Education and Environment

Stephen Wiseman

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The fundamental problem of whether environment or heredity plays the greater part in determining ability is age-old. This study describes an investigation carried out by the Manchester School of Education to determine the relationship between educational attainment and social and environmental factors.

The investigation was based mainly on two extensive surveys conducted in 1951 and 1957 among secondary-school children between fourteen and fifteen years of age in the Manchester conurbation. Tests were given in reading comprehension, mechanical arithmetic and intelligence. The results were then correlated with environmental factors: family, social group, neighbourhood, health, type of school and character of education. The report also incorporates the research carried out by Dr. F. W. Warburton in forty-eight schools in Salford, concerned with the relationship between brightness and backwardness and the school environment.

The result of all three researches shows that scholastic performance is strongly associated with social factors, particularly those concerned with the family and the home. One of the surprising findings was that social factors, in this context, appear to have a stronger connection with the intelligence test than with the reading and arithmetic tests. Other findings demonstrate the vital importance of the mother of the family and of the social group in which the pupil moves. It is shown, too, that social factors appear to affect brightness and backwardness differently. Differences are also shown between reading and arithmetic.

In the final chapter the significant findings of the inquiry are discussed within a wider context and their implications for future research are considered.

With 13 Figures and 62 Tables

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by

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FOREWORD

ALTHOUGH I was Director of the University of Manchester School of Education at the time when the investigations reported in this volume were begun, I can claim no share of credit for their outcome and need not refrain from congratulating the School of Education on the publication of Professor Wiseman's work. I am confident that readers of this volume will share my opinion that it is a work of educational research noteworthy alike for its methods and for its findings.

When one considers the importance of education, the theme of so much speech-making and writing, it is extraordinary that education has been the subject of relatively little research. Expenditure on education, though inadequate, is high, but the investment in research which might make it more productive is almost insignificant. It must be admitted that some of the small amounts made available have been spent on enquiries with ill-defined and ill-chosen objectives pursued by naïve methods; but expert work such as is here reported makes one long to spend at least as much on research in education as on research on (see p. 2) glue. Can it be doubted that educational policies and practices would be vastly improved if research of the quality here exemplified were multiplied a hundredfold?

It is remarkable that this large-scale investigation of education and environment should have been temerariously undertaken, and still more striking that it should have been brought to a successful conclusion. Professor Wiseman has himself generously and justly acknowledged the co-operation he has received not only from his immediate colleagues but from the officers of local authorities and from a large number of teachers. Such co-operation is a proof that while educational research needs greatly increased resources it is also, thanks to the professional attitude of educationists, an economical enterprise.

Since many readers will rightly be most interested in the findings of these investigations, I should like to call special attention to the methodological skill manifested in arriving at them. It is not sufficiently realized that the methods of educational research have been

refined to a considerable pitch of efficiency and sophistication. This has been the work of some distinguished and innumerable workmanlike educational psychologists, mainly during the present century. More recently popular sociologists have attracted attention by their interest in education and perhaps by their support for some popularly acceptable opinions; but although not all the methods used have been as primitive as questionnaires and interviews, the techniques have often seemed to educational psychologists comparatively primitive. One can but welcome the growing tendency to seek techniques which have some of the refinement and subtlety of those so fruitfully employed by educational psychologists. This volume exemplifies, for example, the construction of tests of high reliability for the measurement of educational attainment and the potency of factor analysis in suggesting and controlling the interpretation of data. The reasoning employed at many points is a model of scientific thinking with its respect for evidence, its avoidance of logical pitfalls, its suspense of judgement where scepticism is demanded and its decisiveness when decisions are warranted by the evidence. Only at a few points does Professor Wiseman allow his optimism or his charity to carry him away ('We are all aware, nowadays, of Hebb's "Intelligence A" and "Intelligence B" ' (p. 29); 'We are familiar with Vernon's *v–ed*, *k–m* factors' (p. 71)), or permit his zeal for good education to give his data unexpected elasticity (as when he dismisses corporal punishment). One could wish that much more of educational theory was based on such solid evidence and firm reasoning.

Professor Wiseman is aware of the criticism 'that much research ends with conclusions that, to many experienced educationists, appear "obvious" ' (p. 2). It would indeed be surprising, and suspicious, if the intuitive knowledge derived from generations of experience were totally overthrown by methodical investigation, yet there is a difference between the knowledge of educational lore and knowledge tested and restructured by research. The survey of previous work in Chapter IV of this volume is in itself a valuable assessment of the research contribution to our knowledge of education and environment. It is true that many of the findings of the present study confirm what was already 'known', for example, that educational attainments are somehow related to 'social class' and to economic status. Time and again, however, the report includes sentences such as 'This is a very curious result' (p. 27) and 'This result was contrary to expectation' (p. 108). Such unexpected findings cause the

reader, as they cause the authors, to re-examine their 'knowledge'. Thus Dr Warburton in Chapter VI, confronted with evidence that must have run counter to his previous conclusions about heredity and environment, nevertheless reports the facts objectively, with the result that in Chapter VIII new light is thrown on the issue by the distinction between surveys of attainment in groups of schools and studies of those who actually attain education, individual children. Another example of fresh insight is the distinction tentatively made by the factor analysis between 'family care' and 'home care'.

The volume is indeed rich in suggestions for educationists in whatever sphere they work—the classroom, the neighbourhood or the local authority office. It is at once a good example of what can be accomplished even on a shoestring and an earnest of the benefits which might accrue from adequate support for research in education.

R. A. C. OLIVER

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ACKNOWLEDGEMENTS

ALTHOUGH this book appears with a single author's name on the title page, it will quickly be apparent to the reader that the work described here has been the product of many hands. I am merely the *rapporteur* of a programme of co-operative research, an arrangement with obvious advantages in simplicity and convenience, but one which should not be permitted to detract from the contribution made by other people. Very many of my colleagues, both past and present, in the School of Education and the Department of Education, have assisted in the work reported here, and this note of acknowledgement can be only a token payment of my indebtedness to them.

A major share of this indebtedness goes to Professor R. A. C. Oliver, who, as Chairman of the Research Committee of the School of Education, has been closely associated with our investigations since their inception. Without his assistance and support such an ambitious programme could hardly have been mounted, let alone carried through to completion. Dr F. W. Warburton has been closely involved in the whole research right from the planning stage, and, in addition, planned and carried through the Salford enquiry which he himself reports in Chapter VI. His assistance on the side of research design and statistical analysis has been invaluable.

Our enquiries would have been quite impossible to carry out had we not received the fullest support and assistance from the four education authorities involved. Our indebtedness to the chief education officers, Mr Norman Fisher, and later Mr J. K. Elliot of Manchester, Mr F. A. J. Rivett of Salford, Dr Gwyn Thomas of Stockport, and Mr A. L. Binns and later Mr Percy Lord of Lancashire, will be obvious to the discerning reader, and is one which is difficult to pay adequate tribute to in cold print. We owe them our thanks not only for their assistance in the gathering of data, but also for their support and backing, and the lead which they gave to their administrative officers and the teachers who were so heavily involved in the testing programme. The fact that we were able to test 14,000 children in the conurbation, in every kind of secondary school, without

encountering any difficulties, is itself a remarkable tribute to the completeness of this co-operation.

We are grateful, too, for the help we received from the 'non-educational' organizations in Manchester, in providing the data we required; data which were not always easily available and which often had to be abstracted from bulky records. Our particular thanks are due to Dr C. Metcalfe Brown, Medical Officer of Health and Principal School Medical Officer, Manchester; to Dr E. Malcolm Jenkins, Senior Medical Officer, School Health Service, and to Mr I. H. D. Brown, the Children's Officer. We received great assistance from the N.S.P.C.C. and we are grateful to Mr H. Robinson for his whole-hearted co-operation.

No acknowledgement would be complete without a tribute to the people who have done most of the hard work of tabulation, collation and calculation—the research assistants of the School of Education. During the period of this research there have been four such assistants involved in this work, Dr Jack Wrigley, Mr P. M. Foster, Mr J. W. Thompson and Mr G. M. Forrest. Particular acknowledgement must go to the first and to the last: to Dr Wrigley for his major share in the first stages of the research, and particularly for his valuable work in the construction of the tests used in the investigations; to Mr Forrest for his involvement in the final stages, demanding a great deal of calculation and analysis, as well as the preparation of tables and data for the written report. The administrative side of such an enquiry is sometimes overlooked, in spite of its importance. To the Secretary of the School of Education, Mr A. E. G. Roberts, I owe a great deal. He, together with Mr Quayle and the office staff, have been heavily involved in our work from time to time, and I am glad to have this opportunity of saying thank you.

To all these, and to many others not specifically named, may I express my grateful thanks, and the hope that this record of our investigations will be an adequate justification of their labours. May I add a note of apology for the time which it has taken to complete this publication? Without the boon of a sabbatical term in 1962 the delay would have been even longer.

CHAPTER I

PRELIMINARY PLANNING

THE planning of a research programme for a School of Education demands the consideration of a number of relevancies. Although the central purpose of an area training organization is the training of teachers, a School of Education has other, and wider, functions. Among these is the promotion and prosecution of educational research. While it would be sensible and undoubtedly desirable for such research to be concerned with the central function of teacher-training,[1] its research efforts should certainly not be confined to this field. Rather, it should aim to serve the needs of education in its own region, carrying out investigations that are likely to prove useful to the local education authorities in the area.

Not long after the creation of the Manchester School of Education, it set up a Research Committee. This Committee felt that the choice of its first major project was particularly important, not only for its intrinsic validity and value, but also as a demonstration of policy and as a reassurance to teachers and administrators in the region. Such reassurance was felt to be necessary, since research in education is often criticized for being fragmentary, or ephemeral, or unrelated to the practical problems of the classroom, or directed towards questions the answers to which are already known. Evidence to support all such criticisms may be found by any diligent reader of the appropriate journals and degree theses, although the proportion of research that can validly be attacked on such grounds is a good deal smaller than many critics believe. And much of this criticism is inescapable, since researchers must be trained, and the topics on which they may best cut their teeth as investigators must often appear trivial, and to be of little or no direct value to the practising teacher. Moreover, the distinction between 'pure' and 'applied' science, though sometimes artificial, is nevertheless relevant in this context. A good deal of

[1] The current major research project in the School is a follow-up of all the students in its constituent colleges and departments who were certificated six years ago.

research must be done, particularly in educational psychology, on topics which have little or no overt relevance to the practical problems of the teacher, but which, nevertheless, are of fundamental importance in the development of a coherent theoretical structure and conceptual framework which are essential for future progress. It is true, too, that much research ends with conclusions that, to many experienced educationists, appear 'obvious'. But, as D. E. Broadbent says, 'The merit of objective study of behaviour is that it provides a means of testing intuitive knowledge and sorting the true from the false; not that it should necessarily provide some quite different and previously unheard of method of dealing with people.'[1]

No Research Committee can—or should—remain immune from the pressures of current controversies. The early years of the School of Education were those which also saw the heated discussions over '11-plus', and particularly over the validity of the intelligence tests used in this examination. This accounted for the first research sponsored by the Committee, and one which made a significant contribution to the controversy.[2] But the Committee was anxious to embark on a major project which would have a specifically regional context and application, in accordance with its defined policy.

There is no dearth of problems in education which cry out for investigation: large areas of the educational field are relatively unexplored. This is not surprising in the present state of affairs, when the amount of money devoted to educational research—by the State, the universities, the local authorities and the teachers' associations—is derisory by any standard. Of a total expenditure of £800 millions on education, the amount devoted to research is one-fiftieth of one per cent. We spend over 20 times as much on medical research, 30 times as much on agricultural research. The Department of Scientific and Industrial Research has a budget over 80 times as large as that for educational research. D.S.I.R. spends more on research into glue[3] than we do on research into education. The considerable time lag in the production of this publication is itself a bitter comment on research facilities.

