the Registrar-General*, pp. xii and xiii, 1864.

INFANT mortality provides society with the first major index of the reaction of a new human life to its surroundings. It is a measure of man's ability and willingness to control his environment. The characteristics of a community in all gradations from the aboriginal of Australia to the civilised Scandinavian begin to impress themselves as soon as the child starts its separate existence apart from its mother. This existence begins with explosive force. At no period in after life does there occur any shock like that accompanying birth. For in the great systems of the body, in the physiological processes of respiration, circulation, heat regulation and digestion, there is an instantaneous and drastic change, and the failure of the child to meet the new demands on him—or of the community to provide adequate protection—can only result in death. Infant mortality is indeed the price of adaptation paid by each generation when entering life, and the toll of infant deaths is to-day, just as it has always been, a broad reflection of the degree of civilisation attained by any given community. " Health ", declared René Sand, " is purchasable . . . Each country, within certain limits, decides its own death rates."[1] In the British colony of Gambia in West Africa life for the native is both brutal and brief, with infant deaths at the rate of

[1] *Health and Human Progress* 1935.

370 to every 1,000 births. At the other extreme there are districts of New Zealand where the rate has fallen to below 20. Or we may compare modern Glasgow and its rate of 109 in 1936 with pre-1939 Amsterdam and a rate of only 30. These wide differences in the risk of death bear out Sir Arthur Newsholme's view that " Infant Mortality is the most sensitive index we possess of social welfare and of sanitary administration, especially under urban conditions ".[1]

" Progress ", wrote Herbert Spencer, " is not an accident ", and it is no accident that the infant death rate for England and Wales has fallen from over 150 to around 50 in one hundred years. It was not, however, until about 1900 that the rate began to fall rapidly, and the ensuing 30 years witnessed the greatest decline. It is instructive to note that public attention—as seen in the flow of commissions and inquiries after 1900—was directed to the high infant mortality chiefly by the disclosures of physical ill-health and inefficiency during and after the South African War.[2] There is perhaps something rather shocking in the idea that it took a war to focus public attention on a wastefully high infant death rate. Whatever our reaction, it remains true that our concern for national health has followed the course of our military fortunes. Just as the South African war focussed attention on the physique and health of the nation (impelling the Inspector-General of Recruiting to speak of " the gradual deterioration of the physique of the working classes from which the bulk of the recruits must always be drawn "), so did the war of 1914–18, with its revelations of ill-health and the first appearance of the phrase " a C3 nation " ; and now once

[1] Supplement to 39th Annual Report of the Local Government Board. 1909–10.

[2] The first detailed statement of Infant Mortality in the Registrar-General's Reports appeared in 1905.

again, the present war—pressing closely on the whole population—sharply reminds us that we tend to forget communal fitness when the threat of mass destruction is not upon us. As F. Le Gros Clark wrote, " The fact is that most of our standards are still very crude and pragmatic ; " and he added that " Usually at the back of our minds hangs the vision of war as the supreme test of stamina ".[1] We have yet to formulate a standard of positive health as an absolute good in itself unrelated to industrial or military considerations. To do so, however, demands an understanding of the fundamental causes of ill-health and premature death.

The termination of an individual life is the product of an enormous number of complex and inter-related forces ; from a Government's policy in international affairs to the local methods of refuse disposal and from a coal-owner's decision to close the pits to a mother's intake of calcium. Reducing this diversity to identity, to find the causation of infant mortality, we can distinguish two main factors operating in the past to produce a high death rate. One can be summed in the word poverty ; the other is insanitary urbanisation.

As an illustration of the latter we may compare Norway's infant mortality rate of 105 during 1851–55 with Glasgow's rate of 109 in 1936. In the middle of the nineteenth century Norway and Ireland were considered to be, in comparison with England, poor countries. While ignorance, lack of personal hygiene and a higher degree of poverty contributed to produce a rate above 100, these countries did not suffer from the dirt and infection manufactured by industrialisation and rapid urban growth. During 1891–95, just before a rapid decline in the rate occurred in each country, England and Wales had a

[1] Le Gros Clark, F., and Titmuss, Richard M. (1939) *Our Food Problem.*

rate of 151, Ireland 102 and Norway 98. The purely economic differences between these countries were, however, masked by the factor of population density; and for that reason by standards of sanitation involving air and water-borne infection. While Ireland and Norway were, in the main, poverty stricken at the end of the last century, their poor were not crowded together in an insanitary environment. The people of England and Wales who, at that time probably stood at a somewhat higher standard of living, were nevertheless subjected to the factor of high population density. This factor, when superimposed on poverty, thus contributed to produce an infant death rate 50 per cent. higher than that obtaining in poorer, but sparsely populated agricultural communities. If however the urban populations of the three countries are compared we find Dublin with the highest rate of 169, then Oslo with 158 and lastly London with 156. In the reversal of the rates for English, Irish and Norwegians we see the influence exerted in the nineteenth century by the forces of density and industrialisation. It was Farr who first pointed out that mortality was a function of the density of the population. His formula of 1843 showed the mortality to vary with the sixth root of the density.[1] In the sixties he found that the relation was expressed approximately by the eighth root of the density.

Thus in Farr's day the public health administrator was faced with two main problems, poverty and drains. But although both were indubitably present only one was recognised as a problem—poverty was part of the natural order of things—and all the emphasis was concentrated on drains. While the Royal Commissions on sewage policy succeeded one another with monotonous regularity, the

[1] Farr, W. (1843) Appendix to Registrar-General's Fifth Annual Report.

treatment of the impoverished sick was dominated by the simple Poor Law maxim that " People must not be encouraged to be ill by the knowledge that they could be treated free at the expense of the State ". To most, poverty, or the inequal distribution of wealth, was quite natural in an age when every man was taught to promote his own self-interest. The poor were part of the landscape. The phrase " the labouring poor ", so beloved of official reports in those days, is rich in social implications.[1] Equally expressive was Young's tranquil observation, as of one enunciating a commonplace, that " everyone but an idiot knows that the lower classes must be kept poor or they will never be industrious ". In such an age when, under the leadership of the new class of self-centred, self-confident, god-fearing and money-worshipping entrepreneurs, Britain was becoming the workshop of the world, it was not perhaps unnatural that to many the provision of drains conflicted with the principle of self-seeking. " The beneficient private war " (to quote Sir Henry Maine) " which makes one man strive to climb on the shoulders of another and remain there " was hardly conducive to equality in the realm of clean water, drains, water-closets and other sanitary necessities. *The Times* in 1858 summarised its opposition to sanitation when it wrote, " The English people would prefer to take the chance of cholera rather than be bullied into health ". It is necessary to read the lives of men like Farr, Chadwick and Simon to understand how long and bitter was the battle for drains. Just as the mass of the working class suffered from an inequal distribution of wealth, so, until the turn of the twentieth century, did they have to endure

[1] See Simon, John (1890) *English Sanitary Institutions* and *General Report on the Sanitary Condition of the Labouring Population of Gt. Britain*, 1842.

pail closets, privy middens and ash-pits, while existing

long in populous city pent
Where houses thick and sewers annoy the air.

It was not until the rich were forced to the conclusion that sanitation was economic sense and would save them, the rich, from contracting much infectious disease (witness the influence of the cholera epidemics) that water-closets and clean water were provided. Thus the winning of the battle for drains and the effective control over sanitary urbanisation were the chief factors in the lowering of infant mortality to one-third of its former level. It has now been abundantly proved that mortality need not increase at all with the density of the population so long as other influences are not active at the same time. This is notably true so far as infant mortality is concerned; and it may be said that in most advanced countries the infants have now little to suffer from the struggle for adaptation to an urban mode of life.[1] Stocks, for instance, has shown that up to middle life the importance of crowding per room as a factor in mortality would appear to be now almost double that of density per acre.[2] He arrived at this conclusion by measuring the change in mortality according to the two types of density, one factor being held constant in each case. To distinguish between the two factors of density is important; the one (per acre) is an index of success or failure in combating insanitary evils

[1]See for example the discussion on the changes since 1871 in the relative healthfulness of town and country by R. S. Barclay, W. O. Kermack and A. G. McKendrick (1940) ("Comparison of the Specific Mortality Rates in Town and Country Districts of Scotland since 1871", *J. Hyg., Camb.*, *40*, 423). The authors "conclude that the relative healthiness of the town is now at roughly the same level as that of the country. The balance of advantage may still be with the latter, but, if so, it cannot be very great".

[2]Stocks, P. (1934) "The Association between Mortality and Density of Housing", *Proc. R. Soc. Med.* (Epid. section), *27*, ii, 1127.

such as water-borne infection, the other is a measure of the effects of overcrowding *per se* (including the transmission of disease by droplet infection) and/or other social factors with which overcrowding is inextricably related.

Improved sanitation having amputated the nineteenth century peak in infant mortality, there now became apparent the contours of a new peak largely formed on the dynamics of poverty. It was not, however, until 1911 that the first official attempt was made to measure the different rates of mortality in different social classes.[1] Before this a few unofficial investigations had been made, mainly actuarial in purpose, and concerned to find out the expectation of life of different social groups. But such work had to be done with most inadequate statistics, and the results were thus not very reliable. As early as 1815 Milne[2] concluded that "There can . . . be no doubt but that the mortality is greater among the higher than the middle classes of society". In 1832 Farren[3] thought that members of the peerage had a lower expectation of life than the general population. Farr[4] in examining the life span of kings and peers drew attention to the great insecurity surrounding the lives of the noble. This great pioneer of English statistics later compared the work of Edmonds[5] on the mortality at different ages of English peers with that of labourers employed by the East India Company. After excluding from the peers' mortality those deaths (5 per cent) due to violence—hardly an occupational risk—he found that the labourers had the lower mortality. Farr's comment runs: "Are we to infer that the mortality

[1]The earliest investigation of occupational mortality among adult males relates to 1851 (14th Annual Report of the Registrar-General).

[2]*Treatise on Annuities.*

[3]*Observations on the Mortality among the Members of the British Peerage.*

[4]Farr, W. (1837) *British Annals of Medicine.*

[5]*Lancet*, 1838, *39*, 867.

among peers is now higher than among labourers, crowded within the metropolis ? Should we not rather infer, that as the investigation extends far back into the centuries of bloodshed and pestilence, that the lives of peers were then shorter, and are now longer, than the lives of labourers ? The plague, which was born in huts, and nursed by famine, rioted in luxurious halls, and smote the high-born ".[1] And it was not only in huts that the plague was born. At royal Windsor the footmen suffered from perpetual sore throats until in 1844 more than 50 unemptied cesspits were discovered beneath the castle. It seems then that Farr's inference of a change in the differences in mortality experienced by distinctive social groups was the truth ; for a " gentleman " in London, the Commissioners of 1844 were told, lived on the average twice as long as a " labourer ", while the corresponding figures for Leeds were forty-four and nineteen years, and for Liverpool thirty-five and fifteen. In York City, during the years 1839–41, the average age at death for " gentry and professional persons and their families " was 48.6 ; for " tradesmen and their families " 30.8 ; and for " labourers and their families " 23.8.[2]

Clearly the industrial revolution had something to do with this trend in differential mortality. " It is a melancholy fact," wrote, as late as 1865, the most distinguished of contemporary economists, " that the whole structure of our wealth and refined civilisation is built upon a basis of ignorance and pauperism and vice, into the particulars of which we hardly dare to inquire. . . . We are now in the first morning of our national prosperity and are approaching noon, yet we have hardly begun to pay the

[1] Article " Vital Statistics " in McCulloch's *Account of the British Empire*, 1837.

[2] First Report of the Commissioners for Inquiry into the State of Large Towns and Populous Districts, 1844, *1.*

moral and the social debts to millions of our countrymen which we must pay before the evening ". In 1861 Bailey and Day[1] found that the mean duration of life at birth in Peerage Families was greater than that for the general population, greater indeed than for Farr's " Healthy Districts " of England and Wales. The difference was apparently largely due to lower death rates during childhood, for, as Bailey and Day pointed out, "the advantage in favour of the families of the peerage is most remarkable in infancy and childhood—the mortality under the age of 10 years being little more than one-third of that of the general population ". This class difference was again confirmed when, in 1874, Ansell found that the expectation of life at birth in the upper and professional classes was 53 years indicating an advantage of about 10 years over the expectation for the general population.[2] Thus it would seem that even in those early days wealth triumphed over the handicap of inferior drains. To enquirers at that time such as Farr and Chadwick, concerned with the riddle of varying death rates, nothing was known of the functions of nutrition, but to the more far-sighted it seemed that some important factor, other than drains, was at work. Bailey and Day, for instance, concluded that, " A consideration of the characteristic features, both of these and of other observations on persons in affluent circumstances, may suggest to another class of enthusiasts that there are many other causes affecting the mortality of mankind besides the sanitary condition of their habitations ; and that although ventilation, drainage, and water supply are all very necessary things, they are not ' all the law and the

[1] *On the Rate of Mortality prevailing amongst the Families of the Peerage during the 19th century. J. Inst. Actu., 9,* 305.

[2] Ansell, C. (1874) " Vital Statistics of Families in the Upper and Professional Classes ". Discussion in *J. R. Statist. Soc., 37,* 464.

prophets' notwithstanding". They went on, "Despite all that has been written on the subject we remain of opinion that the law of mortality of the human race is yet undiscovered".

Twenty-two years were to pass before Sir Francis Galton published in 1883 his conclusions as to the parts played by heredity and environment in determining human qualities. His verdict was: "We may, therefore, broadly conclude that the only circumstance, within the range of those by which persons of similar conditions of life are affected, that is capable of producing a marked effect on the character of adults is illness or some accident that causes physical infirmity. The impression that all this leaves on the mind is one of some wonder whether nurture can do anything at all, beyond giving instruction and professional training. There is no escape from the conclusion that nature prevails enormously over nurture when the differences of nurture do not exceed what is commonly to be found among persons of the same rank of society and in the same country".[1]

The study of heredity preceded nutritional research for it was not until 1897 that Eijkman, concerned with the outbreaks of beri-beri in the jails of the Dutch East Indies, carried out his classical experiments with chickens and decided that some important factor was missing from the polished rice the native prisoners were receiving. Since these two men first spoke there has accumulated a vast amount of evidence on the relative influence of nature and nurture, and the period following the 1914 war has produced results which emphasise the great importance of the qualitative aspects of nutrition. We shall attempt to summarise some of this material when we come to

[1] *Inquiries into Human Faculty*, 1883.

interpret the statistical data on infant mortality. In the meantime we may note that in a few parts of the world infant mortality has been reduced to below 20 deaths per 1,000 live births. Dublin, in 1928, suggested that a rate of 30 was feasible.[1] To-day, in this dark hour of a gifted age, we may suggest that there are no medical, social or economic reasons why advanced communities should not achieve a rate of 15, for the knowledge formerly lacking is now abundantly available. The saving of 100,000 lives of English infants every four years would be no small achievement particularly as, in the coming decades, the problem of declining numbers, and possibly of even further declining birth rates, is one which may before all others condition our national life and colour all our social thinking. When the crisis comes many will no doubt rush in with population policies modelled on the Nazi technique of the enslavement of parenthood. It would be as well therefore if those who have visions of a democratic approach to the problems of population realise in time that they cannot adequately be solved without reference to handicaps and inequalities in infancy. They would also be helped if they appreciated that these handicaps and inequalities are not isolated phenonema but an integral part of an inequal society, pervading and invading the activities of men from the cradle to the grave. If the beginning be sordid can life be full, abundant and generous ?

[1] *Health and Wealth.*

CHAPTER II

THE SOCIAL CLASS DISTRIBUTION OF INFANT DEATHS

" I have taken the pains . . . of setting out these Tables, whereby all men may both correct my Positions, and raise others of their own. For herein I have, like a silly Schole-boy, coming to say my Lesson to the World (that Peevish and Tetchie Master) brought a bundle of Rods wherewith to be whipt, for every mistake I have committed."

JOHN GRAUNT, F.R.S., *Natural and political observations . . . on the Bills of Mortality*. London 1662.

WITH the historical background briefly sketched in we may now turn to the first inquiry into social class mortality by the Registrar-General in 1911. This investigation was in many ways unsatisfactory, chiefly because of defects in the classification on which it was based. Social status can broadly be deduced from a genuine occupational classification; but not from an industrial classification, whereby all grades of workers, masters and men, skilled and unskilled, are grouped together for each industry. The " Occupational " classification used at the 1911 census was in fact largely industrial and thus involved errors in social grading. It was, nevertheless, considered fairly satisfactory by Dr. Stevenson (Superintendent of Statistics, General Register Office) on the grounds that the values obtained for each social class increased with some regularity from Class I to Class V, in the manner shown in Table I.

Dr. Stevenson added that if Class I had been based on stricter methods of selection the rate would have been shown to have been much less. That this is so is

TABLE I

Infant Mortality per 1,000 *legitimate live births based on the father's occupation* (1911)

Class	*Social and economic grading*	*Mortality per* 1,000
I	Middle and upper classes	76.4
II	Intermediate, comprising elements of I and III	106.4
III	Skilled labour	112.7
IV	Intermediate, comprising elements of III and V	121.5
V	Unskilled labour	152.5
VI	Textile workers	148.1
VII	Miners	160.1
VIII	Agricultural workers	96.9

confirmed by the fact that for infants of Army and Naval Officers (included in Class I) the rates were just over 40, and for infants of Church of England Clergymen (also in Class I) the rate was 48.