The exploration of virgin territory is, however, as the oil companies know, a chancy business: the attractions of unexplored fields might

[1] *Behaviour*. London, Eyre and Spottiswoode, 1962, p. 178.

[2] Wiseman, S., and Wrigley, J., 1953. 'The Comparative Effects of Coaching and Practice on the Results of Verbal Intelligence Tests', *Brit. J. Psychol.*, **44**, 83–92.

[3] Mr J. H. Boyden, M.P., in the House of Commons, 19 April 1962.

well run counter to the desire to produce results of overt value and use to the local education authorities. One solution of this dilemma was to consider the possibility of planning a research in two phases: the first phase to yield results of immediate practicality, after which these results might form the basis for a second investigation of a more exploratory kind.

This preliminary planning was being carried out in 1950, when the effects of the war on the educational system were gradually disappearing, and when one of the major interests in education was the new secondary modern school and its efforts to define more clearly its aims and methods—efforts which were complicated by the existence of the 'new' age-group of 14+ produced by the raising of the school leaving-age. The general aims of the Research Committee have been indicated: the operation of those aims within the prevailing educational climate produced the final research project.

It was decided to investigate the abilities of children of 14+, the age of those in the final year of the secondary modern school. To do this it would be necessary to construct special tests, since there were no existing tests of attainment at this age level.[1] These tests would, it was hoped, be of value to schools and authorities for purposes of educational and vocational guidance. The tests, when constructed, would be administered in the North-West region and standardized from the results. This would achieve two further objects. First, it would give local authorities factual information about levels of achievement of the 14+ age-group which could be used to test the validity of the then current criticisms of educational standards made by employers and the general public. Such criticisms were common in the late '40s, and were probably prompted by a feeling that we were still well below pre-war standards in the three R's. Second, it would give the tests a valuable *regional* standardization. The complications, and difficulties, of adequate standardization of tests of educational attainment are not always fully appreciated. A teacher in, say, Lancashire in 1960 will use a standardized reading test in order to judge the level of attainment of his class, without realizing the implications of the fact that the basis of standardization was the data obtained from children in, say, London, in 1935. Standards of educational attainment vary geographically, and also temporally. Standards in London are not the same as those in Birmingham, or

[1] The tests most nearly approaching this were the Moray House 'Advanced' Tests, designed for 13+ children, in English, Arithmetic and Intelligence.

Manchester, or Glasgow. This is not only because of differences in the quality of schools, of teachers and of equipment, in the proportion of time allocated to particular subjects in the time-table, in the stress laid by administrators and inspectors on standards in this, that or the other subject, but also because of more basic regional differences. Cities and towns and rural areas differ in the quality of the environmental stimulation they afford to the intellect; they vary in respect of the distribution of trades and vocations and professions among their population; they have different ways of organizing their schools, with differing proportions of children in selective and specially favoured establishments. And they differ in their speech habits, their idiom and their dialect, so that a sentence in a reading test that produces little challenge in Scotland may hold traps for children in southern England. Nor is educational attainment cataleptic. Standards that are accurate and truly representative of a particular region in 1950 may be completely false in 1960. Schools do not stand still; the educational system is not static. A teacher may announce that Johnny has 'a reading age of 8', and feel that this assessment has provided a weighty anchor in a sea of subjective judgement. And yet such a statement is practically meaningless unless we know *where* and *when* the test used was standardized.[1] Attainment ages, and attainment 'quotients', are not fixed and immutable. With energy and determination any good school system can make nonsense of existing test norms within two or three years.

The first phase of the research was thus fixed: the construction and standardization of tests of educational attainment, thus providing L.E.A.'s with (*a*) the tests and (*b*) the results from the standardization of the tests in their own areas.

The decision on the second phase of the research was also mediated by the post-war educational climate and the considerable upsurge of interest in environmental and social factors in education. The 'region' envisaged in the phase one testing is part of one of the world's great conurbations, within which may be found great environmental variations, with strong contrasts in such things as density of housing, quality of housing and general socio-economic level. Repairs and rebuilding following war damage, the pressing on with the back-log of slum clearance and the concomitant growth of suburban and over-

[1] I am tempted to add *how*, since a great deal depends, too, on the quality, the representativeness, of the samples of children used to calibrate the test.

spill housing, all these promised at least two decades of rapid change and development within the conurbation, with major population movements continually going on. Add to this the change produced by the increased social services of the welfare state, and we are presented with the picture of a minor social and environmental revolution. It is not surprising, therefore, that the Research Committee decided that the second phase of the enquiry should be an investigation of the relationship between educational attainment and social and environmental factors. The difficulties involved were recognized, but equally so was the importance of gaining some knowledge, however meagre, in this almost unexplored field. It was accepted that this research would be a pilot survey, but it was hoped that it might pave the way for further and more penetrating analyses. In the event, and with the co-operation of the Manchester Education Committee and other departments of the Corporation, it proved possible to develop a second and more detailed investigation of part of the area. This report, then, concerns itself with the first phase of the research—the construction of tests and their application within the conurbation—and also with two investigations into the relationships between educational attainments and social and environmental factors.

CHAPTER II

THE TESTING PROGRAMME

The area

ONE of the first decisions to be made was to define the region to be covered by the investigation. The intention was to cover the Greater Manchester conurbation, but this phrase in itself does little to define the boundaries of the region. Local government boundaries mean little or nothing in 'real' terms in this vast region of bricks and mortar: they are historical accidents rather than lines separating real entities or units. One town merges imperceptibly into another: one searches in vain for geographical, social or human criteria to justify the delineation of a true boundary separating essentially different areas. And it was soon apparent that the definition of the conurbation unit was almost as chimerical.[1] Immediately one was faced with questions such as the inclusion, or exclusion, of Bolton, Bury and Rochdale; questions which, it became clear, would need to be answered in terms of expediency rather than as a considered judgement. The conurbation, as defined (however inadequately) by the 1951 Census, embraced a population of nearly two and a half million. It was obvious that this area was too large for the slender facilities at our disposal. We therefore searched for the definition of a smaller area, which would contain the central hub of the conurbation and which, in addition, would provide adequate heterogeneity for the purposes of the second phase investigation. Such a unit was finally defined, including the county boroughs of Manchester, Salford and Stockport, and the boroughs and urban districts of Lancashire immediately contiguous. This is an area of 113 square miles, holding a population (1951 Census) of 1,390,000. Table 2.1 gives details of the boroughs and urban districts included, together with population data, and the map (Fig. 1) shows the boundary of the area. It will be seen from the table that popula-

[1] As these words are being written, the Local Government Boundaries Commission is engaged on the task of defining the limits of the 'special review area' of the S.E. Lancashire conurbation, and finding it a hazardous and highly subjective exercise.

tion density ranges from 6 per acre in Middleton to 35 in Salford, a considerable variation. But the large size of the sub-units in Table 2.1 means that even greater variations are concealed within them. Within the county borough of Manchester, with an average density of 26 per acre, there is one ward with a density of less than 10 and another with one of more than 80. The overall density for the area is 19 persons to the acre: equivalent to more than 12,000 per square mile. The overall density for England and Wales (1951 Census) is 753 per square mile.

TABLE 2.1

AREA COVERED BY THE INVESTIGATION

District	Population (1951 Census)	Area (acres)	Population Density
County Boroughs			
Manchester	703,082	27,540	26
Salford	178,194	5,142	35
Stockport	141,650	7,861	18
Lancashire Boroughs			
Stretford	61,874	3,559	17
Eccles	43,926	3,508	12
Swinton and Pendlebury	41,926	3,364	12
Prestwich	34,466	2,460	14
Middleton	32,607	5,140	6
Lancashire Urban Districts			
Urmston	39,237	4,763	8
Chadderton	31,124	3,128	10
Failsworth	18,032	1,101	16
Droylsden	26,363	1,012	26
Audenshaw	12,661	1,227	10
Denton	25,603	2,470	10
Total	1,390,123	72,280	19

Another indication of the heterogeneity of the area can be seen if we take the figures for social class distribution.[1] In class I of the Registrar General's classification, there are 33 per thousand in England and Wales. For Salford, Failsworth and Droylsden the figure is 14, for Prestwich 49 and for Urmston 55. If we go to the other end of the scale, social class V contains 128 per thousand in England and Wales; 209 per thousand in Salford, 94 in Prestwich and 79 in Urmston. It is clear that we have here a densely populated area which, nevertheless, holds within itself quite large variations in density and

[1] 1951 Census Report. Lancashire: Table 27.

in social class. It seemed, therefore, eminently suitable for the second phase of the research, while being manageable in size for the testing.

The children

Having defined the area to be covered by the research, it was now necessary to define the population of children. From the 1951 Census returns it was estimated that the 14+ age-group in the selected area would embrace some 17,000 or 18,000 children. Of this total some,

Fig. 1. The area covered by the testing

because of physical or mental handicap, would not be at school; others would be attending schools outside the area—either in boarding-schools or in neighbouring schools outside our arbitrary boundary. Those within the area would be at schools of many different types (e.g. grammar, technical, central, secondary modern, all-age) under different types of control (e.g. local authority, direct grant, independent). Two decisions had to be taken: whether to test all children, or only a sample; and whether to test children in all types of school.

The arguments in favour of testing a carefully drawn sample of children rather than the total population were strong ones. The most obvious was the reduction in time, in labour, in cost. It was estimated that there would be at least 15,000 children in the tested population: the printing load alone, for the production of tests, would be very heavy. And the Research Committee were well aware that, by a well designed sample structure, the results from a relatively small fraction of these thousands could provide an accurate and highly reliable estimate of the spread of abilities in the total population of the age-group. Nevertheless, the decision was taken to test all available children, for a number of reasons. One of the aims of phase one was to produce a sound standardization of the specially constructed tests. Teachers and authorities had become accustomed to using the 11+ tests produced by Moray House and the National Foundation for Educational Research. These tests, being used by individual L.E.A.'s for complete age-groups of primary children, were available to authorities with conversion tables based on the results from very large numbers of children—often more than 20,000. Although a sound standardization could well be produced for the Manchester tests on a sample of, say, 3,000 children, it was felt that authorities habituated to the very large Moray House populations might view such norms with some suspicion, however unjustified. The demands of phase two had also to be considered. The social factors analysis might well involve a breakdown of the field into sub-units of a pretty small size. It was essential that the numbers of children within such sub-units should be large enough to keep error-factors within manageable limits. With very small sub-groups, revealed differences have to be very large before statistical significance can be demonstrated. It will be remembered, too, that one of the major aims of the research programme was one of 'reassurance' to teachers and educational administrators, and from a public relations point of view there was no doubt that a 'total' testing was preferable to a sample survey. It was not only the fact that the layman has a profound suspicion of 'statistical jugglery' (sometimes with justification!) and that the elements of sampling theory are not (yet) an accepted part of a liberal education. We also had to consider the possibility that teachers might misunderstand the purpose of the testing. When an outside authority proposes to examine school-children, it is to be expected that the teaching profession will view the exercise with less than complete enthusiasm, and even with suspicion. It seemed to us that this concern

and uneasiness might well be magnified were we to test in some schools and not in others. One can imagine complaints from some teachers because they had been chosen, and from others because they had not.[1] For these reasons, then, the decision was made to test the complete age-group, and not a sample.

The second question was whether to test children in all schools, including private schools, or to confine the enquiry to those schools maintained by the local authorities. Independent schools vary enormously, of course, in size and status, ranging from the long-established and highly efficient to the 'school around the corner', taking a handful of children in a converted house, and not 're-cognized' by the Ministry of Education. Bringing this category into any research programme is enormously difficult. Even to discover them all would be far from easy, and to secure adequate co-operation (including the administration and marking of objective tests) from staffs many of whom are unqualified, would be almost impossible. There seemed no doubt that *independent* schools should be excluded from the survey.

The question of *direct grant* schools was more difficult. After a good deal of thought and discussion, it was decided to omit these too, even though they included schools of very high reputation and quality.[2] There were two main reasons for this. First, their catchment areas are very wide (Manchester Grammar School, for example, draws pupils from the Lancashire coast in the west, and from York-shire in the east) and they contain large numbers of pupils who live outside our selected area. And since our plans were for a 'school based' research, this would have introduced many complications. Second, our main aim was to be of service to our own local education authorities, and it seemed sensible to confine our enquiry to schools under their jurisdiction. The only other schools omitted from the survey were two special schools catering for handicapped children. This was done advisedly, since it was clear that the tests we were to use would be inappropriate for such pupils.

[1] It says a great deal for the professional responsibility of the teachers, for the skill of the educational administrators, and for the good relations and confidence existing between them, that we had no objections, no complaints and no mis-understandings during the whole of the testing programme. With nearly 300 schools involved, this is indeed an extraordinary testimony to the education service.

[2] In retrospect, I am now convinced that this decision was a mistake. In spite of the difficulties involved, one must recognize the necessity of including such schools in any survey if a true picture is to be obtained of the distribution of educational ability in an area.

The tests

The next question to decide was the tests which we were to construct for the purposes of the experiment. Since we were to test boys and girls of 14+ in secondary schools of all types, selective and non-selective, it would be necessary to use tests which were legitimately applicable to all such children. In other words, we had to ensure that the coverage of the tests was acceptable to all the schools, and that questions were not set on topics or areas of curriculum that could not reasonably be expected to be included in all school programmes. Boys and girls of 14+ in grammar schools have studied some trigonometry and some French, but very few children in secondary modern schools have any acquaintance with these subjects. To attempt to test such subjects, therefore, was clearly impossible. We obviously had to confine ourselves to basic skills and the fundamentals of curriculum. It is true, of course, that subjects like geography and history appear in the time-table of all secondary schools, but the British educational system, unlike that of many European countries, lays down no common ground in such subjects. It would be impossible to construct tests of these subjects which would be acceptable to, and legitimate for, all schools. We concluded that the only subjects that satisfied our criteria were English and Arithmetic. And even within each of these it would be necessary to be selective: there are considerable differences, for example, in the amount and complexity and kind of English grammar taught in secondary schools, while many types of problems in Arithmetic are far from universal in their popularity with teachers. Our concern for the 'public relations' aspect of our work, our desire to avoid (even at heavy cost) educational criticism of the form of the investigation, led us to a highly conservative decision: we selected *reading comprehension* and *mechanical arithmetic* as the subjects of our tests. For obvious reasons—and particularly in view of the social factors research in phase two—we added *verbal intelligence* as the third test.

Test construction

The method of constructing the three objective tests followed the usual pattern. First of all, for each test we collected about three times as many items as we finally required.[1] These were then administered

[1] In this work of inventing test-items we received considerable help from our colleagues on the staff of the University Department of Education, to whom I make this grateful acknowledgement. It is important to make the source of items

to a specially chosen sample of children of 14+ (coming, of course, from schools *not* included in the major research). This sample ($N = 250$) covered a wide range of ability, from the most backward to the very able, and was as representative of the total 14+ population as could be achieved. The results of this try-out testing were then analysed. Data were obtained, for each item, on its level of difficulty and its 'efficiency' or power of discrimination. From these results, poor items were discarded, and final versions of the tests assembled from the items which had shown themselves to be the most efficient.[1]

The end-product of this phase of the work was a 60-item test of Reading Comprehension (45 min. testing time), a 60-item test of Mechanical Arithmetic (60 min.) and a 100-item test of General Ability (60 min.). These tests have been published[2] and are available without restriction.

The Reading Comprehension test consists of eleven prose passages, each followed by a number of questions. The passages come from a variety of sources, including material from reference books, guide books and scientific writing, as well as purely literary passages. The Arithmetic test starts with simple sums on the four rules, goes on to items involving money, length, capacity, weight and area. It includes simple problems such as the cost of so many articles at so much each. There are questions on vulgar fractions and decimals, and conversion from one to the other. Averages and percentages are represented. There is a section of five items involving substitution in simple formulae (e.g. if $a = 3$, $b = 2$, $c = 1$ find the value of . . .). Finally there are items on areas and volumes, with illustrative diagrams. The General Ability test consists of items of well-established types, such as analogies, classification, missing-figure sums, matrices with missing elements, series, etc.

Summary

The form of the first phase of the research was now defined:

Area: The boroughs of Manchester, Salford, Stockport. The contiguous boroughs and urban districts of Lancashire.

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as wide as possible: any single individual inevitably shows a preference for some types of item at the expense of others.

[1] Those who are interested in the techniques of test construction and item analysis will find them described in more detail in one of a series of *Research Guides* to be published shortly by the Manchester University Press.

[2] Manchester Reading Comprehension Test (Sen.) 1, Manchester Mechanical Arithmetic Test (Sen.) 1, Manchester General Ability Test (Sen.) 2, and handbooks. University of London Press.

Schools: All local authority maintained schools in the area having children of the required age, excluding special schools.

Children: All boys and girls aged 14 and not yet 15, present in the chosen schools on the day of testing.

Tests:

Reading Comprehension	(45 min.)
Mechanical Arithmetic	(60 min.)
General Ability	(60 min.)

The administration of the tests

The testing of many thousands of children was a formidable undertaking. We had to rely very heavily upon the co-operation of the education authorities and the teachers in the schools: without this such a programme was quite impossible. It was clear, too, that the project was feasible only if we could rely on the teachers, not only to give the tests, but to mark them. The marking of 42,000 scripts could not possibly be done centrally, with an exiguous staff of one research assistant and one clerk! It was clear, too, that the labour of analysis and standardization would have to be lightened as much as possible by mechanization, and the decision was taken to employ punched card equipment.[1]

An official approach was made to the chief education officers of Manchester, Salford, Stockport and Lancashire, explaining the purpose of the research, and the very large amount of help we hoped to get from the schools. We were delighted to receive assurances of co-operation, together with expressions of interest in the research and support for its usefulness.[2] From the education officers we received details of all the schools having children of the required age:

Grammar	22
Technical	9
Selective Central	9
Modern	58
All-age	175
Total	273

The next step was to write to the heads of all these schools, outlining the research plan and explaining the help we wanted from their

[1] Since the University then possessed no such equipment we had to farm out this work to the Manchester branch of Hollerith.

[2] I cannot speak too highly of the help we received from the staffs of the education offices of the authorities concerned. It involved them in a great deal of work, but this was accepted without demur, and carried out with efficiency and despatch.

staffs. Again, we were quite overwhelmed by the response. We had agreed to omit any school which objected to taking part in the research: the fact that not one school out of the 273 was omitted speaks for itself. By November 1951 tests, instructions to invigilators and pupils' schedules had been printed, and were parcelled up for despatch to schools; schools themselves were given details of the testing programme, and asked to arrange the testing at any suitable times during the third week of the month. It was not necessary to disrupt the school time-table by insisting on a common time on a common date, provided that adequate security measures were taken with test papers. It was necessary to guard against the leakage of tests from one school to another having its testing programme a day or so later.

A 'schedule' was printed for each pupil, so that all the data could be collected on one sheet for transfer to punched cards. The question then arose as to what additional information could be gathered here, apart from the essentials of name, school, date of birth, sex, and the scores in the three tests. It was tempting to add a great deal more, but we were restrained by the knowledge of the very heavy load already placed on the teachers. The giving, and the marking of these objective tests (220 items for each child) was demanding enough: the schedule to be completed for each child must obviously be kept as short as possible. The most pressing claim for inclusion was, we felt, some information on the occupational level of the child's father. Socio-economic status is a fundamental variable in the kind of research we were engaged in. But to ask for this kind of information is to risk misunderstanding, misrepresentation, press interviews and questions in the House. We decided—conservative as always—to play safe and omit such a question. But we did ask for two additional pieces of information: whether the pupil had a twin taking the test (since the study of twins has proved valuable in the investigation of heredity *v.* environment); and a rating on the school attendance of the pupil during the past twelve months.

CHAPTER III

RESULTS FROM THE TESTING

Reliabilities of the tests

It was necessary to discover how accurate our measuring instruments were, by calculating the reliabilities of the tests. A random sample of 355 scripts was drawn and a correlation calculated between the score on the odd-numbered items and the score on the even-numbered items. This yielded the *split-half reliability*. We also calculated a measure of *internal* consistency, using the Kuder-Richardson formula 20. Both these techniques tend to give rather an optimistic estimate of test reliability or consistency, and at a later stage we carried out a test re-test correlation, with an interval of a month between the testings. This provides the most satisfactory estimate that can be obtained. The results from these exercises are shown in Table 3.1 which also includes the Standard Error of Raw Score which in many ways is more meaningful than the reliability coefficient.[1] It will be seen that coefficients vary between ·94 and ·97. These results are very satisfactory, and compare favourably with other tests.

TABLE 3.1

TEST RELIABILITIES

Test	S.D. of raw scores	Split-half	Kuder-Richardson	Test re-test	S.E. of raw score
Reading	12.388	.944	.940	.938	2.9 - 3.1
Arithmetic	14.641	.972	.955	.950	2.4 - 3.3
General Ability	20.872	.964	.954	.936	3.9 - 5.3

Since the tests had been marked by teachers in the schools, many of whom were quite inexperienced in this work, it seemed desirable to investigate the level of accuracy of marking. We had, of course,

[1] For those unfamiliar with these methods of estimating the consistency of measurement, Chapter VI in Wiseman (1961) gives a simple explanation of the underlying rationale.

issued very careful instructions to the markers, and laid out a marking programme which involved two separate and independent markings of each script. Nevertheless, errors in marking are easy to make, particularly in dealing with objective tests, and a check on accuracy was obviously desirable. We therefore went through the random sample of scripts, checking the marking and noting errors. Table 3.2 shows the frequency of marking error for the three tests. It is interesting that by far the greater numbers of errors are positive rather than negative: the charitable impulses of teachers are evident. This is to be expected. Many answers were 'doubtful', because of poor writing, or more than usually tortuous spelling, and faced with these, teachers gave the examinee the benefit of the doubt. In the check-marking we perhaps tended to lean in the opposite direction. But it will be seen that, out of over a thousand scripts, errors occurred in only sixty, with an over-all average error of +·056 of a mark. This was better than might have been expected in a testing programme of this size, and it is clear that the reliabilities have been but little affected by marker error. It should be noted, however, that the elimination of such error would have the effect of raising the coefficients quoted.