With the 1921 census there were great improvements in the social classification, and ten years later some further minor improvements were incorporated. The 1911 classification did not distinguish the various occupations in mines and textile factories sufficiently to permit their assignment to social groups, but the definitely occupational classification of 1921 provided the means for their analysis by social class and they were merged into the five great social classes. Agricultural labourers (in 1911 considered separately) were assigned to Class IV, so as to make the grouping into five classes complete for the whole occupied and retired population. The improvement effected by genuine occupational tabulation was not limited to the fusion of these three groups with the general population. It also provided much better means of assigning individuals to their appropriate social class. In 1911 many " occupational " headings of an industrial type included members of all social classes, from employers to general labourers, and assignment could only be made to

the class thought most appropriate for the average member of a very diverse group. Tabulation in 1921 and 1931 got over this difficulty and it was no longer necessary to assign the head of a tinplate works to the same social class as his labourers.

In weighing the results of an analysis of infant mortality according to the social class of the father, certain considerations must be borne in mind. We should stress the fact that such an analysis is much more likely to be accurate than a study of the mortality of the fathers themselves according to their occupation, for the following reason. Most children are born when their fathers are between the ages of 20 and 50, that is to say, when the men are engaged on their main occupation in life. Consequently the social environment of the child is likely to be a true reflection of the social and economic status of its father. The defects introduced into a study of adult social class mortality are partly the result of changes in occupation in later life. Thus, a skilled coal miner may, as he gets older, suffer ill-health or be physically disabled and drift into a lighter occupation carrying a lower economic reward. His subsequent death would not be entered against coal-mining (the cause of his breakdown) but against his occupation at the time of his death. This factor of occupational selection is not likely to influence greatly an analysis of infant deaths in the different social classes. Hence the great value of a study of child mortality as an index of the effects of social and economic environment. Moreover, the rate of mortality is not affected by the true occupational risks of the father's occupation, except in so far as these are brought into the home or involve the mother also. In a few instances, notably among textile workers, there is a tendency for the mother to work herself in a factory, with consequent

effects on infant mortality. In other cases the mother may be involved by helping her husband in his occupation, and this may account for the fact that the families of proprietors and managers of retail businesses have as high an infant mortality rate as those of shop assistants, notwithstanding the differences in income levels and resulting social classification. In addition there are other factors at work connected indirectly with the father's occupation, such as the compulsory choice of residence under urban rather than rural conditions, or in a neighbourhood which is cold, damp or smoky, or where the housing conditions are unsatisfactory. All these factors, collectively expressed in the social classification, are, however, of small weight in relation to the influence of the weekly income. Most of them, moreover, like housing conditions, diet and medical attention, are conditioned by the scale of income. There remains the question of physical and mental selection, but this we shall discuss later when we come to consider the causes of death in each social class.

What we have to remember throughout this study is that the division of the population into five broad social classes is made on the basis of economics. The allocation of each occupation to one of the social classes has clearly been decided in terms of money : i.e. the average wages or salaries earned. Throughout the Registrar-General's Report the term " social class " is used to denote what is, in effect, an economic grading. The terms " social status " and " economic status " appear, regrettable though it may seem, to be interchangeable. The standing of an individual in society to-day is very largely measured by his economic status, by his share of (and claims on) the national income ; and this too is what decides the place he must occupy in the tables in which the Registrar-General sums up his grand inquest upon the army of the

dead. This fundamental fact should not be forgotten when the mortality tables that follow are studied.

The Registrar-General, in his discussion and analysis of infant mortality according to the social status of the father, has only made comparisons of the data for the periods 1921–3 and 1930–2. Dr. Stevenson attempted, however, to relate the findings for 1921–3 with those for 1911.[1] Table II sets out the figures for the three periods:

TABLE II

Infant Mortality by Social Class of Father

Social Class	*Death rate per 1,000 legitimate live births*			*Per cent of rate for all classes*		
	1911	1921–3	1930–2	1911	1921–3	1930–2
All Classes -	125	79	62	100	100	100
Class I - -	76	38	33	61	48	53
Class II - -	106	55	45	85	70	73
Class III - -	113	77	58	90	97	94
Class IV - -	122	89	67	98	113	108
Class V - -	153	97	77	122	123	125

Despite the serious defects in the 1911 classifications, which may be thought to invalidate any comparison with later periods, a study of this table yields some interesting information. Although miners, textile workers and agricultural workers are omitted from the data for the first period, the table shows a regular increase in the ratio for Class V—namely, 122, 123, and 125. For other classes the trend is irregular. We see that for all five classes the death rates have fallen considerably but the decline has been steeper for Classes I and II than for Classes III, IV, and V. Bearing in mind the defects in the material on which the figures are based (defects which we hope to remove) we may provisionally conclude that the gradient of inequality has not lessened over the twenty years but has, in fact,

[1] *Biometrika*, 1923, *15*, 382.

tended to increase. The rate of decline has been slowest for Class IV. One fact is indisputable: that the rate for Class I in 1911, although inflated by the inclusion of non-Class I elements, was lower than the Class V rate twenty years later.

In an attempt to measure more accurately the true social class trend I have made various studies with the object of surmounting the defects in the classifications used at the earliest period. I have used different devices, some of which will be described, but all having as their objective the elimination of the defects and the cross-checking of results. The broad conclusions derived from each social grouping used agreed to a remarkable extent.

In the first investigation, which will be called Study "A", only clearly defined occupations have been used, thus avoiding any groups in which there was a likelihood of directors, managers, departmental heads, foremen, and skilled and unskilled workers being allocated to the same class. This has entailed the exclusion of the mining and heavy industries, textiles and most manufacturing processes, wholesale and retail trades, clerical occupations and other trades in which there existed a considerable range of income and consequently of widely different social status. The groups used are those which were allocated to the same social class at each period. One exception to this rule is agricultural workers who were placed in a separate class in 1911. As this group was placed in Class IV in 1930-2, it has been so allotted for 1911. Appendix I contains a list of the occupations selected. For the first period the Registrar-General provides details of births and deaths for one year only, namely, 1911, but for the other periods infant deaths are tabulated for three years, and these have been related to the births during the mid-year, the latter being

multiplied by three. Tables III and IV summarise the results :

TABLE III

Study " A " of Infant Mortality by Social Class of Father (1911)

Class	*Legitimate live births*	*Deaths under the age of one*	*Rate per* 1,000	*Per cent of Registrar-General's rate for all classes* (124.9)
I -	8,990	494	54.95	44
II -	23,196	2,092	90.19	72
III	62,293	6,858	110.09	88
IV	49,604	5,140	103.62	83
V -	93,323	14,962	160.32	128

In comparing these rates with those supplied by the Registrar-General (see Table II), it should be remembered that the rate for Class II in Study " A " is decreased by the exclusion of the retail trades and that the Class IV rate is also decreased by the inclusion of Agricultural workers.

TABLE IV

Study " A " of Infant Mortality by Social Class of Father (1930–2)

Class	*Legitimate live births*	*Deaths under the age of one*	*Rate per* 1,000	*Per cent of Registrar-General's rate for all classes* (61.6)
I -	24,483	787	32.14	52
II -	43,332	2,036	46.99	76
III	195,801	10,787	55.09	89
IV	98,082	5,671	57.82	94
V -	237,735	19,972	84.01	136

It should be observed that in Table IV the rate for Class IV is decreased by the exclusion of unskilled and semi-skilled occupations in the textile and heavy industries.

In Study " A " the death rate during 1911 for All Classes amounted to 124.45, virtually the same as the Registrar-General's rate for All Classes (124.9). In 1930–2,

the Study " A " rate was 6 per cent above that given by the Registrar-General, the respective figures being 65.48 and 61.6. The study covered 28 per cent of the births and deaths in 1911 and 33 per cent of the births and 35 per cent of the deaths in 1930–2.

The death rate for the different classes, and for all classes combined, shown by Study " A " are remarkably similar to those calculated by the Registrar-General. A comparison of the two sets of figures, however, brings to light one fact. When groups are selected to reflect differences in the status of the social classes more accurately, we see that there is a greater range of inequality; a greater difference in the risk of death between infants of the poor and infants of the rich. Thus, to take an example, the removal from Classes I and V of certain elements which do not properly belong there widens the difference between the respective death rates. In other words, class inequalities are in fact greater at both periods than would appear from the Registrar-General's figures alone. This is also seen clearly by a comparison of the Class V rate in 1930–2 with that for Class I in 1911, which shows that at the later period the Class V rate exceeded that for the top class twenty years earlier by as much as 53 per cent.

As to the *trend* in the death rates shown by Study " A ", we see that a similarly heavy fall (as shown in Table II) has occurred during the twenty years in all five rates; but notwithstanding the greater scope for reduction among the bottom classes the figures support our previous conclusion that there has been no diminution in the social class gradient.

The argument and general conclusions of this book rest in very large part on the validity of the statistical material. We must therefore be sure that every possible step has

been taken to overcome the defects in the Registrar-General's 1911 classification and so to render possible a just comparison with later years. We believe that the results of Study " A " do provide such a measurement, but we can check our conclusions, and incidentally meet any possible criticism, by adopting a second method of analysis. This method is to amalgamate Classes I and II and Classes IV and V of Study "A", thus providing three big social classes comprising, broadly speaking, the professions and upper and middle classes (Classes I and II), skilled workers (Class III), and semi-skilled and unskilled workers (Classes IV and V). This reduction in the number of groups—forming the basis of what will be called Study " B "—should meet any suggestion that owing to changes in the description of professions or occupations certain groups might have appeared in Class I (or IV) at one period and in Class II (or V) at the second period. The results are set out in Table V :

TABLE V

Study " B " of Infant Mortality by Social Class of Father

Class	*Period*	*Death rate per* 1,000 *legitimate live births*	*Per cent of Registrar-General's rate for all classes*
I–II -	1911	80.35	64
III -	,,	110.09	88
IV–V -	,,	140.65	113
I–II -	1930–2	41.63	68
III -	,,	55.09	89
IV–V -	,,	76.36	124

Before these figures are discussed we may include, as the further check shown in Table VI, the Registrar-General's figures from Table II grouped on the same basis as Table V.

TABLE VI

Infant Mortality by Social Class of Father (adapted from Registrar-General's Tables)

Class	*Period*	*Death rate per 1,000 legitimate live births*	*Per cent of Reg.-Gen.'s rate for all classes*
I–II	1911	95.8	77
III (including textile workers and miners)*	,,	130.2	104
IV–V (including agricultural labourers)*	,,	134.6	108
I–II	1921–3	53.8	68
III	,,	76.9	97
IV–V	,,	92.5	117
I–II	1930–2	43.1	70
III	,,	57.6	94
IV–V	,,	72.1	117

*For 1911 the Registrar-General used eight classes in all, textile workers, miners and agricultural labourers being dealt with separately. These three occupations have, for this study, been grouped as shown, so that the figures for all three periods cover the total population.

What may be deduced from Tables V and VI and what is the result of comparing them with Tables II, III and IV? We suggest that the same conclusions are reached and that they provide a useful check on our earlier results. That is to say, both tables show that there has been no diminution in social class inequalities; indeed, they suggest more forcibly than Tables II, III and IV that these inequalities have increased. This is clearly illustrated if we look at the differences in another way. From Table V it is evident that the rate for Classes IV and V exceeded that for Classes I and II by 75 per cent in 1911 and by 83 per cent in 1930–2. The Registrar-General's figures in Table VI show at both periods a somewhat smaller excess but a larger growth in the difference;

namely, in 1911 Classes IV and V exceeded Classes I and II by 41 per cent and in 1930–2 by 67 per cent. Table V also illustrates the principle shown by Tables III and IV, that when the Classes are more carefully selected the differences are found to be greater than is suggested by the Registrar-General's figures (as set out in Table VI).

We have now studied social class differences in infant mortality by using (*a*) the Registrar-General's tables, (*b*) selected social groups, and (*c*) three large groups covering the whole population. The conclusions derived by each method all broadly agree. But as each one of these approaches to the problem involves the amalgamation of a number of occupations, we may appropriately complete this study of large, intermediate and small social groups by comparing (as in Table VII) the death rates in single occupations with the death rate for all occupations.

TABLE VII

Infant Death Rate per 1,000 *legitimate live births by Social Class of Father in separate occupations per cent of the death rate for All Classes.* (*All Classes*=100).

	Per cent of All Classes	
	1911	1930–2
Agricultural labourers	78	96
Coal miners	130	134
General labourers	134	132
Bricklayers	90	89
Bricklayers' labourers	117	113
Dock labourers	138	137

The men working in these six occupations provided England and Wales with 24 per cent of the total legitimate births in 1911 and with 28 per cent during 1930–2. The only occupation to show a significant change during the twenty years is agriculture, and here we see that its

relative position worsened considerably. The other occupations exhibit little change. There is nothing in Table VII which can be held to invalidate the conclusions previously reached.

Thus far, with the aid of many statistics and the somewhat laborious reading made necessary by the checking and cross-checking of the material, we can conclude that social inequalities, as measured by infant deaths, are as high as, if not higher than, before the 1914–18 war. On the basis of the latest available social class mortality data we see that the mortality of Class V exceeds that of Class I by 161 per cent ; or, in other and more understandable terms, for every 100 births in each class three infants of the rich die as against eight of the poor. Moreover, this gross range of inequality has persisted at least as far back as 1911, notwithstanding a heavy fall in the absolute rates of death and despite great advances in nutritional science, medicine, social welfare, medical services, sanitation and hygiene, and housing.

Of no small importance in any study of infant mortality is the development of maternity and child welfare services. These were still in an embryonic state in 1918, although the impetus behind their development largely derived from the war. County Councils first received grants to provide such services in 1915, and were first permitted to provide milk and meals for nursing mothers and infants in 1918. The number of infant welfare centres in England and Wales rose from 650 in 1915 to 1,278 in 1918, and to 3,580 in 1938. The first ante-natal clinics were started in London in 1915 ; by 1918 there were 120 in England and Wales ; in 1938 there were 1,795. There were also 12,555 beds in Maternity hospitals in 1938, nearly all of them having come into existence since 1918. Midwives not certified by the Central Midwives Board

were first forbidden to practise, except under a doctor's supervision, in 1910, and about 60 per cent of midwives were then untrained. In 1917 no fewer than 39 per cent of practising midwives were still untrained, though they could only work under a doctor's supervision. The Midwives Act of 1936 finally forbade untrained women to attend childbirth in any capacity. In 1914 only 600 health visitors were employed by local authorities in England and Wales and a handful worked for voluntary agencies. In 1918 there were 2,897 full or part-time health visitors, equivalent to 1,355 whole-time visitors. By 1938 the number had risen to 5,978, equivalent to 3,079 full-time visitors. It should be recognised that these maternal and child welfare clinics and other similar social services were designed to cater—in the main—for Social Classes III to V inclusive. It is pertinent to suggest therefore that their growth between 1911 and 1931 should have had the effect of not only lowering the absolute infantile death rates but of equalising the risk of entry into life. As we have shown, however, their development has not prevented the 1911 range of inequality from persisting practically unchanged, although it must be recognised that without these services the range might have widened considerably. Apart from these services social reformers have continued throughout this period to fight for better conditions, believing that the disappearance of inequality would accompany social reform. At the end of the twenty years the State paid an allowance of 2/- a week for the child of an unemployed man ; spent 30/- a week on each mentally defective child in a Home ; and 54/- a week on each youth in a Borstal institution. Despite this confusion in sentimentality and economics, the evidence so far examined may at first sight suggest the responsibility of hereditary factors for the persistently excessive mortality

among the poorer classes. To this possibility we will return later.

But obviously the next stage is to break down the twelve-monthly death rates so far examined in order to discover at what ages and from which causes inequality derives its strength.

CHAPTER III

INEQUALITY FROM MONTH TO MONTH[1]

THE words " Infant Mortality " have a deceptive simplicity, for in fact they mask some of the most complex problems of medicine and society. For one thing, this term takes no account of the extremely difficult problem of stillbirth with which infant mortality is closely associated. Stillbirth registration was not enforced until 1927 and the necessary statistical data are therefore lacking.[2] As a measure of this problem, however, we may remark that in 1938, when there were 32,700 deaths under the age of one in England and Wales, there were also 24,700 stillbirths. Although no tabulation of still births according to social class has been made in this or any other country, nevertheless, the available evidence—on a geographical basis—suggests that the trends for infantile deaths and stillbirths correspond, the incidence of the one as of the other rising as one descends the economic scale.[3]

To return then to the problem of live births, we must first examine social class mortality according to age at death. For the two periods 1911 and 1930–2 there is

[1]In order to reduce the number of statistical tables in this Chapter, some of the death rates relating to Study " A " and forming parts of Tables VI and XI have been relegated to Appendix D.

[2]See Appendix C which discusses the problem in greater detail and refers to the new statistics provided by the Registrar-General.

[3]Some relationship between the stillbirth rate per 1,000 total births and " annual earnings of father " was found by Selwyn D. Collins (1927) in " Economic Status and Health · a Review and Study of the Relevant Morbidity and Mortality Data ", *Publ. Hlth. Bull.*, No. 165, United States Public Health Service, Washington. See also the references to the investigation into stillbirth and neo-natal mortality in Aberdeen by Baird and Wyper, summarised in Chapter VIII and discussed in Appendix C.

sufficient information about the rates of death under one month, 1–3 months, 3–6 months, 6–9 months and 9–12 months. For the intervening period (1921–3) the data relating to the last two three-monthly periods are not accessible, having been amalgamated in the official statistics into one age group of 6–12 months.

Bearing in mind all that has been said about the defects inherent in the classification in use during 1911, we may set out the death rates for the three censal periods (see Table VIII).

TABLE VIII

Infant Mortality by Social Class and Age
Based on Table II

Deaths from All Causes per 1,000 *legitimate live births*

Class	*Under* 1 *month*	1–3 *mos.*	3–6 *mos.*	6–9 *mos.*	9–12 *mos.*	6–12 *mos.*
			1911			
I - -	30.2	14.9	13.0	9.9	8.4	18.3
II - -	36.5	20.6	20.3	16.3	12.7	29.0
III - -	36.8	21.2	22.1	17.8	14.8	32.6
IV - -	38.6	22.7	23.8	19.7	16.7	36.4
V - -	42.5	28.6	31.4	26.2	23.8	50.0
All Classes	39.1	23.3	24.9	20.2	17.3	37.5
			1921–3			
I - -	23.4	4.9	4.3	—	—	5.8
II - -	28.3	9.5	8.1	—	—	9.6
III - -	33.7	13.5	12.4	—	—	17.2
IV - -	36.7	15.8	15.6	—	—	21.3
V - -	36.9	17.8	17.7	—	—	24.6
All Classes	33.9	14.0	13.2	—	—	18.0
			1930–2			
I - -	21.7	4.3	3.1	1.9	1.7	3.6
II - -	27.2	6.5	4.7	3.6	3.0	6.6
III - -	29.4	9.3	7.5	6.0	5.3	11.3
IV - -	31.9	10.8	9.4	7.8	6.9	14.7
V - -	32.5	13.1	12.0	10.2	9.2	19.4
All Classes	30.2	10.0	8.4	6.9	6.1	13.0

For a clearer appreciation of the trend and relative distribution of these death rates (their implications are discussed later) each rate may be expressed as a percentage of the All Classes rate (see Table IX).

TABLE IX

Percentage Distribution of Infant Mortality by Social Class and Age

Class	*Under* 1 *month*			1–3 *mos.*			3–6 *mos.*		
	1911	1921–3	1930–2	1911	1921–3	1930–2	1911	1921–3	1930–2
I	77	69	72	64	35	43	52	33	37
II	93	83	90	88	68	65	82	61	56
III	94	99	97	91	96	93	89	94	89
IV	99	108	106	97	113	108	96	118	112
V	109	109	108	123	127	131	126	134	143

	6–9 *mos.*		9–12 *mos.*		6–12 *mos.*		
	1911	1930–2	1911	1930–2	1911	1921–3	1930–2
I	49	28	49	28	49	32	28
II	81	52	73	49	77	53	51
III	88	87	86	87	87	96	87
IV	98	113	97	113	97	118	113
V	130	148	138	151	133	137	149

The foregoing table, which, of course, ignores the change in the absolute rates of death, expresses the trend in the social gradient. Table X shows how the rate has declined in each class and in each age-period :

TABLE X

The Decline in Infant Mortality by Social Class and Age

		Per cent of 1911					
Class		*Under* 1 *month*	1–3 *mos.*	3–6 *mos.*	6–9 *mos.*	9–12 *mos.*	6–12 *mos.*
I	1921–3	78	33	33	—	—	32
	1930–2	72	29	24	19	20	20
II	1921–3	78	46	40	—	—	33
	1930–2	75	32	23	22	24	23
III	1921–3	92	64	56	—	—	53
	1930–2	80	44	34	34	36	35
IV	1921–3	95	70	66	—	—	59
	1930–2	83	48	39	40	41	40
V	1921–3	87	62	56	—	—	49
	1930–2	76	46	38	39	39	39
All Classes							
	1921–3	87	60	53	—	—	48
	1930–2	77	43	34	34	35	35
		Per cent of 1921–3					
I	1930–2	93	88	72	—	—	62
II	,,	96	68	58	—	—	69
III	,,	87	69	60	—	—	66
	,,	87	68	60	—	—	69
	,,	88	74	68	—	—	79
All Classes	,,	89	71	64	—	—	72

In studying Tables VIII, IX and X we should first note that, since 1911, the decline in the death rate for infants under one month has varied little between the different classes. At 1–3 and 3–6 months the decline has been least in Classes III to V, the largest reductions being in Classes I and II. At 6–12 months the greatest reduction is again in Class I ; the least in Classes IV and V. Much the same may be said of the change between 1921–3 and 1930–2.

For the first age group—i.e. for neo-natal deaths—the tables indicate that there has been little alteration in the position of the five classes over the twenty years but a slight lessening of the gap since 1921–3 : see in particular Table IX. The over-estimation of mortality for Class I and its under-estimation for Class V in the 1911 figures should not, however, be overlooked. This defect in the statistics at both ends of the social scale was pointed out in Chapter II. The Registrar-General's figures (which include the 1911 classification defects) indicate that the " worst " rate (Class V) exceeded the " best " (Class I) by :

41 per cent in 1911
58 per cent in 1921–3
50 per cent in 1930–2

If we use instead the selected Social Classes (Study " A ". Tables III and IV) we find that the " worst " rate exceeded the " best " by :

106 per cent in 1911
66 per cent in 1930–2

This method shows a somewhat different trend—a decrease in class inequality. If we amalgamate Classes I and II and IV and V from the Registrar-General's Table (see Table VI), we find excesses of :

18 per cent in 1911
22 per cent in 1930–2

This conflicts with the trend shown by Study " A ", so

finally we examine the individual occupations previously studied (see Table XI).

TABLE XI

Ratio of Death rates under one month in separate occupations

	Excess over rate for All Classes (Table VIII)		*Excess over rate for Classes I–II (Table VI)*	
	1911	1930–2	1911	1930–2
Dock labourers	12%	data not available	27%	data not available
Agricultural labourers	minus 6%	6%	7%	21%
Coal miners	19%	28%	36%	46%
Bricklayers	minus 7%	data not available	6%	data not available
,, labourers	,, 6%	,,	8%	,,
General labourers	20%	14%	37%	31%

Although the data for three occupations are not available for 1930–2, the remaining occupations, agricultural labourers, general labourers and coal miners, supplied 21 per cent of the total births in England and Wales during 1911 and 26 per cent in 1930–2. Consequently our examination concerns a considerable section of the economically poorer classes. For children of agricultural labourers and coal miners we see that there occurred a small increase in the excess for deaths during the first month, although in both cases the absolute rates of death declined during the twenty years. On the other hand, general labourers (supplying a third of the births for the three occupations in 1911 and one-half in 1930–2) registered a fall. In studying these figures of social class mortality under the age of one month, it should be borne in mind that all the percentages are small and the amount of change—either upward or downward—is also small. All the figures are in fact, as we shall see later, dwarfed by the corresponding figures for later periods.

We may now summarise this analysis of deaths within the first month of life. Mortality at this period falls into a special category because not only are the major causes of death quite different in character from those operating in subsequent months, but the problems surrounding such causes demand separate consideration. We cannot be precise as to the extent to which congenital factors determine early mortality, but we can at least state that it is during the first month that they may be expected to exert their greatest influence on the death rate. Yerushalmy of the New York State Department of Health indicated in a paper, " The Effect of Order of Birth and Age of Parents upon Neo-natal Mortality " that variations in neo-natal mortality are dependent upon congenital differences to a larger degree than are variations in adult or infant mortality as a whole. He shows that mortality varies with the age of mother and order of birth, the rates being 30.7 for first births ; a minimum of 25.5 for second births and then rising to 40.4 for sixth and seventh births. There is a greater liability among first born to trauma and to certain diseases such as congenital pyloric stenosis and congenital deformities. For age of mother the rates are 33.5 for under twenty years of age, 28.2 for 20–24, a minimum of 26.2 for 25–29 and then rising to 48.1 for 40 and over. The analysis was in respect of New York State (exclusive of New York City) for 1936 and a comparison was made with the 1917 data.[1]

So far as the results of this research throw any light on the trend in total neo-natal mortality in England and Wales, it is probable that the higher rate consequent upon an increased proportion of first births in 1930–2 is largely counterbalanced by a reduction resulting from a lower proportion of fourth plus births. Thus, there is little

[1]Yerushalmy, J., (1938) *Amer. J. Hyg, 28,* 244.

doubt that in Class I the 1930–2 death rate was subject to a much greater proportionate influence of first births than in 1911, while at both periods the factor of fourth plus births could not have been very important. On the other hand, the higher death rate involved in first births must, in 1930–2, have had a far smaller influence in Class V than in Class I, though even in this lower class it must have been greater than in 1911, just as the influence of the higher death rate for fourth and later births must have been less. Comparing the influence of both factors (first and fourth plus births) at both periods for the two classes, it is arguable that Class V should have benefited to a greater degree than Class I. In other words, the results of the relative trends should have led (all other factors being constant) to a narrowing of the difference between the death rates for the two classes. Conversely, however, we might have expected a rise in the difference for the period 1921–3 and 1930–2 for the reason that the birth rates of the bottom classes declined faster during these ten years than those for the top groups. But, as we shall see, instead of a rise we find a diminution in the gap between the death ratio of Classes I and V.[1]

In later pages we shall return to the subject of hereditary influences, but meantime may note that, on an assessment of the available statistics, the differences in the death rates between the various social classes and particularly between the top and bottom groups do not appear to have changed significantly since 1911. Two methods of analysis we have used show slight rises in the difference ; a third method involving more carefully drawn social grouping shows a moderate fall ; and in an examination of three large occupations we find that agricultural labourers and

[1]Reference should be made here to Appendix C which discusses at greater length the influence exerted on total infant mortality by maternal age and birth order.

coal miners show small increases whereas general labourers show a decline. The trend in these occupational groups is a little surprising, for whatever may be said of differences in innate qualities between agricultural labourers to-day and those of 1911, we should have thought that coal-mining would have attracted a better type of workman than general labouring. Nevertheless, infants of coal miners have a higher death rate in the first month of life than those of general labourers.

In view of the greater reliability in the classification of the father's occupation we are on much safer ground in comparing the results for the two periods 1921–3 and 1930–2. At the first period Class V exceeded Class I by 58 per cent and by 50 per cent ten years later. The second half of Table X also shows that the death rates for Classes III, IV, and V all fell to a greater extent than those for Classes I and II. Admittedly the changes are not large but the trend does support the statement that there is no evidence of (*a*) wide differences in the neo-natal death rate between vastly different social classes and occupations, or (*b*) any indication of larger differences to-day than in 1911.

We may now examine deaths in the two months after the first month of life, i.e. the second and third months. Here we find that the various methods of estimating social class differences all agree in showing greater inequality in 1930–2 than in 1911, despite the fall in death rates. Table X shows that the Class I rate declined by 71 per cent as against 54 per cent for Class V. In other words, according to the Registrar-General's figures the " worst " exceeded the " best " by 92 per cent in 1911, 263 per cent in 1921–3, and 205 per cent in 1930–2. Study " A " figures show an excess of 180 per cent in 1911 and one of 239 per cent twenty years later, while if Classes I–II and IV–V of the

Registrar-General's figures are amalgamated (see Table VI), we obtain an excess of 36 per cent in 1911 which grew to one of 94 per cent in 1930–2.

Turning to the next age group (3–6 months), we may see from the Tables that the *growth* of inequality is much more pronounced than for ages 1–3 months. In comparing the " worst " with the " best " we obtain the following excesses :

	Registrar-General's figures	*Study "A"*	*Amalgamation of Classes I–II and IV–V (Table VI)*
1911	142%	253%	54%
1921–3	312%	—	—
1930–2	287%	330%	145%

There is no conflict here. Each method points to much greater inequality in 1930–2. Moreover, it should be noted that all three 1930–2 percentages are considerably higher than those for ages 1–3 months which, in turn, were much in excess of the figures for the first month.

It is, however, when we come to the last six months of the first year of life that the full implications of this investigation are revealed. Comparing again the " worst " and " best " rates, we obtain :

	Registrar-General's figures	*Study "A"*	*Amalgamation of Classes I–II and IV–V (Table VI)*
1911	173%	299%	66%
1921–3	324%	—	—
1930–2	439%	498%	180%

All three sets of percentages show a great increase in inequality. The conclusions not only confirm the results for earlier age groups but show the general soundness of the methods used in Study " A ". Moreover, an important fact, the widening range of inequality between Classes I and V is supported, in every age group, by the trend shown by Classes II and IV. That is to say, Class II (like Class I) improved at a faster rate than either Classes IV or V.

Further, the great body of skilled workers represented by Class III, of whom industrial Britain is so proud, have not improved in any age group at anything like the same rate as Classes I and II. Table X depicted the trend for all Classes, and we see that for the age group 6–12 months Class I has fallen to 20 per cent of its 1911 rate (Class II—23 per cent) against 35 per cent, 40 per cent and 39 per cent for Classes III, IV and V respectively.

To summarise the excess mortality of Class V over Class I we may tabulate the percentages we have obtained (see Table XII).

TABLE XII

Percentage Excess of Class V over Class I

Age	1911 *Study "A"*	1921–3 *Registrar-General's figures*	1930–2 *Study "A"*
0–1 month - -	106	58	66
1–3 months - -	180	263	239
3–6 ,, - -	253	312	330
6–12 ,, - -	299	324	498
1–2 years - -	—	—	406[1]

(As a matter of interest we have included the excess for 1–2 years in respect of 1930–2, the first censal period for which the data have been collected by the Registrar-General).

This Table expresses something more than comparisons of infant deaths; it gives a glimpse of the great and widening gulf that separates one class of the people from another. The separation can be measured both by the increases in the percentages—reading across the table—or by noting that inequality *increases with age*—reading down each column. In 1911 an excess of 106 per cent rises in stages to one of 299 per cent; twenty years later an initial excess of 66 per cent grows to 498 per cent. These statistics epitomise the chances of death of two infants;

[1] *Registrar-General's figures*

one born to well-to-do parents, the other to poor parents ; both potential citizens of Britain. During the first few weeks of life, little separates the two children in their chances of death, but slowly at first and then with increasing effect, as week succeeds week, the gulf widens.

CHAPTER IV

THE DISEASES OF INEQUALITY

WE have analysed deaths within the first year as a whole, and have further classified them in four different periods of infancy. The next stage in this investigation is to examine the class distribution of the diseases which resulted in death.

It is unfortunate that in this field the information is much less adequate. What we want to know is the cause of death, the age at death, and the social class of the father; and we want these facts tabulated together. Apparently we are asking too much. The official statistics (and there are no unofficial ones) do not provide this information. However, we are never wholly beaten in statistical work of this kind so we proceed to use a legitimate device to meet official deficiencies. We know that certain diseases are common to age X and to age Y so we proceed to group a number of diseases according to the age when they are known to occur. First, for the period 1930–2, we will examine the incidence of two large and differently constituted groups,[1] namely:

GROUP A. Premature births.
Congenital malformations.
Injury at birth.
Convulsions.
Congenital debility.

[1]Both Miller, F. J. W. (*Lancet*, 1942, *2*, 269), and Stocks, P. (*Lancet*, 1942, *2*, 469), have pointed out that statistics of causes of death in infancy must be interpreted with care owing to faulty certification. This source of error is to some extent eliminated, however, by the use of large groups of diseases.

These causes accounted for half of the total infant mortality during 1930–2 for All Classes. Of the deaths from these causes 80 per cent occurred during the first month; moreover, these causes accounted for 80 per cent of total deaths in the first month. Manifestly, therefore, in examining this group we are for all practical purposes examining a group of diseases death from which occurs within the first month of life. As a contrast we will analyse at the same time a large group of diseases for long recognised as environmental, namely:

GROUP B. Measles.
Whooping cough.
Diarrhoea and Enteritis.
Tuberculous diseases.
Bronchitis and Pneumonia.
Other infectious and parasitic diseases.

These causes account for 36 per cent of the total infant mortality. 91 per cent of the deaths under these headings occurred from 1–12 months and they accounted for 64 per cent of all deaths occurring during the same period. Thus, deaths in Group A are mainly due to causes that have nothing to do with the post-natal environment—to ante-natal, connatal and neo-natal factors and to deficiencies in genetic equipment; whereas in Group B they are due mainly to environmental factors. In examining these two groups it should be noted that we are dealing with approximately 86 per cent of total infant mortality. Extracting the necessary data we find that in 1930–2:

TABLE XIII

Social Class Mortality by Cause. 1930–2

	Death rate per 1,000 *legitimate live births*	*% of total mortality in the same class*	*% excess of Class V over Class I*
	GROUP A (mainly neo-natal)		
Class I	20.5	63	—
Class V	33.1	43	61
	GROUP B (mainly 1–11 months)		
Class I	6.2	19	—
Class V	34.3	44	453
	BALANCE OF INFANT MORTALITY		
Class I	6.0	18	—
Class V	9.7	13	62

We may draw attention to the fact that while for all classes Group A represented 50 per cent of total deaths, it comprised 63 per cent in Class I and 43 per cent in Class V. As for Group B, an all class proportion of 36 per cent sinks to 19 per cent for Class I and rises to 44 per cent in Class V. While the conditions in Group A are the dominant causes of death in Class I, they are certainly not so in Class V. If we refine Group A by selecting certain causes of death, some of which are particularly associated with primiparous births and are not in the main hereditary, namely:

GROUP C. Congenital malformations.
Injury at birth.
Other developmental and wasting diseases consisting mainly of atelectasis, icterus neonatorum, diseases of the umbilicus and pemphigus neonatorum

we find that Class I returns a death rate of 10.1 (i.e. 31 per cent of the total class mortality) as against a rate of 10.4 in Class V (i.e. only 13 per cent). *These results show that for environmental diseases Class V exceeds Class I by the enormous figure of* 453 *per cent, while for other diseases the*

difference in comparison, is insignificant. This is the position on the basis of the most up-to-date social class figures we have.