TABLE 3.2

FREQUENCY OF MARKING ERRORS

Test	Error									Mean
	+4	+3	+2	+1	0	-1	-2	-3	-4	
Reading	2	-	1	20	330	2	-	-	-	+.079
Arithmetic	-	1	-	10	341	2	1	-	-	+.025
Intelligence	-	2	2	12	336	1	-	2	-	+.042

Standardization of the tests

The need for standardization—i.e. the conversion of the raw scores on a test into 'standard' scores—arises out of the specificity of raw test scores. As I have said elsewhere:

> The level of a test or examination is something entirely in the hands of the test constructor. He can make the test as easy, or as difficult, as he likes. Without knowing the difficulty-level of a test, a result (such as 70%) cannot be interpreted. . . . If we are to resolve this difficulty, so

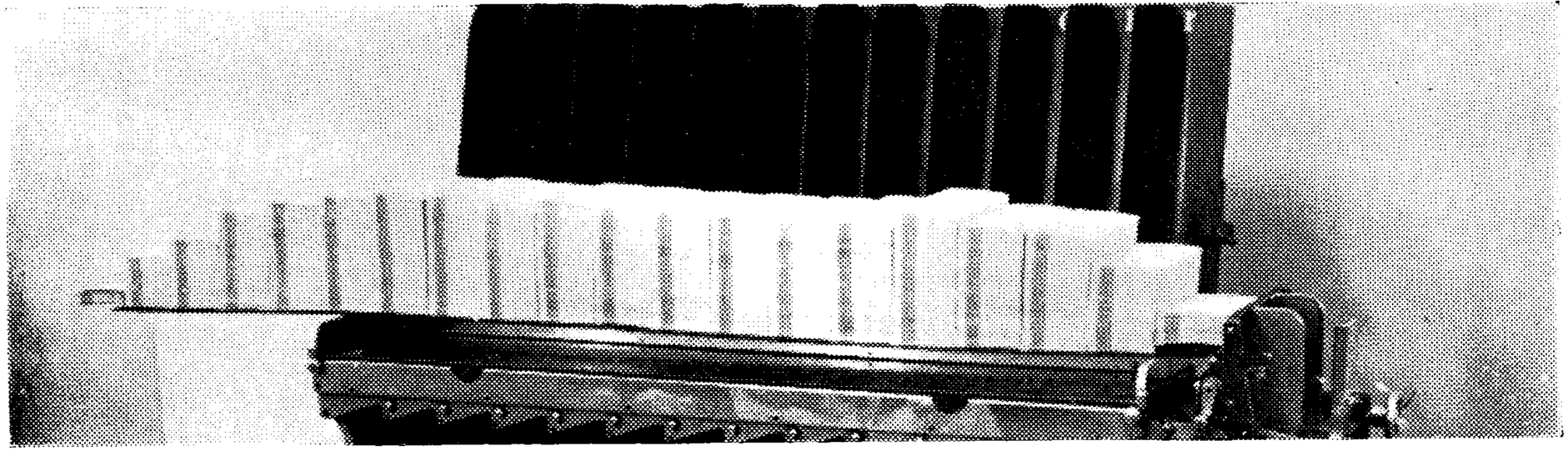

Fig. 2*a*. Distribution of raw scores on Arithmetic test

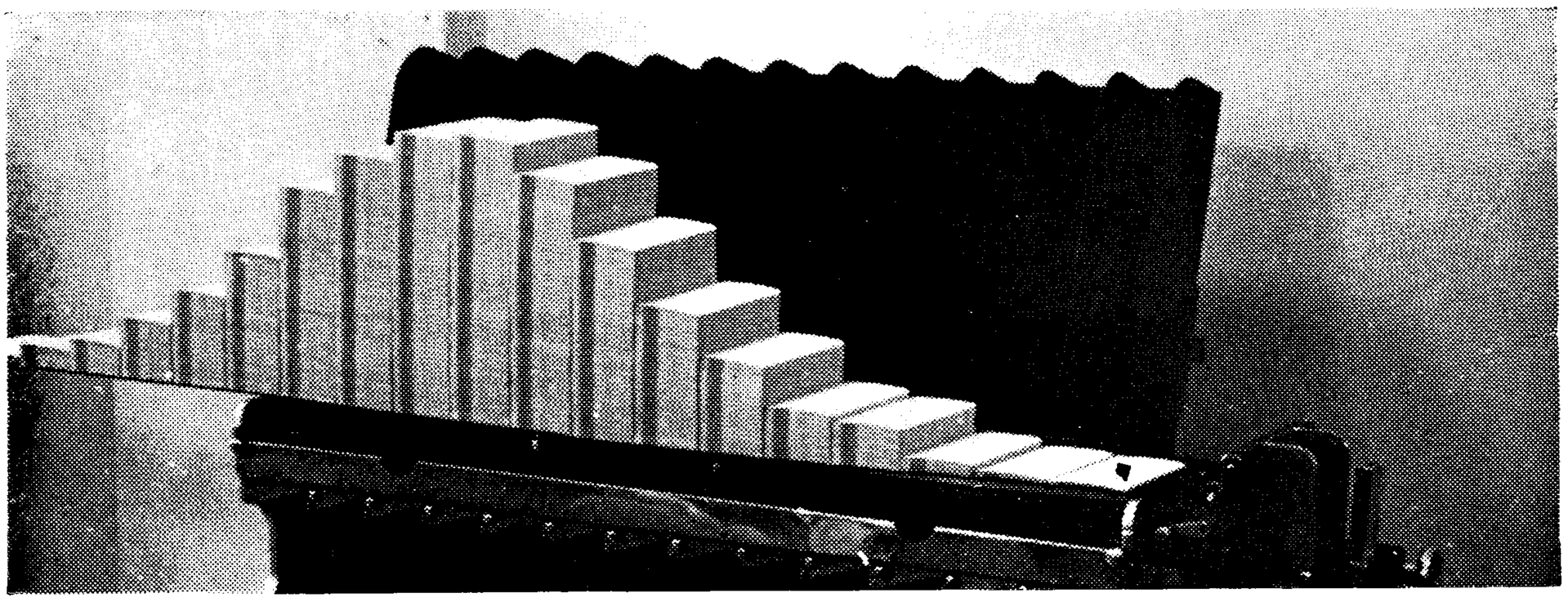

Fig. 2*b*. Distribution of standard scores on Arithmetic test

> that results from one test or examination can be compared with those from another, we must find some way of converting these quite arbitrary 'raw' scores into other units having a more rational basis. (Wiseman, 1961, p. 88.)[1]

We adopted the generally accepted technique of using standard scores having a mean of 100, a standard deviation (a measure of 'spread') of 15, and a normal distribution. At the same time, it was necessary to calculate an age-allowance, since there was a difference of twelve months between the ages of the youngest and the oldest child in the sample. This age-difference affects attainment: it is found that the average test score of children aged, say, 14.11 is higher than the average score of those aged 14.0. When converting raw score to standard score, it is convenient to have a table which does this for each month of age separately, so that no child is handicapped—or favoured—by virtue of the accident of his birth date. The method used was that described by Thomson (1932) and Lawley (1950).[2]

It should be noted that, although we aim at producing a normal distribution of standard scores—the familiar 'cocked-hat' shape—the test constructor aims at a very different goal for his raw score distribution. Here he is concerned with obtaining the maximum amount of discrimination among the children, and in particular with separating (as far as possible) the abilities of those children lying around the average level of attainment. He tries, therefore, to produce a *rectangular* rather than a normal distribution, so that the efficiency of discrimination is similar at all points along the range of ability. The contrast between the distributions of raw and standard scores is well displayed in Fig. 2, which shows photographs of the arrays of punched cards (one for each of the 14,000 children) sorted into 20 score-groups for Arithmetic, first on raw score and second on standard score.

The intelligence test was standardized on the total sample, boys and girls together. In view of the differences commonly found between the sexes in English and Arithmetic, these two tests were standardized separately for boys and girls. In the tables which are given later sometimes results are given in terms of raw score, at other times in standard scores. It follows that differences may be revealed

[1] References in this form refer to the bibliography at the end.

[2] Since we were dealing with children between the ages of 14 and 15, an age which is close to the point at which intelligence begins to 'level out', it was necessary to test the linearity of regression of score on age. This was done for all three tests: there was no significant departure from linearity.

between the sexes in terms of raw scores which are not evident in terms of standard scores, and vice versa.

Children and schools

Table 3.3 shows the total number of children tested, and their distribution over the different types of schools. Table A.1[1] shows the sample in greater detail, by sex, by authority, and with a finer classification of school type, while Table 3.4 summarizes this information in terms of percentages, thus making possible a quick comparison of authorities. These tables form interesting evidence of the individuality of the English educational system. Twenty-six per

TABLE 3.3

THE TESTED SAMPLE

Type of School	No.	%
Grammar	2127	15.5
Technical	694	5.0
Selective Central	747	5.4
Modern	4891	35.6
All-age	5292	38.5
Total	13751	100.0

cent of this large sample of children were in some form of selective secondary school: the percentages from the individual authorities vary from 18 to 32. All four authorities provided technical schools, and one had 10% of children in selective central schools. Notice, too, how uneven has been the progress towards the elimination of all-age schools—over half the children of secondary age in one authority attend such schools. But it must be remembered that this was 1951, not long after the ending of the war. The impact of war damage was by no means constant over the whole of this area, nor were other attendant difficulties in the way of reform and development distributed evenly over the region. And it is necessary to emphasize the folly of drawing invidious comparisons on the basis of a cross-section at one point in time. Rates of progress may be more signi-

[1] Tables numbered with the prefix 'A' refer to tables in the Appendix.

TABLE 3.4

SAMPLE BY PERCENTAGES OF SCHOOL TYPE

Type of School	Manchester	Salford	Stockport	Lancashire	Total
Grammar	12.1	11.7	23.4	22.8	15.5
Technical	4.1	5.8	8.5	5.1	5.0
Selective Central	10.2	-	-	-	5.4
Total Selective	26.4	17.5	31.9	27.9	25.9
Modern	27.6	26.9	46.1	57.2	35.6
All-age					
Roman Catholic	18.1	16.1	9.9	7.5	14.7
C. of E.	8.7	17.9	3.8	4.3	8.7
County	19.1	21.6	8.4	3.1	15.0
Total	45.9	55.6	22.1	14.9	38.4
	99.9	100.0	100.1	100.0	99.9

ficant than particular levels: later in this report the results from the 1957 survey will show a radical transformation in one authority over a mere six-year period.

Differences between school types

The simplest way of showing differences between school types in the results from the three tests is to give the mean score for each kind of school. Such an analysis is a very crude one, and gives no information about the spread of scores, or the overlap between different groups. The most efficient measure of spread is the standard deviation, and Tables 3.5 and A.2 show the means and S.D.'s for the sample as a whole, and mean scores for the separate authorities, respectively. Table A.2 should be read in conjunction with Table A.1, which gives the number of children contributing to each cell in the table. The large difference in mean score between boys and girls in grammar schools in Salford, for example, takes on a different complexion when it is seen that there are nearly twice as many girls as boys in this type of school.

But raw scores, as already mentioned, cannot be compared from one test to another. To do this we must use standard scores, which are shown for authorities and school types in Table A.3. Remember that the mean score for the sample as a whole is 100, and that about

two-thirds of all the children fall between the limits 85 and 115. The differences between school types are much as might be expected, but there are some interesting variations between subjects and between authorities.

The question of 'overlap' between the abilities of children in different categories has already been mentioned, and it is clear that much of the information of interest and value to teachers and administrators is contained not so much in mean scores, but in the way in which scores are spread. Quoting S.D.'s for different types of

TABLE 3.5

MEAN RAW SCORES AND S.D.s BY TYPE OF SCHOOL

Type of School	Intelligence		Reading		Arithmetic	
	Mean Raw score	SD	Mean Raw score	SD	Mean Raw score	SD
Grammar	63.55	15.233	46.63	6.609	44.71	8.928
Technical	47.74	13.158	41.22	6.893	42.84	8.207
Selective Central	47.56	13.335	41.96	6.798	37.82	8.470
Modern	24.84	15.557	28.73	10.792	23.80	12.821
All-age	22.32	14.759	27.60	10.851	22.91	13.214
Total	32.20	21.375	32.39	12.332	28.34	14.854

school does little to illuminate this question, since—among other factors—distributions within any one category are not likely to be normal. Indeed, it is almost certain that they will be skewed: in some cases (e.g. grammar schools) strongly skewed. It is desirable, therefore, to use some more adequate means of studying the spread of ability. What we are mainly interested in are the children at the two extremes of the ability-range—the bright and the backward.