Although it would have been of considerable value to have analysed the trend in these separated causes of death between 1911 and 1930–2, it has, unfortunately, not been possible to do so. Nevertheless, the fact must not be overlooked that the environmental diseases listed in Group B account for the vast majority of deaths after the first month and that, as has been shown in previous tables, inequality grows rapidly from 1–3 months up to the end of the first year. Consequently, an analysis of cause of death would merely add confirmation to confirmation. However, as we are able to make one limited comparison of 1921–3 with 1930–2, we include the figures as a matter of interest (see Table XIV). For this purpose we use two further groups, D and E, the former corresponding (on a limited scale) to Group A and the latter to Group B. Approximately three-quarters of deaths within Group D occur within the first month and 90 per cent of Group E during the succeeding eleven months.

TABLE XIV

Social Class Mortality for Certain Causes, 1921–3 *and* 1930–2

GROUP D

Congenital malformations and injury at birth

	Death rate per 1,000 *legitimate live births*	*%₀ of total mortality in the same class* 1921–3	*%₀ excess of Class V over Class I*	*Death rate per* 1,000 *legitimate live births*	*%₀ of total mortality in the same class* 1930–2	*%₀ excess of Class V over Class I*
Class I	5.7	15	—	7.3	22	—
Class V	5.1	5	—	7.4	10	—

GROUP E

Tuberculous diseases, bronchitis and pneumonia, and diarrhoea and enteritis

Class I	8.1	21	—	5.1	16	—
Class V	39.1	40	383	28.0	36	449

The data in Table XIV call for careful study. If the physical outfit at birth of children born to Class V parents differed vastly from that of children born to those in Class I, then this difference should be revealed in the first half of this table. In fact no such difference is shown. In this respect the figures are unequivocal.

But when we turn to the group of environmental diseases, deaths rooted in bad housing, nutritional deficiencies, defective clothing, ignorance, inadequate medical care and a host of attendant evils, then we see, in full measure, the gulf that divides one social class from another ; the privileged from the under-privileged. What is no less striking than the extent of the differences is the fact that the gap increased after 1921–3 and, for all we know, may still be growing.

CHAPTER V

SOCIAL CLASS MORTALITY IN DIFFERENT PARTS OF THE COUNTRY

WE can now bring to a conclusion the statistical section of this study by a brief survey of the social class differential within different areas of the country. Unfortunately we shall not be able to examine the *trend*, as it is not possible to construct estimates for any period earlier than 1930–2.

TABLE XV

Social Class Inequalities by Regions 1930–2
(*For constitution of regions see Appendix B*)

	Class I	II	III	IV	V
	Infant mortality per 1,000 *legitimate live births*				
Greater London -	29.6	39.8	49.7	62.3	71.2
Rem. of South East -	33.1	38.4	41.6	46.8	54.0
North 1 - -	37.8	50.3	71.9	86.8	100.6
North 2 - -	39.2	52.6	61.7	73.1	82.3
North 3 - -	34.4	46.9	67.8	74.7	84.6
North 4 - -	31.3	51.2	66.8	78.9	93.3
Midland 1 - -	32.7	44.5	58.9	63.8	77.7
Midland 2 - -	35.6	45.0	61.2	64.5	76.0
East - - -	29.9	41.7	46.7	55.9	61.5
South-West - -	35.0	43.7	45.4	54.4	58.6
Wales 1 - -	43.1	52.2	70.0	73.0	77.4
Wales 2 - -	38.6	54.5	61.7	69.6	70.3

Reading Table XV horizontally it is seen that mortality increases with descent in the social scale. The importance of these figures is that they should help to dispose of the suggestion that variations in all types of mortality exhibited by different areas of the country may be a product of climatic differences. A high infant death rate in the North may seem at first sight to have some connection

with climate, but when we find how the rate is made up, as in Table XV, it becomes clear that a harsher climate cannot explain all the differences between Classes I and II and IV and V. Later in this chapter we refer to work by Lewis-Faning in which he uses the term " geographical and racial factors " as a possible explanation of high mortality in the North. But if this factor of climate were really significant we should expect to find that Class I infants in the North had a much higher death rate than Class I infants in the South. But this is not the case. Lancashire and Cheshire (North 4) for instance, with a notoriously damp climate and a heavy smoke belt resulting in lack of ultra-violet radiation, have a lower Class I rate than the South West and South Wales with their more favourable climate. Moreover, the Class I rate for North 4 is lower than that for the whole of the country. Even Durham and Northumberand (North 1) return a Class I rate only a little higher than for the South West and one lower than that for South Wales. The large differences between the Class V rates for the North and the South can be attributed, in the main, to the much more depressed economic conditions of the poor in the North. Moreover, a community in poor circumstances is more likely to be affected by a severe climate than a similarly placed community living under more favourable climatic conditions. If the sensitive child cannot be adequately protected against harsher elements, then clearly a higher death rate is likely to result. But that northern conditions can be overcome is apparent from the Class I figures.

This finding agrees with the regional distribution of social class mortality for men aged 20–65, which shows that Class I men in the North do not show any excess and appear therefore to be unaffected by any differences in climate.

One general conclusion to be drawn from Table XV is that with increasing adverse economic conditions (in the different regions) the range between Classes I and V becomes wider. Looking at the regional extremes we see that while Class V mortality exceeded that of Class I in the South-East by 63 per cent and the South-West by 67 per cent, in North 1 the excess was 166 per cent and in North 4 it was 198 per cent.[1] Translating these figures into words we may say that where a region or district is economically depressed, social class differences *within* that area are greatly accentuated. This principle operating in poverty-stricken areas of England and Wales can also be found in the mortality indices of the more uncivilised and backward countries of the world. These countries can generally be recognised not only by the height of their absolute death rates but also by the enormous social class differences they display.

The Class I infant mortality rate for the whole of the country is, as we have seen, as low as 33 per 1,000 legitimate live births, but the same class for the two divisions, Greater London and the East, returns considerably lower figures, namely, 29.6 and 29.9 respectively. In this connection it is instructive to recall that the Senior Medical Officer of the Ministry of Health, when giving evidence before the Barlow Commission on 16th November, 1938, remarked that " an infant mortality rate of 29 was far beyond the wildest dreams of this country so far."[2]

[1]As already pointed out, it is not possible to carry the study of social class mortality beyond 1930–2. A further study (unpublished) by the writer, of aggregate infant mortality in all County Boroughs of England and Wales in relation to unemployment and poor relief indices for the period 1927 to 1938, indicates that *excess* mortality in the North and Wales (above County Boroughs in the South-East) has *increased* since 1930–2.

[2]Report of the Royal Commission on the Geographical Distribution of the Insured Population. Minutes of Evidence. 1938.

To understand the extent to which mortality from preventable causes contributes to the class differences within the various regions, we have extracted the death rates for the group of diseases discussed earlier—namely, measles, whooping cough, diarrhoea and enteritis tuberculous diseases, bronchitis and pneumonia and other infectious and parasitic diseases. Table XVI gives the infant death rates from these causes per 1,000 legitimate live births for the two extreme classes.

TABLE XVI

Regional Inequalities in Environmental Causes of Death.

Region	*Class I*	*Class V*	*% excess of Class V over Class I*
Greater London - -	5.5	37.2	576
Remainder of South East	7.4	20.9	182
North 1 - - -	9.6	51.6	438
North 3 - - -	7.2	37.0	414
North 4 - - -	5.6	45.8	718
Midland 1 and 2 - -	7.3	33.8	363
East and South-West -	4.3	21.5	400
Wales 1 and 2 - -	10.4	29.4	183

The data for North 2 have been omitted on account of the small number of deaths involved, while those for the two Midland and Welsh regions and for the East and South-West have been combined. It is not possible to measure the regional social class differences by month of death, for the official statistics do not provide the data.

This table exhibits the wide regional disparities which, when summed, become an excess of Class V over Class I for the whole of England and Wales of 453 per cent. The excess in Lancashire and Cheshire is an illustration of the need for equality in terms of health. And here the need is not expressed in any utopian measure ; it is deliberately based on an index of preventable death. The fact that for every eleven infants of the economically favoured groups

who die from preventable causes, 90 children of the poor die from similar causes summarises, as a matter of life or death, the power of environment and economics. More, much more, could be drawn from these figures but the task demands the wit of a Swift and the humanity of a Farr. It requires (to quote Professor M. Greenwood) that " all this light on contemporary social conditions should not be imprisoned between the covers of a Blue-book, but should illumine our understandings and our hearts, teaching us to work for a better England."[1]

[1] "Occupational and Economic Factors of Mortality", *Brit. med. J.*, 1939, *1*, 862.

CHAPTER VI

SUMMARY OF STATISTICAL CONCLUSIONS

As we have now covered most of the statistical material on social class mortality, we may, as a preface to discussion, summarise the major findings :

1. Despite a considerable fall in the absolute rates, the range of inequality for total infant mortality is as great as, if not greater than, in 1911.
2. The inequality gradient in respect of neo-natal mortality alone does not appear to have changed since 1911. One analysis (Study " A ") showed that the Class V excess over Class I had declined from 106 per cent in 1911 to 66 per cent in 1930–2.
3. For the age groups 1–3, and 3–6 months inequality has grown, the rise being greater for the second group.
4. At 6–12 months inequality reached its peak with a Class V excess of 498 per cent (Study " A "). Most significant of all, while the excess has been reduced for deaths under one month it has risen from 299 per cent to 498 per cent for the group 6–12 months.
5. For all three censal periods it was found that Class V excess mortality increased regularly with age, but while the difference between the excess percentages at 0–1 and 6–12 months was 193 in 1911, it increased to 266 in 1921–3 and 432 in 1930–2.
6. The facts for Classes I and V were, it was found, supported by the development of Classes II and IV.
7. In 1930–2 Class V showed an excess mortality of 61 per cent in a group of conditions intimately connected with ante- and neo-natality, comprising prematurity,

congenital malformation, injury at birth, convulsions and congenital debility ; in a group of environmental diseases relating to later infant life it showed an excess of 453 per cent.

8. A study of an additional group of diseases concerned with ante- and neo-natality and associated with primiparous births showed practically no difference between Class I and Class V death rates.
9. In an attempt to ascertain the trend between 1921–3 and 1930–2 in social class mortality from (*a*) congenital malformations and injury at birth and (*b*) diseases connected with environment in its widest sense, it was found that (*a*) showed little change in the relative position of the two classes as against a rise in the Class V excess under (*b*) from 383 per cent to 449 per cent.
10. Analysing the social class differential for the first year of life within regional areas of the country we found that increasingly adverse economic conditions accompanied a far wider range of inequality. This principle was further illustrated by the fact that for a group of environmental and preventable diseases the Class V excess in Lancashire and Cheshire amounted to 718 per cent during 1930–2.

CHAPTER VII

THE CAUSATION OF DIFFERENTIAL MORTALITY

SINCE Galton concluded that " nature prevails enormously over nurture ", many authorities have held, and their views have been shared in a greater or less degree by a considerable section of public opinion, that extreme contrasts in infantile mortality are substantially the product of a high mortality, being so to speak the outward and inevitable expression of a defective genetic constitution.[1] The findings in the previous chapters do not support this view. If it be supposed that the reproductive efforts of the poorest sections of the community (including as it must the supposedly high fertility of the social problem group) tend to be dysgenic, we should certainly not expect to find a reduction in Class V excess mortality during the first month of life since 1911 and a rise from 299 per cent to 498 per cent for the 6–12 months age group. At this point we may assume that the factor of the

[1]A recent expression of this viewpoint may be found in Public Health Report No. 86 " A Study of the trend of Mortality Rates in Urban Communities of England and Wales, with Special Reference to ' Depressed Areas ' ", published in 1938 by the Ministry of Health. The Author, Dr. E. Lewis-Faning, writes : " The conclusion I arrive at from this research is therefore that it is not reasonable to attribute to the industrial depression of 1929–33 any deterioration of mortality rates in the depressed areas. At first sight one might be inclined to regard this as a matter for congratulation, that at least the mortality of the people had not suffered by reason of the economic crisis. But tracing backwards through the years the history of mortality in these districts, one is almost inclined to wish that the excessive mortality depicted *could* (Author's italics) be shown to be related to the events of 1929–33 as effect to cause. For, were that really the case, the lifting of the depression might be expected to cure the evil. My analysis shows that we are concerned with a more deeply rooted evil, possibly involving genuine geographical and racial factors."

inheritance of unhealthy qualities has not grown in importance in Class I. Of course, if it has, our subsequent reasoning would fall to the ground.

Rejecting then this assumption, we are left with environment, in the widest sense of the term, as the greater determinant. We may here quote the Registrar-General who, in 1937, wrote: "It is incredible that hereditary selection or differing standards of the mother's health, which have been shown to be highly correlated with infant mortality as a whole, should be more operative in later than in earlier infancy and it must be concluded, therefore, that the great bulk of the excess of urban over rural mortality is directly due to environmental and economic influences."[1] The implication clearly is that if hereditary factors were responsible for the differences between urban and rural mortality then such differences should be shown during early infancy. In other words, the difference should be at its peak within the first months, as the unfit were being weeded out, and the curve of death should then decline with some regularity, reaching its lowest level during the last three months of the first year.

This conclusion, that hereditary differences cannot explain the contrasts between urban and rural mortality, is highly significant and we submit that it applies with equal force to the wide differences in social class mortality. It is noteworthy that the age at which peak mortality occurs is the same in both cases—namely, at the end of the first year of life, when environmental agencies are exerting their greatest influence. Cheeseman, Martin and Russell have shown that for a group of diseases which they describe as non-preventable (although as we shall indicate later a large number of deaths from prematurity *are* preventable) the difference during the decennium 1921–30

[1]Statistical Review. Text.

between the rates in town and country during the first month of life amounted to 4 per cent, while for children aged 6–12 months the mortality in the county boroughs was 7 per cent worse than in the rural districts. For a second group of diseases, infectious and nutritional, the contrast was vastly greater. The Authors write: "The effects of an unhealthy environment are apparent in the first month of the child's post-natal existence and they become more accentuated with age. The mortality amongst children under one month in the county boroughs is 56 per cent higher than that in the rural districts, and for those aged 6–12 months the excess is no less than 96 per cent."[1] In his study of "The Association between Mortality and Density of Housing"[2] Stocks showed that density per room, at constant density per acre, had the effect of increasing mortality step by step with increasing density (passing from 0.55 to 1.30 persons per room), the influence being greatest at ages 1–5 years, diminishing quickly at school ages, expanding for young adult females (males were not studied) and then steadily diminishing with advancing age. If it be held that the less desirable stocks gravitate (owing to economic inability) into overcrowded rooms, then, as Stocks remarked, the divergence of the mortality curves should increase with advancing age and not diminish. It is significant, then, that the greatest influence of overcrowding occurs in the pre-school and post-school (sensitive adolescent) groups. So far as the effects of occupation after school life are concerned, the Registrar-General concluded that the immediate effects of occupation on men's mortality are of relatively slight importance compared with the

[1]Cheesman, E. A., Martin, W. J. and Russell, W. T. "Disease and Environment" (1938) Biometrika, *30*, 341.

[2]Stocks, P. (1934) *Proc. R. Soc. Med.* (Epid. section), *27*, 1144

environmental and economic conditions of home life and, further, that the worse the general environmental circumstances the greater are the social contrasts in mortality for both sexes.[1]

Right down the ages heredity has been held to be of immense importance in human affairs. The emphasis given to hereditary factors in the Old Testament can be traced in all types of ethnic groups, from the Bantu to the Nordic. And indeed it was natural that they should receive such prominence when little was known about environmental influences. The belief in the importance of heredity can also be traced to parental " wishful thinking ", and to such historical developments as kingship and inherited leadership. These empirical views were strengthened and given some scientific basis when Charles Darwin began to write of heredity in relation to evolution and when his cousin, Francis Galton, from a study of fifty-five pairs of twins, coined the term " eugenics."[2]

Recent studies of identical and fraternal twins, however, and the progress made during the last two decades in the field of psychology, anthropology, physiology, and the social sciences, have led to a drastic revision of this early and primitive emphasis on hereditary factors. It is now realised that such socially valuable qualities as high intelligence and high ethical standards are so modified and controlled by environmental differences that the geneticist can as yet contribute relatively little to scientific knowledge of their inheritance. To suggest, therefore, that the problem is one of nature versus nurture, as did some early writers, is to misunderstand the whole nature of man. Heredity and environment are not conflicting influences, and it is seldom profitable to discuss their complex

[1]Registrar-General's Decennial Supplement. Part IIa. Occupational Mortality, 1931.

[2]*Inquiries into Human Faculty*, 1883.

inter-action or their relative influence, except in relation to well-defined characters (e.g. eye colour) or in studies of defined differences (e.g. in health and intelligence) between limited and precisely differentiated social groups.

We cannot traverse in this chapter the vast literature on hereditary endowment, intelligence and, that even more elusive quality, personality. Intelligence influences health because the sensible person will take care of himself and his family, whereas the feeble-minded one will not. Moreover, maternal intelligence and efficiency influence the environment and consequently the health of the child.[1] We know that children tend to be like their parents in hereditary capacity, although inherited intelligence has not the full opportunities for development in an evil environment or when nutrition is inadequate. Gray and Moshinsky show that our present social system fails to use vast reservoirs of innate intelligence in the children from lower social strata. Contrary to the usual belief, only about a third of the children whose performance is in the top thousandth come from the higher social and the professional classes, while wage-earners contribute 50 per cent of these children of "exceptional intelligence."[2] The wastage of social personnel is such that "If we take the level of ability attained by approximately 50 per cent of children who are educated at their parents' expense (Intelligence Quotient 130 or Index of Brightness 120) then approximately 25 per cent of pupils educated at the expense of the State attain the same level. When account is taken of the unequal size of these two social groups it is found that the numerical contribution at this level of ability of the last-named group amounts to 80 per cent

[1]See *Poverty, Nutrition and Growth*, Medical Research Council Special Report Series, No. 101, 1926.

[2]Gray, J. L., and Moshinsky, P. (1935), "Ability and Opportunity in English Education" *Sociol. Rev.* 27, 2.

of the total. Of these only a little more than a quarter have the opportunity of proceeding as free pupils to secondary schools. Individuals at this level of ability, whose education is limited to the central school, alone exceed the numbers of all fee-paying pupils of similar ability. In the whole school population more than 50 per cent of the able pupils are without the opportunity of higher education. While only 3 per 1,000 of free pupils in secondary schools fall below the selected level of ability, the corresponding figure for the entire group of fee-paying pupils (all of whom nevertheless enjoy the opportunity of a higher education) is nearly 50 per cent. In other words, taking children of equally high ability, seven fee-paying pupils will receive a higher education for every one free pupil. Conversely, if we consider children who fall below the selected level of ability, for every one free pupil who is afforded the opportunity of a higher education, there are 162 fee-paying pupils who enjoy the same advantages."[1]

Gray and Moshinsky were concerned to show the wastage of high ability in children of the poor by lack of educational opportunities; their work did not however cover the closely related problem of the wastage of gifted children through malnutrition and lack of adequate clothing, rest and house-room. But these environmental agencies are just as important as destroyers of ability in their effect of preventing high intelligence from developing to full capacity. The dictum of Herophilus, "without health wisdom is darkened," still stands. This has been recently demonstrated by the admirable work of Newman, Freeman and Holzinger who concluded that "as regards body weight and intelligence the environmental factor, operating alone in the case of separated identical twins,

[1] "Ability and Opportunity in English Education", in *Political Arithmetic* (Edited by Hogben, L.) 1938.

can produce differences as great as or greater than those produced when both hereditary and environmental factors operate within twin families, as in the case of fraternal twins." Their evidence further showed that, " the role of heredity and environment in producing twin differences is a function of the type of environment. Thus for twins reared together, most of the difference between members of a pair may be due to the nature factor; whereas for twins reared under strikingly different environments, the nurture factors will have a relatively greater influence."[1] Prior to this work Shepherd Dawson found no association between the " non-brain diseases " and intelligence. He concluded that, " children who were suffering from rheumatism, pneumonia, nephritis and other ailments described as " non-brain " did not differ in intelligence from the healthy members of the population to which they belonged.[2] This finding was confirmed by the investigations of N. J. England[3] and Evelyn Lawrence.[4]

Karl Pearson[5] found, however, a small correlation to exist between health and intelligence. The work of Newman, Freeman and Holzinger, which is wider in scope and accordingly greater in value than that of other investigators in the same field, is consistent with the view that a study of the health in adult life of pairs of twins reared apart would show that environment has a far greater

[1]Newman, H. H., Freeman, F. N., and Holzinger, K. J. (1937) *Twins.*

[2]*Intelligence and Disease*, Medical Research Council Special Report Series, No. 162, 1931.

[3]" Health and Intelligence in School Children ", *J. Hyg. Camb.*, 1936, *36*, 74.

[4]" Intelligence and Inheritance ", *Brit. J. Psych.* Mono. Supp. 16, 1931.

[5]" The Relationship of Health to the Psychical and Physical Characters of School Children." Drapers Co. Research Memoirs. Studies in National Deterioration. 1923.

influence in determining health and age at death than heredity. Apart from the effect of changed post-natal environment on intelligence test scores, there is evidence from a number of sources showing that pre-natal environment may be of importance.[1] Hogben summed up the work in these fields when he wrote: "Meanwhile we should scrutinise dogmatic assertions about the relation between genetic variability and social behaviour with due regard to the difficulties of the problem and the paucity of relevant information. Because differences in the intelligence quotient are not much affected by school environment, many writers have given, and still give, support to the view that differences of this kind are a reliable index of inborn endowment. Such assertions are not supported by the results of inquiries into twin resemblance. They overlook the significance of the uterine environment and the period of social training before intelligence tests can be applied. Between birth and the age at which formal education begins there is a protracted and, it may be, highly significant period during which differences of social behaviour may affect the behaviour of an individual. Hence the comparative constancy of a psychological index, such as the intelligence quotient between four and fourteen years of age, offers no presupposition in favour of the view that it measures a characteristic which is little affected by differences in the family environment. In the light of new evidence derived from the study of twins, conclusions about inborn differences based on intelligence test score comparisons of different occupational and racial groups have little scientific validity."[2]

[1]See for example, Lafitte, F. (1940) "The Consequences of Differential Fertility" Population Policies Committee. Chap. IV, Part I (privately circulated).

[2]Hogben, L., *Political Arithmetic*, 1938.

We have touched first on the indirect effects of heredity in relation to health acting through the medium of intelligence. If this factor of maternal intelligence in its effect on child care was of importance in determining infant mortality it is reasonable to suggest that it would exert its greatest influence during the first few weeks of life when the infant was struggling to adapt itself to the experience of a separate existence. But as the differences in infant mortality in the first month between the extreme social classes are not only small but have tended to decline since 1911, we can conclude that its importance has probably been over-emphasised.

When we consider the direct effects of heredity on health we find that, although inheritance influences physical and mental characteristics, the available evidence does not indicate that it has much influence on the health of mankind in general. Up to the present the young science of genetics has largely confined itself to the study of relatively rare defects and abnormalities. Genetic factors are, it has been found, responsible for certain uncommon diseases and it is believed that they play a part in the causation of several commoner diseases. Certain mental diseases, such as schizophrenia and manic depressive psychosis, are transmissible in varying degrees, and inherited predisposition plays a part in the causation of epilepsy.[1] It is probable, indeed, that inborn factors play a part, not demonstrable genetically yet, in the predisposition to all diseases. Diseases known to be inherited to a greater or lesser extent include diabetes mellitus (also affected by environmental factors such as nutrition as was demonstrated by the trend at the end of the 1914 war and by its social class distribution), asthma and other allergic

[1]Landis, C., and Page, J. B. (1938) *Modern Society and Mental Disease.*

diseases,[1] some defects of the endocrine glands, certain diseases and defects of the eyes and ears, and some of the blood diseases. When we sum up, however, we find that all these disorders play an exceedingly small part in the total death roll at all ages including infancy.

In all the major causes of death in this country there is little or no evidence of *important* hereditary factors. At one time, it is instructive to note, it was commonly held that tuberculosis was inherited, but we now know that what is inherited is a predisposition to infection by the tubercle bacillus, which may never become evident but for adverse nutritional and other environmental factors. Just as in the case of tuberculosis, so we may learn during the next few years that man's health, physique and intelligence are conditioned to a greater extent by his nutritional state than is to-day thought possible. Huxley, in 1936, claimed the " strong probability " that most of the differences in physique and intelligence between the social classes are dependent on differences in nutrition rather than on genetic factors. He further maintained that social environment is by far the most important part of the environment of man, and consequently that we ought to concentrate " on producing a single equalised environment in which the inherited qualities of the race can develop under the most favourable conditions."[2] This considered opinion completely accords with our analysis of social class mortality and of the underlying causation of the divergent neo-natal and post-natal inequality trends. The analyses by age, by class and by cause all substantiate the dominance of environment. We must first recognise this if our approach to the problem is to be methodical. It is, indeed, a question of priorities. The fundamental

[1]Bray, G. W. (1934) *The Chances of Morbid Inheritance* (Edited by Blacker, C. P.)

[2]Huxley, J. S. (1936) " Eugenics and Society " *Eug. Rev.*, *28*, 11.

difficulty is that bad living conditions so often produce the same kind of results as bad genes. " We must," as Jennings wrote, " correct the bad living conditions, not only for their directly beneficial effect, but also for the sake of eugenics. When this is done, it will be possible to discover what defects are primarily the result of defective genes, and then to plan measures for getting rid of these genes: measures for stopping the propagation of their carriers ".[1]

[1]Jennings, H. S. (1930) *The Biological Basis of Human Nature.*" New York.

CHAPTER VIII

THE PROBLEM OF DEATHS IN THE FIRST MONTH

In Chapter II (Tables VIII, IX and X) it was shown that, in the period between 1911 and 1930-2, the death rate under the age of one month for All Social Classes had only fallen from 39.1 to 30.2, or by less than one quarter. Further, it was shown that the rate for Class V had fallen somewhat faster than for Class I, so that by 1930–2 the former exceeded the latter by only 66 per cent. This difference, small as it is in comparison with the excess in later infancy, might in part or in whole be accounted for by better spacing of births, the age of the mother at birth, better pre-natal care and other related factors. Woodbury[1] found that when there is an interval of only one year between births the death rate is 50 per cent higher than when the interval is two years or more. He also found that when babies come too close together the first as well as the second suffers. Thus, when a new baby is started before the first baby is a year old, the chances of death are multiplied by three. This is in part due to the loss of care suffered as a result of the mother's energy being drained by a new pregnancy. Woodbury's figures indicate the desirability of a two years' interval for recuperation before starting a new pregnancy. No benefit, however, seems to be derived from extending the interval beyond two to three years. Clearly the better-off classes have had an advantage here over the poor in access to birth-control advice, efficient contraceptives, and so on.

[1]Woodbury, R. M. (1926) *Infant Mortality and its Causes.*

Very early childbearing seems to be particularly harmful to the infant. The infant death rate when the mothers are aged 18 and 19 is considerably higher than the rate when the mothers are aged over 20. This factor may be of some importance in view of the comparatively early age at marriage in the poorer social groups.[1]

According to the Registrar-General's 1930–2 figures, the Class I death rate for under one month was 21.7, while that for Class V was 32.5. To what extent can both these rates be reduced ? The following rates for widely varying occupations and economic classes have some bearing on the answer :

Occupation of Father	*Neo-natal death rate per* 1,000 *legitimate live births*, 1930–2
Doctors	20.5
Army (non-com. ranks)	26.1
Bricklayers' labourers	26.3
Teachers	26.8
Fishermen	27.7
Farmers	29.3

On the whole there is little difference between these rates although they are drawn from very diverse social groups. If hereditary factors exerted great influence one would not expect, for instance, to find bricklayers' labourers placed above teachers. These rates seem to indicate therefore that some reduction is possible, at least, that the rate for All Classes combined might be levelled down to that for bricklayers' labourers.

We can look at this problem from another angle : that of urban versus rural mortality. By 1938 the death rate for the whole of England and Wales had been further reduced—from 30.2 to 28.3, but while that for Administrative London was 23, the rate in Rural Districts was 29. This seems to indicate that the reason for the low

[1]See also Appendix C which discusses this factor of maternal age in greater detail.

rate in inner London is that during the puerperium, and for a week or two later, a large proportion of mothers in the poorest groups enjoy an amount of medical and nursing care that is denied to them at all other times. This may also explain why the children of bricklayers' labourers (essentially an urban occupation) return a lower rate than farmers and fishermen.

In some economically favoured areas the death rate was below 20 in 1938. Croydon, for example, returned a rate of only 17.

To return, however, to the period 1930–2, a comparison by age of English and Dutch urban and rural infant death rates brings out certain interesting facts. In Table XVII, the rates for county boroughs have been compared with those for Dutch towns of over 100,000 inhabitants, and English rural rates with those for Dutch communes of under 20,000 inhabitants. The areas, though not strictly equivalent, are sufficiently like each other to warrant a comparison.

TABLE XVII

Urban and Rural Infant Mortality by Age in Holland, 1930–2, *and in England and Wales,* 1931, *per* 1,000 *live births and per* 1,000 *population aged* 1–2

Age	*Dutch towns over* 100,000	*County Boroughs*	*Per-centage excess*	*Dutch communes under* 20,000	*English rural districts*	*Per-centage excess*
Under 1 month	17.7	33.7	90	25.2	32.1	27
1–3 months -	5.5	12.7	131	8.8	18.0	105
3–6 months -	6.0	11.7	95	8.3	6.3	–24
6–12 months -	8.1	18.9	133	11.3	10.5	–7
1–2 years -	8.6	21.4	149	10.2	11.3	11

The table shows that the death rate during the first two years of life is consistently at least twice as high in English county boroughs as in large Dutch towns. No one

supposes that the inhabitants of Amsterdam are genetically superior to the inhabitants of large English cities, so there would seem to be room for considerable improvement in the English neo-natal death rate. It should be observed that the rate for all classes in the large Dutch communes is well below that of Class I in this country. We are, in Table XVII, evidently confronted with a distribution of infant mortality resulting from most intensive public health work in its widest sense. Not only have the bad influences of urbanisation been vanquished, but the mortality at all periods of infant life has been driven far below the general level of the surrounding country. This astonishing result invites, nevertheless, the reflection that the rural infant death rates, if similar attention was given to the country districts, could undoubtedly be brought down to an equally low or even to a lower level.

Another example of environmental control comes from Chicago where infant mortality has been reduced from 74 per 1,000 births in 1925 to 38 in 1937. This development can be compared with that of Liverpool, where the respective figures were 99 and 82. After an extremely active and sensible campaign by the Board of Health in Chicago—particularly directed towards neo-natal mortality—a fall in this death rate from 37 to 25 in twelve years has been followed by a remarkable drop in infant deaths for the succeeding eleven months from a rate of 37 to 13.[1] These figures should be contrasted with the latest data on social class mortality in England and Wales. In 1925 Chicago's neo-natal mortality practically equalled the corresponding rate for the whole of England and Wales in the year 1911. By 1937, however, Chicago's rate was not much above the 1930–2 rate for Class I in this country. Incidentally, we may remark that Chicago has not

[1]Bundesen, H. N., *et al.* (1938) *J. Amer. med. Ass. 111*, 34.

achieved, by any means, the lowest rate.[1] Oslo and Amsterdam, for example, had by 1936 driven down their infant death rates to 30 and 31 respectively, and neo-natal mortality to 16. This reduction in infant mortality should be compared with the figures given in the first few pages of this study where it is indicated that in 1891–5 Oslo's rate of 158 exceeded that of London's, then 156. By 1936, London returned a neo-natal rate of 24 (as against 16 in Oslo) and 42 for the remaining eleven months as compared with 15 in Oslo.

We can further refine the neo-natal death rate and, incidentally, gain some idea of the scope for improvement by dividing, as in Table XVIII, the first month into a number of periods:

TABLE XVIII

Age Distribution of Mortality under One Month
(England and Wales)
Rates per 1,000 *live births*

	Days 0–1	Rate % of 1906–10	Days 1–7	Rate % of 1906–10
1906–10	11.5	100	13.0	100
1911–15	11.4	99	12.7	98
1916–20	11.0	96	12.4	95
1921–25	10.4	90	11.3	87
1926–30	10.3	90	11.5	89
1931–35	10.7	93	11.7	90

	Weeks 1–2	Rate % of 1906–10	Weeks 2–3	Rate % of 1906–10	Weeks 3–4	Rate % of 1906–10
1906–10	5.8	100	5.7	100	4.2	100
1911–15	5.7	98	5.3	93	3.9	93
1916–20	5.6	97	4.7	83	3.4	81
1921–25	5.0	86	3.9	68	2.8	67
1926–30	4.3	74	3.2	56	2.4	57
1931–35	3.9	67	2.9	51	2.2	52

[1]The figure for 1940—published since the above was written—was 28.8. See Hess, J. H., and Lundeen, C. (1942) *The Premature Infant*, on the lessons of the Chicago experience.

The death rate for the first day shows scarcely any change since 1906–10. If we assume that the causes of infant mortality may be divided into two broadly distinct categories, (*a*) those depending upon the fitness of the infant to live at all, and (*b*) those arising from the unfitness of the surroundings to support infant life, then we may suggest, although it is debatable, that the majority of deaths in the first day fall within category (*a*). For 1–7 days we observe that there has been some slight reduction in the death rate since 1906–10. As the total rate for the first week was, in 1931–5, 22.4 and in view of the evidence of lower rates in England as well as abroad, it would seem that there is scope for further improvement in respect of 1–7 days. The considerable fall that has already occurred in the rates for the second and subsequent weeks, in conjunction with the fact that they have by no means touched bottom, suggests room for further reductions. It is a great pity that such statistics for ages under one month have never been collected for the social classes and different occupations, because we might have learnt much of value from them.

As regards causes of death in the first month (analysed by social class in Tables XIII and XIV), we may quote McNeil who, in discussing prematurity as the greatest single predisposing factor in neo-natal deaths, concluded that the death rate could be reduced in two ways: by better ante-natal care of the mother and by more skilled nursing and dieting of the infant.[1] So far as nursing is concerned, it is clear from McNeil's study and from the work of the Chicago authorities[2] that it is not sufficient to provide modern hospitals and separate nurseries. A much

[1]McNeil C. (1940) " Deaths in the First Month and the First Year ", *Lancet, 1,* 819.