It was therefore decided to perform an analysis based on the standard scores, and to find what proportion of children fell (*a*) above the upper limit of 115, and (*b*) below the lower limit of 85. These limits are, of course, one S.D. above and below the mean respectively, and in the total sample of children about 16% fall into each of these two extreme groups. The limits 115 and 85 are quite arbitrary—a similar analysis could be carried out using other, and different, levels. But there is something to be said for the choice of these in particular. Roughly speaking, the upper 16% of children

may be regarded[1] as demonstrably of 'grammar school type', while a standard score (or quotient) of 85 is often regarded as a reasonable demarcation between 'normal' and 'backward' children.

Distribution of 'brightness'

Table 3.6 shows the number of children in each type of school who fall into the 'brightness' category. This is also expressed as a

TABLE 3.6

DISTRIBUTION OF 'BRIGHTNESS' BY TYPE OF SCHOOL

Type of school	Total Number	Intelligence		Reading		Arithmetic	
		N	%	N	%	N	%
Grammar	2127	1603	75.4	1358	63.8	1230	57.8
Technical	694	211	30.4	183	26.4	304	43.8
Selective Central	747	218	29.2	233	31.2	166	22.2
Modern	4891	175	3.6	251	5.1	274	5.6
All-age	5292	163	3.1	243	4.6	349	6.6

percentage of the total number of children in a particular type of school. The differences between school types are in the direction we should expect, but the amount of 'overlap' is marked. For the intelligence test, for example, there were 338 children attending secondary modern and all-age schools whose score on the test was higher than that obtained by 524 children in grammar schools. The overlap in reading and in arithmetic is even more marked: 494 better than 769 in reading comprehension; 623 better than 897 in arithmetic. This is very startling evidence of the existence of undiscovered talent in the non-selective secondary schools. Looked at another way, of the 16% brightest children in the sample—over 2,000 of them—only two-thirds (67%) are in grammar schools, 18% are in technical or selective central schools, and 14% are in secondary modern and all-age schools. Of the 2,268 best readers, 22% are in non-selective schools, and of the one-sixth best at mechanical arithmetic just over a half (53%) are in grammar schools, and over a quarter (27%) are in secondary modern or all-age schools. It is true that arithmetic forms

[1] This statement must not be interpreted as meaning that we are suggesting an I.Q. of 115 as the 'right' level of admission to grammar schools. We do not believe that any such 'right' level can be laid down *ex cathedra*.

only a small proportion of the time devoted to mathematics in grammar, technical and central schools, and that the children in non-selective secondary schools almost certainly devote more attention to this subject. But it must be remembered that this is a fairly elementary test, dealing with basic mechanical computations. And there are no equivalent mitigating circumstances so far as reading comprehension is concerned. This skill is fundamental for those pursuing specialist academic education: the fact that nearly 40% of the best readers lie outside the grammar schools is a sobering thought.

It must be remembered, however, that we are considering the abilities of boys and girls in their fifteenth year, quite a long time after the '11+' (taken at the age of 10). One would not expect any measure of attainment to show a perfect correlation with earlier selection tests, not only because of the time-lag and the inevitable variations in development, motivation, interest and special aptitudes. When we make our comparisons by cutting off a fraction at one end or other of the range of ability, we become subject to the operation of 'regression to the mean', first noted by Galton,[1] which inevitably exaggerates the discrepancy between past selection and present attainment. Nevertheless, the results displayed in Table 3.6 underline the existence of a good deal of 'undiscovered' ability, and emphasize yet again the overlap in potentiality and attainment between selective schools and others, an overlap which justifies a concomitant overlap in curriculum and in method. This is a picture from 1951: in 1964, with the existence of G.C.E. courses in secondary modern schools, even more overlap might be discoverable.

Table 3.6 gives us only a broad picture. Table A.4 breaks this down by authorities. As might be expected this reveals much variation, but to suggest possible causes is a hazardous exercise. Some of the differences might well reflect differences in selection methods at 11+: it is tempting to assume, for example, that Salford's selection programme gives more weight to the intelligence test than to the attainment tests, thus producing lower percentages of brightness at 14+ in reading and arithmetic than in general ability. Table A.4 should be read in conjunction with A.1, which gives the base numbers for the percentages. Some of the big variations then show themselves to be—possibly—the product of small numbers and chance factors. For example, in all-age schools, we have one entry of 0·0%, and

[1] An excellent account of this statistical phenomenon, and its effect on educational data, will be found in Philpott (1945).

another of 18·0%. The first of these refers to a group of only 56 children, the second to 89.

If we break down our data even further, and consider individual schools, then variations become even more striking. Table 3.7 shows the range of percentages (i.e. the highest and the lowest) for individual

TABLE 3.7

BRIGHTNESS : RANGE OF PERCENTAGES AMONG INDIVIDUAL SCHOOLS

Type of school	Number of Schools	Intelligence	Reading	Arithmetic
Grammar	22	56.3 - 91.7	45.2 - 81.3	26.3 - 85.4
Technical	9	5.0 - 43.0	5.0 - 41.0	10.5 - 69.2
Selective Central	9	16.3 - 43.7	18.3 - 45.1	8.7 - 36.6
Modern	58	0.0 - 9.8	0.0 - 14.7	0.0 - 25.0
All-age	175	0.0 - 25.0	0.0 - 29.2	0.0 - 30.8

schools for each test and for each school type. It will be seen that at least one all-age school showed a higher proportion of 'bright' children in arithmetic than did one of the grammar schools. This demonstrates very clearly the extraordinary variations possible among individual schools, variations much too great to be explicable by 'chance factors'.

Distribution of 'backwardness'

We have defined 'backwardness' as a standard score of 85 or below. The raw score level in each of the tests corresponding to this is given below. Since a standard score incorporates an age-allowance there are slight differences between raw scores for the youngest and the oldest children in the sample.

	Youngest	*Oldest*
General Ability	9	12
Reading		
Boys	18	22
Girls	17	20
Arithmetic		
Boys	10	14
Girls	9	12

A study of the actual tests will enable some estimate to be made of the level of ability represented by our arbitrary level of 85. If

85 were a real *quotient*—i.e. obtained from a test standardized on separate year groups (7+, 8+, 9+, etc.)—then we could conclude that children falling below this level have mental ages, reading ages and arithmetic ages below 11½ (11 for the youngest, 12 for the oldest). This, however, cannot be done, since our 'quotients' are only standard scores derived from a single age-group. We were, however, able to calibrate our reading test against the Watts-Vernon tests used in the Ministry of Education's surveys of reading ability[1] (as described on p. 128). From this calibration, it would appear that our limit for backwardness in reading corresponds to a reading age of 10·3 for the youngest child and 11·0 for the oldest.

Table 3.8 shows the distribution of backwardness by type of school.

TABLE 3.8

DISTRIBUTION OF 'BACKWARDNESS' BY TYPE OF SCHOOL

Type of school	Total No.	Intelligence		Reading		Arithmetic	
		N	%	N	%	N	%
Grammar	2127	3	0.1	0	0.0	0	0.0
Technical	694	2	0.3	2	0.3	3	0.4
Selective Central	747	0	0.0	0	0.0	1	0.1
Modern	4891	941	19.2	907	18.5	912	18.6
All-age	5292	1233	23.3	1162	22.0	1152	21.3

It will be seen that the amount of 'overlap' is practically zero (the seven entries in 'technical' were produced by six children, four of whom were from a secondary school of Art). But this is to be expected—this table deals with the bottom 16% of the sample. Table A.5. gives the picture in greater detail for the different authorities. The variation is not so marked as with brightness: the percentages for secondary modern schools range pretty solidly between 15 and 20, and for all-age schools between 20 and 30. The differences between schools, however, are just as great as with 'brightness'. Table 3.9 shows the range of percentages, and it will be seen that we have all-age schools with *no* children in this category, and others with up to 75%. The job of the teachers in a school having three-quarters of its

[1] Ministry of Education (1950) and (1957).

TABLE 3.9

BACKWARDNESS : RANGE OF PERCENTAGES AMONG INDIVIDUAL SCHOOLS

Type of school	No. of schools	Intelligence	Reading	Arithmetic
Grammar	22	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0
Technical	9	0.0 - 5.3	0.0 - 1.0	0.0 - 7.9
Selective Central	9	0.0 - 0.0	0.0 - 0.0	0.0 - 1.4
Modern	58	8.9 - 35.1	10.1 - 37.7	4.8 - 35.1
All-age	175	0.0 - 75.0	0.0 - 75.0	0.0 - 69.2

children below the 85 quotient level must be extremely difficult and onerous.

Attainment and attendance

It will be remembered that the schools were asked to give information about the attendance record of each pupil. This was done by checking one of four categories. These are given below, together with the explanatory notes issued to schools.

A. *Excellent*. This should apply to all children who have had less than, say, ten half-days absences during the last twelve months.
B. *Occasional absences*. This includes children who cannot be called excellent, but who do not fall into the next category.
C. *Frequent absences of two or three days*. These are children who have not had long periods of consecutive absence but who have constant absences of days or half-days, sufficient in number, in the judgement of the teacher, to have produced a definite handicap to their school work.
D. *Long absences*. These are children with one or more periods of absence long enough to have caused handicap to their school work.

It was explained that it was recognized that there would be difficulty in deciding the appropriate category for particular children, but it was hoped that the category descriptions would enable teachers to achieve a fairly uniform standard of assessment.

To experienced teachers it will be evident that these four categories do not form progressive points on a linear scale. From the point of

view of school work and progress, children in category C are likely to be poorer than those in D. Attendance is not purely (not even mainly) a function of physical health. It is rather, for a significant proportion of the pupils, the resultant of a number of diverse forces, and in particular the child's motivation towards school, the parents' attitude towards education, and the number and kind of responsibilities shouldered (voluntarily or otherwise) by the boy or girl within the family. Thus, while category D may reflect predominantly medical and health factors, category C contains within it reluctant pupils, backward pupils, pupils with poor home backgrounds, as

TABLE 3.10

CLASSIFICATION OF ATTENDANCE

Category	Boys		Girls	
	N	%	N	%
A Excellent	2799	40	2056	30
B Occasional absences	2804	40	2839	42
C Frequent absences	838	12	1178	17
D Long absences	431	7	596	9
Unclassified	105	2	139	2
Total	6977	101	6808	100

well as baby-minders, household drudges and unofficial contributors to the family income. We may expect attainment to fall off in category D, because of the effect of long absence from instruction, but the results in category C may be a good deal worse.

The numbers, and percentages, of boys and girls in the various categories are given in Table 3.10. It will be seen that 80% of boys and 72% of girls fall into the 'satisfactory' categories A and B. There is a clear sex difference in the table, with fewer girls rated 'Excellent' and more of them rated C. This difference is highly significant statistically: χ^2, with four degrees of freedom, is 198·7, a value which would occur by chance less than once in one hundred thousand times. It is perhaps not surprising to find more girls of 14+ in category C. There is no doubt that many parents are far from convinced that

education is important for girls,[1] and the impact of domestic duties—including the care of children—on the adolescent girl is often very considerable.

Table 3.11 shows mean standard scores in the three tests for the attendance categories. As expected, there is a fall from A through B to C, and then a slight rise to D. The pattern is similar for each of the tests, but closer inspection discloses a difference in gradient. That for reading comprehension is the greatest, and arithmetic the least. The differences are clear in Fig. 3, where the points are graphed. Notice how the scores on the three tests are almost

TABLE 3.11

MEAN STANDARD SCORES : ATTENDANCE CATEGORIES

	Intelligence			Reading			Arithmetic		
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
A Excellent	103.2	103.5	103.3	104.9	105.6	105.2	102.8	103.1	102.9
B Occasional absences	98.9	100.2	99.6	98.7	100.4	99.6	99.5	100.4	100.0
C Frequent absences	94.5	94.7	94.6	92.3	91.9	92.1	96.4	96.0	96.2
D Long absences	95.9	95.7	95.8	93.2	92.2	92.7	97.1	96.9	97.0
Unclassified	93.7	98.8	96.3	91.8	100.4	96.1	96.1	98.5	97.3

identical for category B, but above and below this common point the lines fan out. This is a very curious result. On *a priori* grounds one would have expected the general ability test to be the 'odd one out', but here it is almost forming an average of the other two tests. Again, one might have expected attainment in arithmetic to have been more susceptible to the effects of absence from school, on the grounds of the logical nature of the subject, and the greater loss from missing particular lessons. And yet the drop from A to C is only 6·7 points, as compared with 8·7 for intelligence and 13·1 for reading.

Disparities between attainment in reading and in arithmetic are

[1] The evidence is overwhelming. See, for example, Ministry of Education (1954) which shows that 21% of girls left grammar schools prematurely compared with 17% of boys; Furneaux (1961), p. 82, where *grammar school heads* judged 60% of their boys capable of gaining a pass degree, as against 40% of their girls; p. 39, admissions to universities in 1955, 3·8% of boys, 1·5% of girls; p. 58, 41% of sixth-form girls with 'less-skilled' parents wished to go to university as compared with 82% of boys in the same category.

often found in individual children. These sometimes attract the attention of clinical psychologists. It has been said that the anxious and neurotic child is often an *over*-achiever in reading, but backward in arithmetic. Davis and Kent (1955) give some results suggesting that verbal achievement is related to home discipline, while Lynn (1955 and 1957) suggests 'a positive association [of anxiety] with better reading than arithmetic' (Reed and Schonfield (1958), however, find his argument less than persuasive). In other words, some

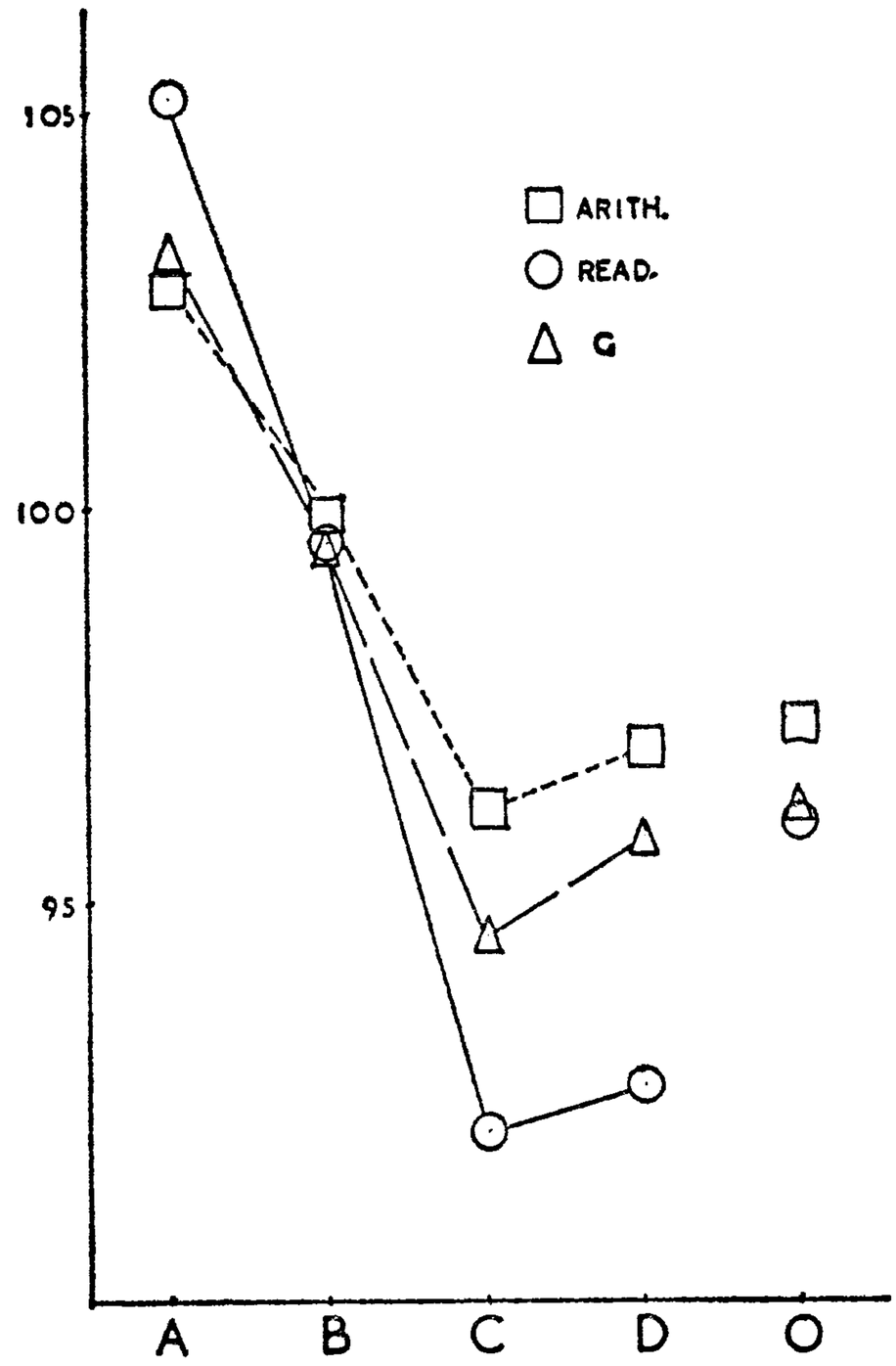

Fig. 3. Mean standard scores: attendance categories

investigators feel that these two subjects are influenced differently by the child's temperament and by parental discipline. It is not surprising, therefore, to see a difference emerging in connection with school attendance, which itself has obvious links with these factors. It is by no means clear, however, how our results can be reconciled with the hypotheses of Davis and Kent, and Lynn, unless we postulate that 'anxiety' in children is correlated with good attendance. As for the effect of home background and parental discipline, we must clearly wait for phase two of our investigation to consider this.

The results from the intelligence test are no easier to explain. If we take the over-simplified and ultra-conservative view, we might expect children in all attendance categories to be, on the average,

equally intelligent: attendance will affect attainment, but cannot affect innate ability. This, however, is clearly an impossible view. Attendance may not affect innate ability, but innate ability will certainly affect attendance. The complex of vectors lying behind the apparently simple concept of 'school attendance' has already been mentioned: motivation is an essential element here. The intelligent—and therefore successful and achieving—child will tend not to be absent: the under-achiever, the dullard, usually has a much more negative attitude to school and much slighter reasons will cause his absence. Thus we would expect to find the mean score of category C to be significantly lower than A. The level of B, also, might be expected to show some depression, but not, one would imagine, a very substantial one. Category D ought to be at least as high as B. The results do not bear this out, and clearly other factors are at work.

There is, of course, the fact that no intelligence test gives a pure measure of 'innate ability'. We are all aware, nowadays, of Hebb's 'Intelligence A' and 'Intelligence B'. And we must note that our general ability test is a verbal one, and all the more subject, for that reason, to the influence of schooling. There is also the small but positive correlation between intelligence and physical factors: there is a tendency for the more intelligent children to be taller, heavier and healthier than the less intelligent. All these factors, however, seem insufficient to explain our present results. Had the graph for intelligence lain above that for arithmetic, instead of between arithmetic and reading, we might perhaps have felt satisfied. As it is, we must note the discrepancy and—again—wait for phase two in the hope that some enlightenment might emerge from the analysis of environmental factors.

CHAPTER IV

EDUCATION AND ENVIRONMENT: A SURVEY OF RESEARCH

A PROBLEM which must have concerned mankind since the dawn of civilization is the problem of heredity and environment: the relative effect of nature and nurture on the abilities and skills of the individual. Many a stone-age man must have cogitated, in a confused sort of way, on the causes of his mate's deficiencies in producing appetizing meals from the products of his hunting, or speculated on the reason for his son's growing superiority in the tactics of inter-tribal warfare. The mediaeval craftsman undoubtedly remarked the individual differences among his apprentices in their speed of learning and their ultimate level of skill. Any teacher, no matter what he is teaching, is brought up against the universal fact of individual differences in aptitudes and abilities; and, since he is a teacher and thus largely in control of the learning environment, tends to regard at least deficiencies as being mainly beyond his control and probably caused by innate factors. It is, then, for education and educationists, a fundamental problem, but it is equally fundamental for the philosopher and the politician. Even to pose the question has been dangerous in certain periods of history; to give a particular answer has been to invite imprisonment, torture and death. This is because of the entanglement of the problem with the question of authority—divine or secular. Speculation about it has been regarded as heretical and treasonable, directed against the power of the church or the state, whenever this power has been in the hands of an hereditary élite. The witch-doctor, the prince-bishop, the baron, the emperor have all proclaimed the power of inborn factors; the reformer, the republican, the radical, the revolutionary have emphasized the equality of man and the potentiality of education, training and a favourable environment. It is, therefore, a social and political question first, and an educational question second. To ignore the prevalent political climate in considering present-day reactions to it is to display a naïveté

which is unlikely to lead one very far along the road to truth. As Burt (1955) puts it:

> . . . a large number of sociological writers appear to accept the general behaviourist view. . . . So far as individual psychology is concerned . . . no new facts have been responsible for this remarkable change of view: it seems rather to be an incidental symptom or consequence of an equally remarkable change in the general climate of opinion. In psychology as in politics, the pendulum of fashion swings to and fro; and the vacillations roughly synchronize. During the nineteenth century, the associationists preached an egalitarian doctrine, and three reform bills were passed. Then the close of the century witnessed a reaction; and we ourselves are witnessing the counter-reaction. An excessive emphasis on heredity has now been succeeded by an equally excessive emphasis on environment. Apparently it is difficult to give due weight simultaneously to each (p. 167*n*).

In view of this ancient debate, so crucial for politics and education, it is to be expected that researchers have attacked the nature–nurture problem. Among the first to do so was Sir Francis Galton, the father of the modern study of eugenics, and the inventor of the statistical technique—correlation—which was to be used in the many subsequent attacks, more systematic, more sophisticated and more rigorous than Galton's could be. Galton studied the family trees of such eminent men as Darwin, pointing out the many illustrious branches that sprang from the main stem. Those of us who studied our psychology and education in the 20's and 30's remember the extension of this line of approach, and, at the other end of the spectrum from the Darwins, the notorious families of the Jukes and the Kallikaks. But such demonstrations fail to carry conviction, since the social environment of the scholar on the one hand, and that of the shiftless and destitute criminal on the other, are as likely to be responsible for abnormal development as are the genes handed down from one generation to another.

Intelligence

Serious research, using developing statistical techniques, began in earnest with the creation of intelligence tests. Here at last, it seemed, was an instrument capable of solving the problem—a test specifically designed to test innate intellectual ability. The concept of 'intelligence', handed down from Plato, Aristotle and Cicero, refined further by the mediaeval schoolmen, came to a more precise and operational definition through the work of Spearman and others.

The 'general factor', or *g*, emerging from the hierarchy of inter-correlations of tests of educational abilities and aptitudes, seemed to correspond to the 'intelligence' of the ancient philosophers, and also to the modern psychologist's concept of 'innate, general, cognitive ability' (Burt, 1955). If this were so, then the index obtained from such tests—the Intelligence Quotient or I.Q.—must be constant. A spate of researches followed, hoping to get a clear answer one way or the other. The hope was illusory. For many children, the I.Q. *was* demonstrably constant—within the limits of the error of measurement. But many enquiries showed the opposite effect. In this country, a typical research was that of Gordon (1923) on canal-boat children, children living a nomadic existence, and having little or no schooling. Gordon showed that, using the best existing tests, I.Q. fell with age. The average I.Q. of the youngest child in the family was 90, of the second youngest 77, of the third youngest 73, and of the oldest 60. This was explicable if the dependence of the tests on schooling was admitted: for such subjects the test used was inappropriate. Many similar researches could be cited, and the results indicated the difficulty—the impossibility—of constructing a 'culture-free' test of innate intelligence. And yet such a test, logically, must be culture-free (particularly if it is to be used on children with strongly contrasting environmental histories).