[2]In Chicago prematurity must be notified within an hour of birth.

higher and stricter standard of antiseptic routine is required if the infant is to be protected from infection. Macgregor, in her classical study of neo-natal pneumonia mortality, arrives at the same conclusion and points out how necropsy often indicates that pneumonia, meningitis, and septicaemia are incorrectly labelled on the death certificate as prematurity or congenital debility.[1] This factor of infection applies—possibly in varying degrees—to all social classes. One reason which has often been advanced to account for a greater incidence of infectious diseases is that of climate (see, for example, the discussion of regional inequalities on page 52, and also earlier references to the work of Lewis-Faning).[2] A considerable part of the social Class V population (with a neo-natal rate of 32.5 in 1930–2) resides in the industrial North and in South Wales, and as late as 1938 there were many towns in these regions with rates of well over 40. Yet that this factor of climate (if it is indeed important) can be overcome, is demonstrated by the experience of Holland with its high population density, damp, misty climate and an infant mortality rate of 38.[3] Moreover, if correction is made for density (that is to say if the increased density per room and per acre is held constant), latitude (passing from zone 50° in the South to 56° in industrial Scotland) is seen to have but a small effect on infant mortality.[4]

[1]Macgregor, A. R. (1939) *Arch. Dis. Childh, 14,* 323. See also Miller's discussion of faulty certifications (*Lancet*), 1942, *11,* 269.

[2]Lewis-Faning, E. (1938) " A Study of the trend of Mortality Rates in Urban Communities of England and Wales, with Special Reference to ' Depressed Areas ' ", *Public Health Report* No. 86.

[3]As long ago as 1914 the infant mortality rate for the Orkneys, Shetland and Northern Scotland was as low as 67 per 1,000 births. See also Table XX, which shows the fall in infant mortality since the last century in England and Wales, Scotland and Holland.

[4]See Stocks, P. (1934), " The Association between Mortality and Density of Housing " *Proc. R. Soc. Med.* (Epid. section), *27,* ii, 1136.

In the United States Herrington and Moriyama have demonstrated that climatic conditions are unimportant. They found that influenza in the Southern States was associated with socio-economic factors and that when these factors were held constant the climatic relationship practically disappeared. They also showed that the incidence of bronchitis and pneumonia under the age of one year was not related to climate.[1] In England with its more uniform climate we nevertheless find enormous disparities—e.g. that the infant death rate from bronchitis and pneumonia in Class V in Durham and Northumberland exceeds that of Class I for the whole of England by 953 per cent. Stocks, after examining the influence of the various factors, concluded that, apart from special effects of diminished sunshine on children, there is no real evidence that the differences in average mortality between different parts of Great Britain have anything to do with climate.[2]

As we have already remarked, McNeil, with other authorities, believes that premature death can be greatly reduced. It certainly has been reduced in other countries, for we find that during the five years 1932–6 the death rate from prematurity and debility was twice as high in England and Wales as in Holland and New Zealand and was greatly in excess of the rates for Australia, Norway, the United States of America, Denmark and Switzerland. Barnes and Willson, writing on experience in the University of Michigan Hospital, report a very considerable fall in the death rate from prematurity. The main factors in this achievement appear to have been better and more nursing care, more and better incubators and a freer use

Herrington, L. P., and Moriyama, I. M. (1939) "The relation of mortality from certain respiratory diseases to climatic and socio-economic factors." *Amer. J. Hyg.*, *29*, 111.

Stocks, P. (1934) "The Association between Mortality and Density of Housing." *Proc. R. Soc. Med.* (Epid. section), *27*, ii, 1138.

of oxygen.[1] From another angle, that of high and low rates in different County Boroughs of England and Wales, the Registrar-General concluded that " large numbers of these diseases " (prematurity and congenital causes) " are due to remediable causes and that considerable improvement in the death rate from this group of causes is possible of achievement in many large towns.[2]

The variation in the death rates (per 1,000 legitimate live births) from congenital malformations among the social classes in 1930–2 was, moreover, only trifling :

Class	I	5.0
	II	5.4
	III	5.6
	IV	5.7
	V	5.4

These rates can be contrasted with those for bronchitis and all forms of pneumonia :

Class	I	2.8
	II	6.1
	III	11.2
	IV	14.5
	V	18.8

Collis is of the opinion that 20 per cent of neo-natal deaths are preventable.[3] This is borne out (apart from the experience of other countries) by Table XIII which illustrates that under Group A diseases Class V mortality exceeds Class I by 61 per cent. Additional confirmation of the wastage of child life within the first month is provided by a study of Group D diseases in the same Table, showing that for congenital malformation and injury at birth Classes I and V death rates do not differ.[4]

[1]Barnes, A. C. and Willson, J. R. (1942) *J. Amer. Med. Ass.*, *119*, 55.
[2]Registrar-General's Statistical Review, Text, 1935.
[3]Collis, R. (1941) " Saving the Premature Baby ", *Lancet*, *1*, 91.
[4]Stocks P. in his paper " The Association between Mortality and Density of Housing ", *Proc. R. Soc. Med.* (Epid. section), 1934, *27*, 1145, suggested that the congenital death rate " is probably a fair index of the relative mortality to be expected throughout the early part of life in the stock from which the infants come, given the same environment."

We can look at this factor of congenital causes in another way. It is known that density per room is highly correlated with social class but when the congenital death rate is grouped according to (*a*) more than one person per room and (*b*) less than one person per room, there is little difference between the two death rates: thus, for 1930–2, (*a*) exceeded (*b*) by 6 per cent in respect of all county boroughs in England and Wales.[1] All this substantiates Collis's statement that premature infants, if born without congenital stigmata and if given special care, will grow into normal adults. Baird,[2] writing on experience in Aberdeen, states that among the well-to-do neo-natal mortality due to prematurity is 10 per 1,000, as against a rate of 20 for the rest of the city ; and he also finds that among the poor, where diet is deficient and adequate rest often unattainable, premature labour is much more frequent than among the better favoured groups.

When the full results of this valuable investigation into the causes of stillbirth and neo-natal deaths in Aberdeen during the years 1938–40 were published,[3] stillbirths were combined with neo-natal deaths in order to obtain some idea of the number of children who reached the stage of viability and yet died as a result of some complication of pregnancy, labour or the puerperium. The investigation covered 3,427 booked cases in Aberdeen Maternity Hospital, 616 emergency cases, 708 booked cases seen in nursing home practice and 250 cases seen in specialist practice. A rough economic grading was therefore obtained. The combined stillbirths and neo-natal deaths in private specialist practice, hospital practice and domiciliary practice were found to be 12 per 1,000, 54.5 per

[1]Registrar-General's Statistical Review, Text, 1934.

[2]Baird, Dugald (1941) "Saving the Premature Baby", *Lancet, 111,* 160.

[3]Baird, Dugald, and Wyper, J. F. B. (1941) " High Stillbirth and Neo-natal Mortalities ", *Lancet, 111,* 657.

1,000 and 78.5 per 1,000.[1] The authors remark that the " low figure in the first group is probably due to a combination of favourable factors—economic, nursing and medical. In the second group the nursing and medical factors are favourable but economic conditions are unfavourable. In the third group the high figure indicates the need for an all-round improvement in medical and nursing care as well as economic conditions." One significant finding was that the cause of death among full-time babies in booked hospital cases was undetermined in by far the biggest group, in contrast to the nursing-home cases or the emergency hospital cases where the commonest cause of death was trauma following difficult labour. The almost complete absence of the unexplained factor as a cause of death in nursing-home and specialist practice, and the difference in the incidence of premature labour, points to the importance of economic factors, the most important of which would be deficiency in diet and lack of adequate rest among the poor. The number of cases analysed in the whole study were small and the results (as the authors recognise) must accordingly be accepted with reserve ; but their general conclusion—namely, that " there is a large wastage of child life (approximately 80 per 1,000 births) associated with childbirth in Scotland, intimately connected with unfavourable economic conditions, and malnutrition and fatigue in the mother," is immeasurably strengthened by the evidence brought together in this chapter. The present writer and Baird and Wyper reached their conclusions without knowledge of each other's work, and all three found that there is ample scope for a reduction in deaths under the age of one month.

Quite apart from problems of prematurity and diet and the risk of infection during the first month of life, it is

[1]The national incidence of stillbirths is considered in Appendix C.

apparent from a study of services in those countries that have successfully reduced their neo-natal mortality that our doctors, midwives and nurses are still insufficiently trained—especially in infant hygiene and nutrition. It was not until 1923 that the General Medical Council recommended the inclusion of infant hygiene in the revised medical curriculum. Even so, medical schools still make very inadequate provision for instruction in this and allied subjects. Another significant fact is that there is no paediatrician on the Central Midwives Board. But while we may greatly reduce the risks of infection and increase the skill of those whose work it is to care for both mother and infant, we shall not have solved the problem of high neo-natal mortality unless at the same time we establish, in the first month, sound digestion and good nutrition in the infants of all classes, particularly Classes IV and V. (See also pp. 85–7.)

From all the available evidence it is clear that in neo-natal mortality, as in infant deaths as a whole (and indeed in most matters concerning man's development), we have a problem of multiple causation. But because the problem is multifactorial that does not mean that we cannot isolate the major determinants. This we have attempted, and from our study emerges the fact that, contrary to widespread belief, there is considerable scope for a reduction in the neo-natal death rate in this country, particularly in the field of prematurity and infection. This reduction can be achieved in all social classes despite the decline in the differential since 1911. The nearer we are to equalising the environment during the first month of life, as well as in later life, the surer we shall be in stating that the differences remaining are genetic in their origin. At present the best we can say is that although innate qualities exert some influence there is little evidence to show that their

effect in determining neo-natal mortality varies very much as between the different social classes. What variation there is, and indeed much of the existing incidence of abnormality and disharmony, is probably the result of inherited predisposition to mental and physical disease which only flowers under the various stimuli of an evil environment. Without such adverse environment, in its widest sense, the disease or defect may never appear.

CHAPTER IX

THE CASUALTIES OF ENVIRONMENT

" How the people of England live is one of the most important questions that can be considered ; for it is the complement of the primary question teaching men how to live a longer, healthier, and happier life. Armed with this golden bough we may enter the gloomy kingdom of the dead . . . "

DR. WILLIAM FARR *writing from the General Register Office on Feb. 5th,* 1875.

WE have seen that after the ante-natal and natal causes of death have spent their force another and quite different lethal agent begins to function. After the first month the infant has left the care of the doctor and the hospital, and with advancing age the environment of the home and attendant social conditions become more and more pronounced. McKinlay's finding that the health of the mother is most closely related to the post-natal death rate, less with the neo-natal rate, and least of all with the still-birth rate,[1] suggests that not only does the relentless pressure of socio-economic environment grow with the age of the infant but that it also operates in the case of the mother. A gradual deterioration in the mother's health would obviously react unfavourably on the infant, particularly through the medium of maternal efficiency. As Marjorie Spring Rice remarks, " It is of course a vicious circle . . . The husband and children must come first and as more of her (the mother's) energy and strength are consumed in this first care, she is obliged to omit the extra effort needed for herself."[2] This factor of the mother's

[1]McKinlay, P. L. (1929), " Some Statistical Aspects of Infant Mortality ", *J. Hyg., Camb., 28,* 4.

[2]*Working Class Wives,* 1939.

health is but one of the direct and indirect causative agents in the determination of an increasingly pronounced social class differential. All these factors, maternal efficiency, lack of care, overcrowding, inadequate clothing, temperature, and most important of all, nutritional deficiency, in their interaction upon one another open the way to infection and premature death. Seebohm Rowntree has shown, in his study of York,[1] that of all children of the working classes (approximating to the Registrar-General's Classes III, IV and V) 52.5 per cent of those aged 0–1 were living in poverty in 1936—a relatively prosperous year. Moreover, the standard used by Rowntree is extremely low ; it allows no fresh milk whatever, and it demands an extraordinary knowledge on the part of the housewife of the nutritive content of different foodstuffs, quite apart from the baking of all bread at home. Since everyone who survives has at one time been aged 0–1 it follows that of each generation of workers at least 52.5 per cent will have spent the first part of their lives in poverty irrespective of what happens to them afterwards. There is no reason to suppose that what is true of children born in York in 1936 is not also true of children born before that year, and that what obtains in York does not also apply to the rest of England and Wales. Rowntree also made a study of infant mortality according to the weekly income of the father and his results compare well with the Registrar-General's rates. He found that when the income was below his poverty standard of 43/6 per week (after paying rent and rates) for a man, wife and three dependent children, the infant death rate was 77.7. The Registrar-General's figure for the lowest economic group (Class V) is 77.0. In the United States we find that Sydenstricker, in reviewing the mass of statistical data

[1] *Poverty and Progress*, 1941.

provided by the United States Children's Bureau on the incidence and causation of post-natal infant mortality concluded : " From data such as these, although they do not take into account heredity as a factor, it is difficult to escape the conclusion that the major determinant in the mortality of infants over one month of age is a complex of environmental conditions among which economic status of the family is a dominant factor."[1] As he regretfully notes, the United States Census Reports do not contain the mine of valuable information on differential mortality by income grouping provided by the Registrar-General in this country. He proceeds in his book to review this information and on the subject of innate characteristics writes : " How far inheritance of physical constitution is associated with social class, especially in a country where the classes are influenced by caste, it is impossible to say ; but it is equally impossible to deny the influence of environment upon the death rate from tuberculosis, for example."[2] It should be noted that this was written before the 1930–2 material was published and that no examination was made of the *trend* in social class infant mortality by age and cause of death.

To revert to opinion in this country, we may cite hospital experience. Graham, writing from the Royal Hospital for Sick Children, Glasgow, states : " In large industrial centres, nutritional (iron-deficiency) anaemia affects about two-thirds of the infant population in the 6–12 months age period because of the absence during this time of iron-containing foods in the diet. Rickets, albeit in a mild form, affects almost half the same infant population. Its cause is well enough known. In the presence of one or more of these conditions infection occurs and the

[1]Sydenstricker, E. (1933) *Health and Environment.*
[2]*ibid.*

death is attributed to the infection. No mention is made, even by the pathologist, of the part played by the nutritional defects. But there is abundant evidence to show that marasmus, nutritional anaemia, and rickets greatly predispose to infection—and they are preventable."[1]

The extent to which infant disease and maternal morbidity is preventable has recently been demonstrated by a nutritional experiment conducted by Drs. J. H. Ebbs, F. F. Tisdall and W. A. Scott, of the Departments of Paediatrics and Obstetrics, University of Toronto, and published in the Journal of Nutrition.[2] The summary reads as follows :

> The pre-natal diets of four hundred women with low incomes were studied. One group found to be on a low diet was left as a control, a second group on a low diet was improved by supplying food during the last three or four months of pregnancy, and a third group, found to have moderately good pre-natal diets was improved by education alone. During the whole course of pregnancy the mothers on a good or supplemented diet enjoyed better health, had fewer complications and proved to be better obstetrical risks than those left on poor pre-natal diets. The incidence of miscarriages, stillbirths, and premature births in the women on poor diets was much increased. The incidence of illness in the babies up to the age of six months and the number of deaths resulting from these illnesses was many times greater in the Poor Diet Group.
>
> While it is recognised that there are other important factors in the successful outcome of pregnancy, this study suggests that the nutrition of the mother during the pre-natal period influences to a considerable degree the whole course of pregnancy, and in addition directly affects the health of the child during the first six months of life.

Whereas 21 per cent of the babies in the Poor Diet Group suffered from frequent colds during the first six months of life, only 4.7 per cent were so affected in the Supplemented Good Diet and 4.7 per cent in the Good Diet Groups. Corresponding results were also obtained in respect of pneumonia, rickets, tetany and dystrophy. As for the mothers, the complications during labour in the Poor Diet Group were chiefly 6 per cent miscarriages,

[1]Graham, Stanley (1940) *Lancet, 1,* 1107.
[2]1941, *22,* 514.

8 per cent premature births and 3.4 per cent stillbirths, while in the Supplemented Good Group there were only 2.2 per cent of premature births and no miscarriages or stillbirths.[1] The mothers in the Supplemented Good Diet Group proved to be better obstetrical risks. The average duration of labour was five hours shorter in this group than in the Poor Diet Group. "We noted," write the investigators, "a marked improvement in the general mental attitude of the patients in the Supplemented Group." This investigation was on a small scale and some of the results are not statistically significant. Nevertheless the general conclusions point in the same direction as other studies. This is the important fact. Moreover, there is nothing in the Toronto inquiry or in the investigation sponsored by the People's League of Health which contradicts the conclusions of this study.

In the light of the foregoing discussion we may, as in Table XIX, re-examine the figures of post-natal mortality for 1930–2 :

TABLE XIX

Infant Death Rates per 1,000 *live births in England and Holland* (1930–2)

Period	*Reg.-Gen.'s Class I*	*Reg.-Gen.'s Class V*	*% excess Class V over Class I*	*Dutch towns over* 100,000	*English County Boroughs*	*% excess County Boroughs over Dutch Towns*
1–3 months	4.3	13.1	205	5.5	12.7	131
3–6 ,,	3.1	12.0	287	6.0	11.7	95
6–12 ,,	3.6	19.4	439	8.1	18.9	133
1–2 years	4.5	23.0	406	8.6	21.4	149

It is surely a reflection on our social system when the death rate for the second year in English County Boroughs

[1]Utheim-Toverud in Norway has obtained similar results, his respective figures being 27.2 per cent and 3.1 per cent (*Acta paediatr.*, 1939, *24*, 116). An investigation in the London area produced evidence showing the benefit to the infant of an improvement in the diet of the pregnant mother and a lessening in the risk of prematurity. (Interim Report of the People's League of Health, *Lancet*, 1942, *2*, 10.)

exceeds that for large Dutch cities by 149 per cent, particularly when some social groups in England have achieved rates well below Dutch experience.

The comparison is seen to be even more unsatisfactory when it is recalled that the Dutch rates have not always been below the English (see Table XX).

TABLE XX

Infant Death Rates per 1,000 *live births in Holland, England and Wales and Scotland*

Year	*Holland*	*England and Wales*	*Scotland*
1880–9 - -	183	—	—
1881–90 - -	—	142	119
1910–19 - -	95	—	—
1911–20 - -	—	100	106
1936–8 - -	37	56	77

The most striking thing about this Table is first the enormous decline of infant mortality in Holland and secondly the manner in which Scotland and England and Wales have been overtaken. The Scottish experience is sufficiently disturbing to warrant a full-length study. One fact stands out—namely, that the relatively low rate in the nineteenth century (before a large proportion of Scotland's population was living in industrial communities) does not support the view that climatic conditions exert an important influence on infantile deaths.[1]

McNeil drew attention to these facts in an article[2] in which he pointed out the scope for reduction in the English stillbirth and neo-natal rates as well as in deaths during later infancy.

[1] In this connection it is worth noting that the infant mortality rate in Iceland was 28.3 per 1,000 live births in 1938 and 37.3 in 1939.

[2] "Child Health in Holland, England and Scotland," *Brit. med. J.*, 1942, *2*, 4239.

TABLE XXI

Stillbirth and Infant Death Rates per 1,000 *live births in England and Wales and Holland* (1938)

	Stillbirth	*Neo-natal*	1–12 *months*
Holland - -	25	21	15
England and Wales	38	26	27

In 1938 the total infant death rate for England and Wales was 53, while during 1930–2 (the period of our social class investigation) it was 62. The war it seems has reversed the downward trend, for by 1941 the rate had risen to 59. It is not unreasonable to assume therefore that the 1930–2 social class distribution is much the same to-day. Holland is not alone in achieving a greater reduction in infant mortality than in England and Wales. In recent years the U.S.A. has steadily forged ahead of this country. In 1920–2 the average rate of the two countries was equivalent (80 per 1,000) and in 1928–30 there was still no appreciable difference, with 65 in the U.S.A. and 66 in England and Wales. By 1936–8 the U.S.A. had fallen to 50 but England and Wales only to 57. It is also instructive to note that, by 1939, rates of less than 35 per 1,000 were recorded in such cities as Chicago, San Francisco, Minneapolis and New York,[1] while 37 per 1,000 was reached during 1937–9 in the states of Connecticut, New Jersey, Oregon and Washington. The improvement of child mortality at ages over one year in the U.S.A. has been even more favourable than that in infancy. At ages 1–14 it was 4.8 per 1,000 population in 1920 and only 1.9 in 1938—a reduction of 60 per cent in less than 20 years. The corresponding rates for England and Wales were 4.3 in 1921 and 2.3 in 1938.

[1]In 1940, the infant deaths per 1,000 live births in New York were 33 (white population) and 55 (coloured).

It is unfortunate that there is no material for the U.S.A. which can be compared with the social class statistics for this country. But we do find that the death rate at ages 1–12 months among the Negro population of the U.S.A. during 1930 was not much higher (51.9) than the bottom economic class in this country, while the following U.S.A. rates for children of mothers born in the countries named were all considerably lower :

Italy	-	30.4
Germany	-	18.4
Scandinavia		17.4
Ireland	-	25.9
Poland	-	35.3

When one remembers the economic condition of the majority of Italian, Irish and Polish immigrants in the States, their low rates afford a sad reflection on the neglect of the under-privileged among our own people. It is something more than that ; it is indeed an indictment of our social system when we find, for example, that in 1936 the infant mortality rate in Glasgow exceeded that for Chicago by 180 per cent, Oslo 276 per cent, and Stockholm by 290 per cent, and that it was in fact higher than the corresponding rates for Tokio, Buenos Aires and Montevideo.

Finally we may make a comparison with one of the Dominions. Although we find that the total Class I rate for the period 1–12 months is as low as 11.0 (as against 44.5 for Class V), yet by 1931–2 New Zealand had reduced her rate to 10. We have to go back thirty years (to before 1905) to find in New Zealand a rate as high as that for Class V in 1930–2 (44.5).

We have shown repeatedly that these enormous disparities after the first month are brought about by causes of death which are definitely preventable. In illuminating this and the extent of the differences in the actual death

rates we have perhaps tended to under-emphasize the factors of morbidity and higher levels of health in later life. Let us therefore be quite clear about this. A high death rate means a high " damage rate ". The reduction of infant mortality is not an isolated phenomena but a hint of a vast improvement in the conditions of child life and in particular the incidence of sickness and ill-health during infancy and later life. This can be visualised when we examine the historical course of mortality. When we compare the general mortality rates by age over a long period of years, we find, in all countries where infant mortality has been materially reduced, an important decrease of mortality also at other ages. An example of this has already been given from U.S.A. This decrease is frequently greater than in infancy, as is shown by an examination of the percentage decrease of mortality by age in England and Wales and in Sweden from 1841–50 to 1926–30. The reduction of the infant mortality during these eighty years amounted in Sweden to 62.4 per cent and in England and Wales to 55.6 per cent. Still higher percentages of reduction were found in Sweden up to the age of 9 : in England, even up to the age of 40 or 44. We shall not attempt here to discuss the reasons for this difference between Sweden and England, which is probably mostly due to the degree of urbanisation and the spread and trend of tuberculosis. In both countries, in spite of these important differences, it is evident that the reduction of mortality in infancy and childhood has not been followed by an increased mortality in later life. We must therefore conclude that the massive reduction of infant mortality since 1841–50 has not in the least impaired any selective effect which it might have had. It must be that the surroundings have become less hostile so as not to demand a large fee of entry possessing no

biological utility. The general impression gained from the available material is that the more easily a generation passes through infancy and childhood, the better are its chances of survival later on. This conclusion tallies with what we know—that a high mortality in early life corresponds with a large amount of infectious disease of various kinds which may leave the organism permanently impaired and therefore less resistant later on in life. A very low infant mortality, on the contrary, is selective, because it eliminates, in the first place, the infants unfit to live at all. " It used to be assumed," wrote Sir John Orr, " that the poor represented an inferior strain of the population and that the high infantile mortality among the poor was Nature's salutary method of eliminating the unfit. This view, which would absolve us from doing anything to abolish poverty, is not supported by facts. Where the infantile mortality rate is highest, the survivors are of the poorest physique and vice versa. The factors which make for high infantile mortality seem to be the same factors which make for ill-health and poor physique among the survivors. There is no doubt about the importance of heredity, but we cannot dogmatise about inherited differences in health and physical fitness between the well-to-do and the poor until environmental conditions affecting the health and physique are comparable in both classes. Of these environmental factors, nutrition seems to be of prime importance, because the results of feeding tests show that when the diet of the children of the poorer classes is improved, making it more like that of the well-to-do, the rate of growth of the children approaches that of children of the well-to-do classes, and there is a noteworthy improvement in health and physique."[1] We can therefore say that the enormous scope for a reduction in

[1] *Nature*, 1939, *144*, 734.

the infant mortality rates (especially during 1–12 months of age) amongst Social Classes III, IV, and V can only lead to immeasurable benefits in public health with all that improved health implies in the fields of efficiency, adaptability, democratic initiative, harmonious living and the enjoyment of creative leisure.

Yet despite the irrefutable nature of this evidence one still encounters outmoded and unsubstantiated opinion, as expressed by Sir Robert Hutchinson, then President of the Royal College of Physicians, London, when he wrote : " One cannot help wondering, indeed, whether the stinting production and careful saving of infant lives to-day is really, biologically speaking, as wholesome as the mass production and lavish scrapping of last century."[1] Is it possible even to pretend that the wastage of child life in the nineteenth century is preferable to the greater care of infants to-day ? Can anyone, particularly medical men, wish to see a return to the days of which Adam Smith wrote when he remarked that " a half starved Highland woman frequently bears more than twenty children . . . but poverty, though it does not prevent the generation, is extremely unfavourable to the rearing of children . . . It is not uncommon in the Highlands of Scotland for a mother who has borne twenty children not to have two alive."[2] Apart from his predeliction for the romantic " wholesomeness " of the nineteenth century, what in effect Sir Robert Hutchinson is saying is that those places in the world to-day such as Africa, India and Asia, where control has not yet been gained over the barbarism of high birth and death rates, are more " wholesome " than the Western democracies. A democratic way of life surely implies a large measure of control by man

[1]" Paediatrics, Past, Present and Prospective, *Lancet*, 1940, *2*, 799.
[2]*The Wealth of Nations*, Book I, 1776.

over his environment, and unless we are to revert to the wasteful habit of the lower primates a controlled birth rate must go hand in hand with a controlled death rate.

Sir Robert's thoughts to-day are not by any means new; they were common in the last century of which he speaks. Indeed, in 1874, the President of the Society of Medical Officers, alarmed by the spread of drains and water-closets, argued that, " an increase in the rate of mortality is often a sign of prosperity; for a high death rate means a high birth rate, and a high birth rate is the invariable concomitant of prosperity."[1] We know without doubt to-day, what some writers had already suggested before the nineteenth century,[2] that not only is wealth inversely correlated with fertility but that a high infant death rate involves high death rates at all ages in later life, while, conversely, low infant mortality is followed by low death rates at later ages.

Nowhere have these mortality principles been better illustrated than by Kermack, McKendrick and McKinlay who, in a thesis first published in *The Lancet* and later developed in subsequent papers, showed in a striking manner the overwhelming importance of environment during early childhood. By a statistical treatment of generation mortality in England (from 1841–50), Scotland (from 1860–2) and Sweden (from 1751–60) they showed that the death rate of the adolescent and adult depend on the constitution acquired during the first 15 years or so of life. In other words, each generation carries with it through adult life and even into extreme old age the relative mortality of childhood. The writers concluded that their statistical results were " consistent with the

[1]Humphreys, N. A. (1874) " The Value of Death Rates as a Test of Sanitary Conditions ". *J. R. Statist. Soc., 37,* 437.

[2]See for example, Graunt (1662) *Natural and Political Observations upon the Bills of Mortality.*

hypothesis that the important factor from the point of view of the health of the individual during his whole life is his environment up to the age of say 15 years, and that improved conditions at later ages have little direct effect. Improved conditions appear to have brought about their beneficial results primarily through their action on the children".[1]

If this theory, fitted to an original treatment of mortality statistics, is substantially correct—and it is difficult to suggest that it is not—then the lessons to be drawn from the past must be applied to the present inequalities of post-natal mortality between the different social classes. The fact that in 1930–2 the death rate for ages 6–12 months for Class V exceeded that for Class I 20 years earlier, and in 1930–2 the excess had grown to 498 per cent, bears witness to the supreme influence of environment.[2] If Kermack and his colleagues are right then the power of economics is not only determining gross inequality today but for decades to come. We might indeed say that from the moment of conception the minutiae and majesty of money come into play. As this wheel of economics gathers momentum the longer the susceptible infant life is subject to its revolutions, it is not surprising that the impact of the machine in a multiplicity of forms on

[1]Kermack, W. O., McKendrick, A. G., and McKinlay, P. L. (1934) Death Rates in Gt. Britain and Sweden ", *Lancet, 1,* 698.

[2]It is difficult to comprehend, in terms of living conditions, a percentage excess of the order of 498. But we can grasp some idea of what it means by saying that the percentage excess of the death rate among children aged 0–5 during 1837 over the corresponding rate for 1937, was around 400. And we should remember that in 1837 thousands of people were dying every month from cholera, small pox and typhus, and that " more than half the children of the working classes die before the fifth year of age . . . In the poorest districts of Manchester, of 1,000 children born, more than 570 will have died before they attain the fifth year of their age". (Report of the Poor Law Commissioners on an Inquiry into the Sanitary Condition of the Labouring Population of Great Britain, 1842).

sensitive infancy should result in an ever-widening range of health inequality. The pity is that it should descend on the larger families and that they should carry its marks throughout life. " Poverty ", said Richter, " is the only load which is the heavier the more loved ones there are to assist in supporting it." Yet it is from the poorer classes of the community that we are relying, to an increasing extent, to provide the citizens of the future.

If the risks of death had been equalised for the first two years of life, then, as Table XXI shows, we could have saved the lives of nearly 70,000 English children during the three years 1930–2 ; and if stillbirths are added the total of preventable deaths is raised to nearly 90,000 (see Appendix C).

TABLE XXI

The Wastage of Child Life 1930–2

Number of lives saved on the assumption that the death rates for Class I applied to other Classes.

Class	*First Year*	*Second Year*
II	2,243	478
III	22,286	6,784
IV	11,583	3,548
V	15,915	6,111
	52,027	16,921

Dublin, in 1928, assumed that if the infant mortality rate for the U.S.A. could be reduced to 30 per 1,000 (which he regarded as feasible), as also did Brend for England and Wales as long ago as 1917,[1] the lives thus saved (162,500) would avoid an annual loss of over $750,000,000 at $5 to the £, approximately £188,000,000. This estimate was arrived at by determining the amount of wealth that human beings of various ages produce in excess of the cost

[1]Brend, W. A. (1917) " The Mortalities of Birth, Infancy and Childhood ", Medical Research Council. Special Report Series No. 10.

of their birth and their education and maintenance. He concluded by remarking that " This is the amount which the country would relatively gain were these lives saved and allowed to reach maturity and play their part in the nation's work. By the cold test of dollars and cents, child life is not cheap in America."[1] We cite this as an incidental reason for action, but not because we wish to see the economic motive used as a primary incentive.

No analysis of infant mortality by social class could be complete without some reference to the important investigation conducted in Stockholm during the years 1918–22. The results of this work—a study of infant deaths in relation to income class—were so astonishing that they led to the widespread use of a slogan " 3,000 children die unnecessarily every year in Sweden." " This argument," says Alva Myrdal in her classic study *Nation and Family*,[2] " aroused the public conscience ". The main data, whose publication led to many necessary reforms, are set out in Table XXII :

TABLE XXII

Infant Mortality in Relation to Income Class in Stockholm, 1918–1922[3]

Rate per 1,000 *Births*

		When father's income was			
	All Income Groups	*Less than* 4,000 *crs.* (£240)	4,000-5,999 *crs.* (£240-360)	6,000-9,999 *crs.* (£360-600)	10,000 *crs.* (£600) *or more*
Deaths during first year -	36.7	48.9	38.3	31.9	14.3
Deaths during first month -	18.0	24.0	15.1	19.7	11.4
Deaths during 2–12 months	18.7	24.9	23.2	12.2	2.9
Stillbirths per 1,000 live births - - - -	15.1	17.5	15.8	13.0	8.0

[1]Dublin, L. I. (1928) *Health and Wealth.*

[2]1941, New York.

[3]Rietz, E. (1930) *Sterblichkeit und Todesursachen in den Kinderjahren*, Stockholm.

These figures, when compared with those in the preceding 21 tables in this book, are, quite literally, astounding. A stillbirth rate of 8.0 and an infant mortality rate of 14.3 for the highest income class are almost unbelievable, particularly when it is remembered that the figures relate to 1918–22. To compare the rates for this class with the 1930–2 rates for Class V in England and Wales is a salutary if very painful experience. The argument has been advanced that the number of deaths on which the figures are based may have been much too small on which to form any firm conclusion.[1] But even if scepticism forbids an acceptance of the figures for the two highest groups, the data shown in Column 1 indicate that the possibilities of further reductions in mortality in Britain have, in the past, been seriously under-estimated. Alva Myrdal, who accepts these statistics without question, remarks: "When infants die, although medical knowledge knows how to prevent it, the technical development of a civilisation has most cruelly outdistanced its humanitarian development . . . The difference in infant mortality of 4.89 per cent and 1.43 per cent in the two income groups at extreme ends of the scale is a grave accusation in a society that believes itself to be a democracy. There can be read in such figures what uneven income distribution does to those who have nothing to do with its causes but all to do with the future of the country. Differences in family income mean differences in food, housing, and medical care. A program of population policy becomes a program of humanitarian justice when it tries to equalise these very differences".

Returning to the English statistics we may point out that before 1911 evidence of these social inequalities was

[1]The complete statistics do not appear to be available in Britain. It seems, however, of the first importance that the results should be verified as soon as possible.

not forthcoming. With the 1911 Census Report it was suggested either that the differences were due to heredity or that the gap had been narrowed. The means of prevention to hand to-day were not then even dreamt of. Now we have statistical proof that not only has the social differential persisted for at least twenty years but that it has widened greatly. The rigidity of the class structure holds, it seems, in the field of health just as it does in the realm of money. Even by 1931 the risk of death to infants of a considerable section of our population was higher than it was for infants of the peerage during the period 1800–1855.[1] For the period we have covered, the social structure of our community has become increasingly immobilised; yet all the time the illusion of social mobility has been gently fostered. In 1911 a smaller working population in a poorer nation had to support a larger child population; to-day, more workers, a wealthier community and one and a half million fewer children to care for,[2] yet we maintain a grosser range of health inequality.[3]

The lesson, the inescapable lesson, of this study, is that the infants of the poor are *relatively* worse off to-day than they were before the 1914 war. They are, in other words, dying in relatively greater numbers. And from the fact that their constitution is not relatively worse, it follows that the influences to which they are subjected must be. To those who have worked so hard and so long to see that scientific knowledge (of medicine, dietetics and the control of preventable diseases) is extended for

[1]Bailey, A. H., and Day, A. (1861), *J. Inst. Actu.*, *9*, 305 (showing that the death rate of infants born to 7,473 members of the Peerage during 1800–55 was 69.6)

[2]the result of a drop of over one-third in the birth rate since 1911. See also Titmuss, R. M., and Titmuss, K. (1942) *Parents Revolt.*

[3]Colin Clark (1937) in *National Income and Outlay* showed that 52 per cent of all the children in England and Wales were living in families where the income was less than 60/- per week.

the benefit of all classes in society there is perhaps a grain of comfort to be extracted from this study. The knowledge of which we speak, and which has been slowly and painfully acquired during the past thirty years, can exert some influence even in a highly hostile environment. But it can only exercise its full influence where the environment is most favourable, for the effects of a good environment are cumulative just as, in a hostile environment, the pressure of adverse influences accumulates and grows with advancing age. It follows then that the well-to-do have been able to avail themselves *at a greater rate* than the poor of the knowledge and opportunities for better infantile health which, in theory, are available to all. Yet practically the reverse might have been expected, i.e. that the well-to-do, who had already benefited greatly from the march of knowledge and the improvements in medical and nursing care, would have been, in consequence, far less affected than the poor, on whose behalf this knowledge and this care were being exercised and extended for the first time. We are in fact further away from the goal of equalised health than we were thirty years ago and this despite a rise in the annual cost of the social services from £55 millions in 1911 (£1 11s. 0d. per head of the population) to £420 millions in 1930–2 (£10 10s. 0d. per head).