The major work on cultural differences in response to intelligence tests and test items is the Chicago study, begun in 1945 and published in 1951 (Eells, Davis, Havighurst and Herrick, 1951). This book has attracted a great deal of critical comment, and it seems true that statistical and methodological errors vitiate some of the detailed conclusions. Nevertheless the main trend of the results is unaffected. Children aged 9–14 years from contrasting socio-economic levels were given seven widely used intelligence tests. The correlations of total score on the several tests with social status varied from ·20 to ·43. A closer study of individual items was made, and it was shown that for 9- and 10-year-olds about half the items showed significant socio-economic differences ($P = \cdot 01$), while for 13- and 14-year-olds the proportion was 85%. The finding that differences between verbal and non-verbal tests are insignificant for low-status groups, but increase with increase in status, while persuasive and 'logical', now seems possibly an artifact caused by inequality of I.Q. units on the different tests (see Travers, 1955, p. 153). Eells and his collaborators suggest that children from the lower socio-economic levels

have difficulty in understanding tests which reflect a middle-class culture and argue that they will therefore experience similar difficulties in dealing with school curricula having the same approach. However, Gordon's (1953) research in technical training showed that conditions which affect test scores 'may not have a corresponding effect on advancement in educational programs'. Travers (1955) suggests that the most appropriate evaluation of the controversy comes from Lorge:

> The authors have not made novel contributions to substantive knowledge, or to research design, or to procedures; nor have they contributed new interpretations of established fact. They have, however, reinstigated an interest in the question of the relation between status and intellect. Their data, indeed, can serve the purpose of giving a bench mark for the inter-relation of these factors for the year 1946. . . . It is hoped that some researchers as enterprising as the Chicago group will bring in the evidence in 1971.

Lorge's implication of the importance of the temporal factor is timely. Changes in social conditions, as well as the refinement of testing instruments, make it impossible to regard the results of any single research as absolute.

We may now consider a group of researches which attacked the problem by using foster-children, children with no genetic links with their 'parents'. Typical here is the research of Burks (1928) who investigated 200 foster-children, all adopted before the age of twelve months, and a control group of 100 children in normal families, matched for age, sex, nationality and occupational status of present home. She found a positive and significant correlation between the I.Q. of the foster-children and their foster-parents—*not* with their true parents—but a correlation lower than that of the controls with their parents. She concluded that the 'maximal contribution of the best home environment is about 20 I.Q. points . . . the least cultured, least stimulating kind of American home environment may depress the I.Q. as much as 20 points' (p. 309). A similar result was obtained by Freeman, Holzinger and Mitchell (1928) who studied two groups of foster-homes, in contrasting environments, good and bad. They found an improvement in I.Q. in one and not in the other, an improvement connected with the age of adoption. There was a significant correlation between the I.Q.'s of unrelated foster-children reared in the same home. It should be noted, however, that this correlation (and the similar one derived by Burks) could arise in part

at least from the method of placement of foster-children. It is unlikely that dull and backward orphans would be placed in highly intellectual homes: placement services usually do what they can to secure 'appropriate' homes for their children. Burt (1943*a*) reports a correlation of ·24 between the economic status of the foster-parents with the foster-child's real parents.

It will be seen that the results of these researches, and many like them, gave comfort to both sides. The I.Q., as measured by available tests, had been shown to be far from constant in particular cases. But in order to demonstrate such inconstancy, it seemed necessary to use children exhibiting environmental histories dramatically different from the usual run. Tests were far from culture-free, but differences in educational level and cultural background had, apparently, to be very large before the limitations of the tests became demonstrable. Adopted children were shown to have I.Q. levels more closely related to those of their foster-parents than to their real parents—and yet the correlations were significantly lower than those of normal children with their parents. It has been shown (Reymert and Hinton, 1940) that a superior environment must be provided very early in life if it is to have any effect on measured intelligence: a change after the age of seven has little effect.

A more rigorous attack on the problem is possible by investigating identical twins who have been brought up in isolation from each other. Identical (as opposed to fraternal) twins derive from the splitting of a single 'egg', and have, therefore, identical genetic constitutions. If we can find pairs of such twins who have been reared apart, and thus have had different environments, it might be possible to disentangle the effects of nature and nurture. In other words, we can compare children of identical heredity brought up in different environments with those of different heredity reared in the same environment. Two studies of this kind have been made, by Burt and Conway (Burt, 1955) and by Freeman, Holzinger and Newman (1937). The correlations, for intelligence test scores, obtained in these two researches are shown in Table 4.1. The important correlations here are for identical twins reared apart. Notice that these are higher than for non-identical twins reared together—and that these, in turn, are very little higher than ordinary brothers and sisters. Nevertheless, environmental effects are clear in the drop in correlation from the first to the second line of the table. The numbers in the crucial groups are small, and this leads to instability in correlation coefficients and

TABLE 4.1

TWINS - CORRELATIONS BETWEEN INTELLIGENCE TEST SCORES
(From Burt 1955, Table I)

	Burt and Conway		Freeman, Holzinger and Newman		
	N	r	N	r Group test	r Individ. test
Identical twins reared together	83	.925	50	.922	.910
Identical twins reared apart	21	.876	19	.727	.670
Non-identical twins reared together	172	.551	50	.621	.640
Siblings reared together	853	.538	-	-	-
Siblings reared apart	131	.517	-	-	-
Unrelated children reared together	287	.269	-	-	-

possible spurious inflation or diminution of particular figures. If we take an overall average of all the five sets of coefficients obtained in the two experiments (using the data given in Table 1 of Burt, 1955) as a rough means of reducing error, we get:

(*a*) Identical twins reared together ·92
(*b*) Identical twins reared apart ·78
(*c*) Non-identical twins reared together ·58

The crucial comparison is (*b*) with (*c*): children of identical heredity brought up in different environments (*b*) versus children of different heredity brought up in the same environment (*c*). The difference is clear, and one must conclude that, although (as Freeman *et al.* put it) 'extreme differences in educational and social environment are accompanied by significant changes in intelligence . . . as measured by our tests', nevertheless the innate factors appear to be much the stronger. Burt himself summarizes his own final conclusions as follows: 'I calculate that in all at least 75 per cent of the entire variance must be due to genetic influences, probably far more. . . . Human intelligence, like human stature, is determined largely though not wholly by multifactorial inheritance' (Burt, 1955, pp. 175–6). As far as intelligence is concerned, this seems to be a reasonable conclusion from the results of research. It does not deny the influence of environment on measured intelligence, but it emphasizes the much greater influence of inherited factors. It fits in with Hebb's theory of 'A' and 'B' intelligences, and it accommodates such findings as that of Clarke and Clarke (1958): 'During childhood and adolescence,

mental (like physical) growth does not proceed at a uniform rate and the individual's position with respect to others in his group tends to vary from year to year, this being reflected in changes in I.Q.' But such a conclusion is in strong contrast to the pronouncements of some writers on education and, in particular, and as already noted by Burt, some of the educational sociologists. Comments such as 'measured intelligence is largely an acquired characteristic' (Floud, Halsey and Martin, 1957), and 'recent inquiries suggest that intelligence, in so far as it can be measured at all, is largely acquired' (Vaizey, 1962, p. 14), seem to merit Warburton's stricture in his review of the first-named book when he suggested that it is 'rather like saying "the English Channel is well known to be wider than the Atlantic Ocean" '.[1] These differences of interpretation of the same experimental data emphasize the social and political implications of the controversy, and form interesting raw material for any psychologist who wishes to study the influence of basic attitudes on the functioning of human intelligence.[2]

No attempt has been made here to make a detailed survey of all the investigations on tests of intelligence that bear on this nature–nurture problem. Only the major researches have been picked out to indicate the justification for the basic conclusion. There seems to the writer no doubt that the postulation of the simple dichotomy heredity:environment is an over-simplification of an extremely complex situation. Nevertheless it is important to consider the present state of the evidence even though we are here concerned mainly with the effect of environment on educational attainment. This is not only because we ourselves have included an intelligence test in our enquiry, but also because of the importance of intelligence as a mediator of educational attainment. We cannot sensibly discuss the

[1] *Brit. J. Educ. Psychol.*, 1958, 28, p. 89. See also Floud and Halsey's rejoinder and Warburton's reply in the same journal, 1958, 28, pp. 290–2.

[2] An interesting study is that of Pastore (1949), who investigated the writin of 24 British and American scientists who had concerned themselves with the nature–nurture problem. The six British scientists were Galton, Pearson, McDougall, Bateson, Hogben and Haldane. He concluded that the political and social attitudes of the scientists were a significant determinant of the position they adopted, and influenced the formulation of their hypotheses, their methodology, their conclusions, and their belief in the implications of these conclusions for the organization of society. Most of them were unaware of these influences.

In view of this, it is perhaps proper to say that the present writer was educated in an elementary school in a Durham mining village, in a local authority grammar school and in a provincial university, and has never—so far—voted Conservative in any local or national election.

effect of environment on education without taking into account the results of experiments of the kind just described.

In view of our previous comments on the political implications of the nature–nurture argument, some readers may be puzzled over one aspect of educational controversy since the war. In the raging debate over 11-plus selection fierce attacks have been made on intelligence tests, and these attacks have come from both wings of the political front. But why should such tests be attacked by right-wing conservatives? Surely they should support their stress on innate factors? The main reason appears to be that the tests are too efficient in this work, in comparison with the traditional methods of building up élites based on birth, or wealth, or power. If we use intelligence tests for educational selection, we shall always select a much higher proportion of children of the professional classes than of those of skilled and unskilled labourers. The correlation between the intelligence of children and their parents is about ·5: the group of more intelligent parents will always contribute a higher proportion of children above the selection level, whatever the level may be. And the (smaller) effect of environment will tend to increase the disparity. But this is stated in proportions of *each group* of parents: in terms of gross numbers there will be far more children of the working class chosen than those of the much smaller professional class. Hence the complaints from the middle-class parent whose child is rejected in favour of one from a home where, it is claimed, 'education is not valued' and which has produced—almost by accident, apparently—a child possessing 'superficial cleverness'.[1] There may well be substance in such views. They would carry more weight, perhaps, if grammar-school selection were based entirely on I.Q. It is conceivable that high innate intelligence coupled with a bad environment might produce poor educational attainment—because of lack of parental backing and encouragement, poor motivation, paucity of cultural background, etc. But the intelligence test is only one element in the selection process, and in the great majority of L.E.A.'s it is accompanied by tests of English and arithmetic, and by teachers' estimates of academic level, and carries much less than half the load of the selection process.[2]

[1] This criticism of intelligence tests is dealt with more fully in Wiseman (1961), together with the criticisms from the political left (pp. 97 ff.).

[2] The general reader of 'popular' books on education is often misled on this point. For example '. . . yet selection is said at present to be made on the basis of intelligence' (Vaizey, 1962, p. 12).

This digression makes it even clearer that, important though it is, the effect of environment on measured intelligence is not central to our main problem. We must now turn to researches which attack, directly, the relationship between educational attainment and socio-economic factors.