To some readers—especially laymen—the results of this study may be unexpected. "If you miss being understood by laymen," said Hippocrates, "you will miss reality." It is fitting, therefore, that we should end with a reference to the important and again unexpected findings of other research workers, who, in a different realm but covering the same period, revealed that (although the enormous inequality in the distribution of private property was known) there had been no significant change

in that distribution since 1911.[1] Is it too much to suggest that if such a change had taken place, if the gradient of economic inequality had become gentler with the years, a statistical study of infant mortality would have yielded results very different from those recorded in this book ?

[1]Daniels, G. W., and Campion, H. (1936) *The Distribution of National Capital*; and Campion, H. (1939) *Public and Private Property in Gt. Britain.*

APPENDIX A

Occupations selected for Study

Class I

Army. Commissioned Officers (Effective).
Naval and Marine. Commissioned Officers (Effective).
Royal Air Force. Commissioned Officers (Effective).
Clergymen (Anglican Church).
Ministers of Other Religious Bodies.
Judges, Stipendiary, Magistrates, Barristers, Solicitors.
Physicians, Surgeons, Registered Medical Practitioners.
Dental Practitioners.
Authors, Editors, Journalists, Publicists.
Articled Pupils and Students in works, etc.
Other Persons engaged in Scientific Pursuits.
Architects.
Chartered, Incorporated, etc., Accountants.
Professional Engineers (Civil, Mechanical, Electrical and Mining).
Ship Designers, Ship Surveyors, Naval Architects.
Auctioneers, Appraisers, Valuers.

Class II

Land and Estate Agents and Managers.
Farmers.
Farmers' Sons, Daughters or Other Relatives assisting in the work of the Farm.
Agricultural and Forestry Pupils (not at Colleges).
Farm Bailiffs.
Subordinate Medical Service.
Lodging and Boarding House Keepers.
Inn, Hotel Keepers; Publicans, Beersellers.

Class III

Mining (in Metalliferous Mines and Workings).
Other Workers Below Ground, Iron, Tin, Copper.
Metal Workers, Erectors, Fitters, Tool Setters, Millwrights.
Brass Finishers and Turners.
Coppersmiths.
Carpenters.
Bricklayers.
Plasterers.
Glaziers.
Slaters and Tilers.
Masons, Stone Cutters, Dressers and Carvers.
Railway Transport Workers; Guards, Signalmen.

Road Transport Workers ; Drivers of Self-propelled Vehicles—Passenger and Goods.
Domestic Servants (Indoor).
Game Keepers and Game Watchers.
Waiters.
Chimney Sweeps.

CLASS IV

Fishermen.
Agricultural Labourers (including Shepherds) and Farm Servants
Stone Miners, Quarriers, Slate Miners, Quarriers.
Army ; all Ranks other than Commissioned Officers (Effective).
Barmen.
Laundry Workers ; Washers, Ironers, Manglers, etc.
Caretakers and Office Keepers.

CLASS V

Pit Workers : Chalk, Clay, Sand, Gravel.
Builders' Labourers.
Bricklayers' Labourers.
Masons' Labourers.
Plasterers' Labourers.
Railway Transport Workers ; Porters (including Lampmen).
Coal Loaders and Dischargers (Water Transport).
Other Dock Labourers.
Messengers (Transport and Communication).
Porters (not Railway, Dock or Domestic).
Costermongers and Hawkers.
Newspaper Sellers.
Watchmen.
General Labourers (so described).
Labourers (so described).

APPENDIX B

Composition of Regions

North I.	Durham and Northumberland.
North II.	Cumberland, Westmorland, and Yorkshire (East and and North Ridings).
North III.	Yorkshire (West Riding) and York C.B.
North IV.	Cheshire and Lancashire.
Wales I.	Brecknockshire, Carmarthenshire, Glamorganshire, and Monmouthshire.
Wales II.	Remainder of Wales.
Midland I.	Gloucestershire, Herefordshire, Shropshire, Staffordshire, Warwickshire, and Worcestershire.
Midland II.	Derbyshire, Leicestershire, Northamptonshire, Nottinghamshire, and Soke-of-Peterborough.
East.	Cambridgeshire, Isle of Ely, Huntingdonshire, Lincolnshire, Norfolk, Rutlandshire, and Suffolk.
South-West.	Cornwall, Devonshire, Dorsetshire, Somersetshire, and Wiltshire.
Greater London.	Administrative London, and certain areas of the surrounding counties.
Remainder of South-East.	Bedfordshire, Berkshire, Buckinghamshire, Essex, Hertfordshire, Kent, Middlesex, Oxfordshire, Southampton, Surrey, Sussex, and the Isle of Wight, but excluding those sections of certain counties coming within the area of Greater London.

APPENDIX C

Miscarriages, Stillbirths, Maternal Age, Birth Order and Other Factors

It has already been pointed out that this study has had to leave out of account an analysis of certain factors which have a bearing on the death rate of infants in all the social classes and occupational groups. Broadly these are the influence of the age of the mother and of, the birth (or pregnancy) order on, the incidence of miscarriages, stillbirths, and neo-natal and post-natal mortality.

While the proofs of this book were passing through the press some new data became available on the influence of some of these factors. First, the Registrar-General issued a valuable Report[1] on the initial results of the Population (Statistics) Act (1938), and, secondly, C. M. Burns published the findings of a study of infant and maternal mortality in Durham.[2] In this Appendix we shall review briefly this and other material on the subject but readers in search of greater detail should refer to these two publications and to *Order of Birth, Parent-Age and Intelligence* by Thurstone and Jenkins.[3]

Miscarriages. No data exist on the incidence of miscarriages, *e.g.* spontaneous and induced abortions, among different social groups. What material there is on the interruption of pregnancy before the seventh month is both scanty and, by its nature, statistically unsatisfactory. Burns found, in her Durham study, that in every 1,000 pregnancies 25 ended in miscarriages. While recognising the deficiencies in the material she concluded that the miscarriage rate was very much higher in the larger than in the smaller families. This conclusion was also arrived at by Huntington.[4] To what extent this was due to physiological causes or to attempts to prevent the birth of a child it is impossible to say. The rate found by Burns is considerably lower than that suggested by the British Medical Association's inquiry[5] and by the Inter-Departmental Committee on Abortion.[6] The former report considered that 15–20 per cent of all conceptions probably end in abortion, while various authorities have computed the annual incidence of abortions in England and Wales at from 75,000 to 150,000. The Inter-Departmental Committee recorded the impression that some 60 per cent are spontaneous. Abortion on this scale, whether criminally induced or spontaneous, clearly interferes with any conclusions on the effects of maternal age and birth order on the rate of stillbirths and

[1]Annual Review, 1938, Part II Civil.

[2]*Infant and Maternal Mortality in Relation to Size of Family and Rapidity of Breeding*, 1942.

[3]This is a useful summary of all studies prior to 1931.

[4]*Season of Birth. Its Relation to Human Activities*, 1938.

[5]Report of Committee on Medical Aspects of Abortion. *Brit. med. J.* Supp., 1936, *2*, 230.

[6]Report of Inter-Departmental Committee on Abortion, 1939.

infant deaths. In other words, while the death rate among second children, for example, *born* to mothers aged 30 in one social group may be higher than among those in another group, the reverse might be true if the order of the infant were determined by the number of pregnancies instead of by the number of births. Any conclusions therefore derived from a study of infant deaths by order of birth must be regarded with caution. Our knowledge of the incidence of abortion is still so fragmentary (and likely to remain so) that it cannot throw any light on this study of infant mortality by social class. All that need be said here is that several investigations, such as the Toronto experiment referred to on page 86 suggest that improved diet lessens the incidence of spontaneous miscarriage.

Stillbirths. At the beginning of Chapter III and again in Chapter VIII we referred to the problem of stillbirths. Reliable statistics have only been available for England and Wales since 1927 when stillbirth registration was first enforced. Up to 1939 the rate remained practically stationary at 40 per 1,000 total births. The Registrar-General, in the Report to which we have already referred, now shows that parity, maternal age and multiple births all influence the risk of a child being stillborn.

Studying first births only, it has been found that the risk of stillbirth increases steadily with advancing age of the mother. For mothers under 20 the risk is less than 3 per cent; by ages 30–34 the risk has doubled, and at 40 plus it has doubled again. The same progression with maternal age is apparent when second, third, fourth and all subsequent birth orders are examined separately. Comparing the stillbirth risk at different birth orders in the same maternal age group we find, for instance, that the rate is higher for all first-born at all maternal ages than for subsequent children up to at least the eighth child.[1] At ages under 20 the risk is about 30 per cent lower for second than for first; at ages 20–25 it is 40 per cent lower, and at ages 25–30 the reduction is 45 per cent. At ages 30–35 the risk for fourth and fifth children is about 50 per cent lower than for first-born. For multiple births the stillbirth rate is more than twice as high as for single births. The Registrar-General also provides much additional information on the regional distribution of stillbirths. In Chapter III we indicated that regional differences in the stillbirth rate correspond to regional variations in infant mortality, and the Registrar-General now shows that during 1938 the risk of stillbirth at all maternal ages ranged from 31 per 1,000 children born in Greater London to 48 in South Wales. That this regional variability cannot be accounted for by differences in fertility is shown if we examine one of the most favourable age groups for reproduction, namely 20–25. The stillbirth rate per 1,000 total births ranged, in 1938, from 22 in Greater London and 24 in the Remainder of the South East to 33 in South Wales and 35 in Lancashire and Cheshire. The relationship between infant mortality and socio-economic indices has for long been recognised and it now seems that a similar, though perhaps smaller, correspondence exists with the

[1]Ansell found in his study, *Statistics of Families in the Upper and Professional Classes* that stillbirths were twice as frequent among first-born as among second-born. (*J.R. Statist. Soc.*, 1874, *37*, 464).

stillbirth rate. During the 1930's the rate in such depressed County Boroughs as Wigan, Bolton, Merthyr and Oldham exceeded by practically 100 per cent. the combined rate forOxford, Croydon, Eastbourne, Canterbury and Bath. From such facts as these, and the important new material now made available by the Registrar-General, it is apparent that there is scope for a reduction of at least 25 per cent in the annual incidence of stillbirths. The work of Baird and Wyper,[1] referred to in Chapter VIII, throws some light on how this can be achieved. During 1930–2 there were 81,000 stillbirths. A reduction of the order of 25 per cent would have meant the saving of roughly 20,000 infants. If we add this figure to the total obtained in Table XXI for infant deaths during the first two years of life we arrive at an estimate of nearly 90,000 *preventable* deaths for the three years. The wastage of child life is still on much the same scale and may be even higher at the end of the war. During 1930–2 the stillbirth and infant mortality rates were 41 and 64 respectively: in 1941 they stood at 35 and 59. It is unfortunate that we have no data on the incidence of stillbirths among the different social and occupational groups but all the evidence suggests that the rate among the poor is much higher than among the well-to-do. It is likely (as in the case of infant mortality) that the social class differences are wider than the regional variations.

The Influence of Maternal Age and Birth Order on Infant Mortality.

In Chapters III and VIII some reference was made to these factors in citing the investigations of Yerushalmy[2] and Woodbury[3] in the United States. Other workers, such as Elderton,[4] pointed out that very early and very late child-bearing was productive of high mortality. We now have Burns's Durham Report[5] which confirms the work of previous investigations and also makes clear the harmful effects to both mother and child of too rapid breeding. The Report shows that the lowest infant death rates were among first, second and third children born to mothers between 20–35 and fourth and fifth children to mothers between 35–40. Late children of large families returned high mortality at all stages, *i.e.* before, during and after birth and up to five years of age.

Burns argues that the reduction in the infant death rate since 1911 is mainly due to the decline in fertility and attributes much of the excess mortality in 1930 to irresponsible breeding by " unfit " stocks. What bearing have these conclusions on our study of social class mortality? In the first place it has to be remembered that the Burns Report relates to an abnormally circumstanced community (Durham County excluding the County Boroughs) mainly composed of unemployed and under-employed mining families living in rural areas. These and many other factors make it impossible to apply the lessons

[1] *Lancet*, 1941, *1*, 657.
[2] *Amer. J. Hyg.*, 1938, *28*, 244.
[3] *Infant Mortality and Its Causes*, 1926.
[4] *On the Relative Value of the Factors Which Influence Infant Welfare. Ann. Eug.*, 1925, *1*.
[5] *Infant and Maternal Mortality in Relation to Size of Family and Rapidity of Breeding*, 1942.

of the Durham investigation to England and Wales as a whole. It is, moreover, unreasonable to compare Durham in 1930 with England and Wales in 1911.[1]

All the statistical work that has been carried out on changes in the fertility differential since 1911 point to a narrowing of the gap between the birth rate of the poor and that of the well-to-do during the twenty years.[2] Broadly speaking the poorer sections of the community (social classes III, IV, and V) have reduced their birth rate to a greater extent since 1911 than have classes I and II. We may suppose that this heavier reduction has been achieved at the expense of fourth and subsequent children to older mothers. The Registrar-General in his Review for 1938[3] shows that the greatest fall in fertility—41 per cent—between 1921 and 1931 occurred in the age group 40–44. As Burns points out, it is the large and rapidly bred families that carry the highest infant mortality rates. It is doubtful whether these families figured prominently in classes I and II in 1911 but they undoubtedly did so in classes IV and V. A marked diminution in the number of these families in the poorer classes by 1930–2 should have led to a narrowing infant mortality differential. Similarly, a greater rate of diffusion of birth control knowledge during the twenty years among classes III–V might have been expected to have contributed to this narrowing. By 1931 the fertility of skilled workers (class III) was as low as that for class I; yet despite the great reduction in their birth rate we find, from the Tables in Chapters II and III, that, relative to class I, their infant mortality had worsened. Both classes IV and V reduced their fertility between 1921 and 1931 to a greater extent than did classes I and II; nevertheless, their excess infant mortality, especially at 6–12 months, was in this period greater than ever.

There still existed in 1931 a class fertility differential. But this difference in birth rates only appears to have obtained in classes IV and V and it had lessened since 1911. The elimination of the fertility differential in class III and its diminution in classes IV and V must have involved smaller families, better spacing of births, fewer births to mothers aged over 40 with large families and fewer rapidly bred families. How far the higher death rates among firstborn children of young mothers influenced the mortality ratio of the poorer classes in 1911 and in 1930–2 we do not know, but it is doubtful whether this factor increased in importance during the twenty years. In any event it is reasonable to suggest that it cannot have had much influence on the environmental causes of death at 6–12 months. Moreover, as we argued in Chapter III, the effects—if any—should have been more than offset by the total reduction in fertility.

[1]For a detailed discussion of the Report see Titmuss, R. M. (1942) *Eug. Rev.*, *34*, 85.

[2]See for example, Innes, J. W. (1941) *Millbank Memorial Fund Quarterly*, *21*, 1, and discussion by Titmuss, R. M. and Kathleen (1942) *Parents Revolt*. Reference should also be made to Innes, J. W. (1938) *Class Fertility Trends in England and Wales*, 1887–1934, and Glass, D. V. (1938) *Eug. Rev.*, *30*, 117.

[3]Civil Part II.

APPENDIX D

Death Rates (per 1,000 legitimate live births) used in Chapter III

Study "A"

Age Group	Period	Class I	Class V
0–1 month	1911	21.7	44.7
	1930–2	21.3	35.5
1–3 months	1911	10.7	30.1
	1930–2	4.2	14.3
3–6 months	1911	9.3	33.0
	1930–2	3.1	13.1
6–12 months	1911	13.2	52.6
	1930–2	3.5	21.2

Amalgamation of Registrar-General's Classes (as Table VI)

		Classes I–II	Classes IV–V
0–1 month	1911	34.3	40.4
	1930–2	26.4	32.2
1–3 months	1911	18.5	25.2
	1930–2	6.2	12.0
3–6 months	1911	17.6	27.1
	1930–2	4.4	10.8
6–12 months	1911	25.3	42.0
	1930–2	6.1	17.1

Separate Occupations

0–1 month	1911	Dock labourers -	43.7
	1911	Agricultural labourers	36.8
	1930–2	,, ,,	31.9
	1911	Coal miners -	46.7
	1930–2	,, ,, -	38.6
	1911	Bricklayers - -	36.3
	1911	Bricklayers labourers	36.9
	1911	General labourers -	47.0
	1930–2	,, ,, -	34.5

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