Educational attainment and socio-economic status

Teachers have been convinced, for a very long time, that bad environment may handicap their pupils. In times of economic stress, as in the hungry 30's, few teachers were unaware of the problems of poverty. They had, before their eyes, ample evidence of under-nourishment, vitamin-deficiency, lack of adequate clothing and the effects of dirt and disease. It seemed to most of them that their pupils' response to education was inevitably affected by such things. Since the war, with the radical changes produced by the welfare state, the emphasis in teachers' conferences and the educational press is less on physical factors than on cultural and moral deficiencies. Lack of sleep, inability to concentrate, loss of interest in school or active hostility to it; the genesis of all these and more is variously put down to the cinema, comics, television, football pools, bingo, the decline in organized religion, mothers going out to work, too much pocket money, too little home discipline, or a general lowering of the moral fibre of the British people caused by the welfare state itself. There is no doubt that the large majority of teachers need no convincing of the effect of environment on the physical, intellectual and moral qualities of their pupils, but there is little agreement on what factors in the environment are most powerful. Each of us tends to have his own pet theory: and it is not difficult so to order one's observation to produce examples of its truth. What does research tell us about it?

Many researchers have investigated the connection between socio-economic level and educational progress. Even in 1926 Lindsay could write, 'It has been conclusively proved that success in winning scholarships varies with almost monotonous regularity according to the quality of the social and economic environment' (Lindsay, 1926, p. 8). While few dispassionate observers with any knowledge of experimental work would agree with his use of the words 'conclusively' (or, indeed, 'monotonous regularity') nevertheless it is a statement that was probably broadly true at the time it was written. Notice that the criterion used is that of 'the scholarship'. Even in those days the '11+' had its critics. This demonstrates the way in

which the pattern of education in a particular country affects the way in which problems are defined—and investigated. For this reason it is often difficult to generalize from research carried out in one educational system to that done in another. The greater part of the research in this field has been carried out either here or in the United States: it will be sensible to review these contributions separately in the first instance.

In America, the swift adoption of objective tests following their success in military classification in the first world war led to many investigations on the effect of social background on test score. Test 'programmes' became larger and larger, and the testing agencies soon collected an enormous amount of data from their standardization exercises, and the employment of their tests by whole school systems. They covered large numbers of schools in widely separated areas—urban and rural, rich and poor. Typical investigations of this type, using the Stanford Achievement tests, are those of Chauncey (1929) and Shaw (1943), both of whom found significant relationships between socio-economic status and achievement test score—and a closer relationship than with I.Q. This comparison of intelligence and achievement in relation to background factors is a common—and valuable—type of enquiry. As will be seen later, it was used to good effect by Fraser (1959) in this country. Coster (1959) studied nearly 900 high school pupils from three income groups, high, medium and low. He found a relationship between this grouping and successful completion of courses, school and out-of-school activities, and continued education. Attitude towards school was not related, nor was study out of school.

All investigators, however, did not find it easy to substantiate the relationship which teachers almost take for granted. Crawford (1929) with college students found that 'economic advantage is by no means positively related to academic achievement, and, in fact, that the relationship which might be expected from the term "advantage" is actually reversed'. French (1959) in a research covering 2,000 children in 41 schools also found that, 'unexpectedly, father's occupation and education showed little or no relationship to the test scores'. Blake (1949) demonstrated a sex difference in the correlation between environment and scholastic aptitude, with boys' correlations consistently higher than those of girls.

With large testing programmes it was possible to widen the coverage of environmental factors by using 'community variables'

available from the U.S. Census data. Many interesting researches used this technique. Thorndike (1951) used the test scores of half a million children from a wide range of communities, large and small, urban and rural. For each community, average I.Q. and an average achievement index were correlated with 24 census variables. Eleven of these correlations proved significant at the 1% level. Highest correlations with I.Q. were with measures of education of the adult population (·43), home ownership (·39), quality and cost of housing (·33), proportion of native-born whites (·28), rate of female employment (·26) and proportion of professional workers (·28). Multiple correlations of between ·55 and ·60 were possible in predicting average I.Q. in a community from a weighted aggregate of community variables. In contrast to Chauncey's and Shaw's results, correlations with educational achievement were *lower* than those with I.Q. Only three were significant: proportion of professional workers (·25), median school grade reached by the adult population (·21) and percentage of high school graduates (·20). In an effort to explain this unexpected reversal of emphasis, Thorndike proceeded to investigate scores for reading and arithmetic, in place of the 'average achievement index'. He found that correlations for reading were very similar to those for I.Q. but those for arithmetic had no relationship—in six out of eleven, signs were reversed.

Mollenkopf and Melville (1955) used the school as a unit, instead of the community. Their subjects were 18,000 ninth- and twelfth-grade pupils from 206 high schools. Background information was obtained on school facilities, staff and support; education and occupation of parents; and characteristics of the community, such as its size and rate of growth. They concluded:

> As was expected, the academic aptitude [I.Q.] of the students predicted the achievement test means considerably better (·90) than did a best-weighted composite of school, parent and community characteristics (·59). Yet some characteristics did add to the effectiveness of this prediction. Among these were the percentage of graduates going on to college, the size of the average instructional class, and the presence or absence of a community library.

Bloom (1956) analysed the scores of senior students in 1,506 high schools on the Tests of General Educational Development. The schools were selected at random, stratified by state and by school size, from all senior high schools in the United States. He found marked state-to-state differences in average scores, related to the

financial support given to education, the use made of educational facilities, citizenship participation and the status of living in the state.

Notice how, over the last two or three decades, researches grow in complexity and coverage, and in the sophistication of the methodology. From the comparison of a single measure of educational achievement with a single measure of socio-economic status we progress to multifactorial studies. From single schools we move to populations of schools and populations of communities. Simple measures of significance—the difference between means and the difference between correlations—give way to more elaborate techniques such as multiple regression analysis. This is a development of insight as well as of expertise. The 'simple' problem is recognized as complex. The single factor is seen to be an over-simplification. What matters is not the relationship of one single variable with another, but the inter-relationships among many variables, and their inter-actions one with another. This logical development leads us to consider one of the most powerful statistical tools developed by the psychologists—factor analysis. By this means we can grapple with the inter-relations of complex social factors and begin to draw the first hesitant maps of this virgin territory.

This technique has been used by Schutz (1960) in his analysis of the scores of sixth-grade children from 84 communities in 30 states on the Stanford Paragraph Meaning Test and the Stanford Arithmetic Reasoning Test. These were correlated with 18 'community variables' and a Thurstone Centroid factor analysis performed. The five factors extracted were then rotated by the Kaiser varimax method. Schutz identified the factors as:

(1) *Urban—financial*, with high loadings in median income (·75), per cent of population foreign-born white (·72), per cent of homes with 1·01 or more persons per room (·65), per cent of wage-earners with less than $2,000 per year (—·81), gross rental (·49). Loadings on reading (·13) and arithmetic (·16) were low.

(2) *Intellectual climate:* per cent of professional workers (·90), median grade of schooling of the population (·73), median value of home (·68), per cent of college graduates in population (·67), gross rental (·64), per cent of unskilled labourers (—·40). (Reading (·14) and arithmetic (·08).)

(3) *Economic stability:* per cent of employed males over 14 (·76), per cent of homes owner-occupied (·67), per cent of employed

females over 14 (—·51), per cent of population non-white (—·43). (Reading (·07) and arithmetic (·00).)

(4) *Academic achievement:* arithmetic (·80), reading (·79), per cent of adults over 25 with no schooling (—·38), median income (·30), per cent of non-white (·26), median school grade (·23).

(5) *Low socio-economic status:* per cent with no schooling (·61), domestics per thousand whites (·61), per cent non-white (·52), per cent of homes owner-occupied (—·41). (Reading (—·04) and arithmetic (—·04).)

It will be seen that the picture presented is far from clear, and that, for example, economic factors 1, 3 and 5 are difficult to distinguish. This is one of the problems often raised by a purely mechanical rotation. The varimax method produces 'simple structure'—mathematically simple, that is. A solution that is psychologically, educationally or socially meaningful might or might not be produced. In the task of exploring this almost unknown territory, it would seem preferable to use varimax as a starting point, and, by graphical methods, seek a solution which seems more educationally profitable.[1] Schutz's solution puts the reading and arithmetic tests into an 'academic achievement' factor, which has low loadings in a handful of almost unrelated social variables. The remainder of the variance of the two educational tests is distributed over the remaining factors, which are themselves difficult to interpret. The writer accordingly proceeded to a further rotation, taking the centroid[2] solution as the starting point, and endeavouring to produce a more meaningful and profitable pattern. Only four rotations were made[3] using graphical methods and no doubt a tidier solution could be achieved by further small adjustments. But the end-result seems more profitable than Schutz's, producing two factors in particular (3 and 4) which share the variances of the educational tests, leaving little or nothing

[1] Factor analysis is merely a method of bringing order out of chaos by *structuring* the co-variation found among a large number of variables. It does this by imposing a number of dimensions, with axes (usually) at right angles—just as we measure latitude and longitude in two dimensions from two axes, the equator and the Greenwich meridian. Neither of these axes is 'right' or immutable: the position of a ship at sea could be defined equally accurately from two other and quite different axes. The rotation of axes, then, merely re-orders the data, and we may choose any position we like for a particular axis, dependent upon our aim.

[2] It would have been preferable to start from varimax, but the detailed loadings obtained from the A.D.I. microfilm unaccountably omitted variable 14 from the varimax solution. I therefore used the centroid solution as a starting point.

[3] 4 *v.* 5, +35°; 1 *v.* 4, —40°; 3 *v.* 4, +30°; 2 *v.* 4, —26°.

TABLE 4.2

FURTHER ROTATION OF FACTORS FROM SCHUTZ (1960)
FACTOR LOADINGS (decimal points omitted)

Variable	1	2	3	4	5
1. % adults, over 25, with no schooling	-18	13	18	-65	19
2. % college graduates in adult population	14	62	00	18	03
3. Median grade of schooling of population	39	53	00	51	08
4. % unskilled labourers, male and female	-28	-36	13	00	36
5. % professional workers	21	82	-13	29	06
6. % employed males over 14	25	-34	41	13	-52
7. % employed females over 14	18	-25	52	-05	-23
8. Domestics per 1,000 white inhabitants	-40	10	33	-36	16
9. % population foreign-born white	52	02	37	-37	25
10. % population non-white	-74	09	36	-20	-20
11. Median income	75	-04	42	24	-10
12. % wage earners with income less than $2000 year	-79	16	-42	-10	12
13. % homes built in 1940 or later	-27	12	-22	00	-20
14. % homes having hot water, toilet, bath and are not dilapidated	66	39	23	14	13
15. % homes with 1.01 or more persons per room	-50	13	-28	-44	-56
16. % homes owner occupied	08	-43	-42	48	24
17. Median value of home	54	54	37	02	-07
18. Gross monthly rental	64	35	13	30	13
19. Mean on Stanford Paragraph Meaning Test, 6th grade	00	02	50	62	00
20. Mean on Stanford Arithmetic Reasoning Test, 6th grade	-01	-01	58	61	-06

spread over the other three. The loadings are given in Table 4.2. Factor 3 is predominantly an *economic* one, with strong loadings in median income, per cent less than $2,000 income, per cent of owner-occupied houses and per cent of employed females. Arithmetic has a higher loading here than reading. Factor 4 is one of *schooling*, with the two highest loadings among the social factors in: per cent with no schooling, and median school grade of population. Of the other factors, unconnected with mean test scores, factor 1 is again economic, but stressing quality of *home* and neighbourhood (notice variables 14, 17 and 18), while factor 2 is clearly *occupational*, with its highest loadings in the percentage of professional workers and the percentage of college graduates. Note that the two educational tests have no loading on this factor: although absence of schooling and median school grade have strong connections with mean test score of children (factor 4), the presence or absence of the top-end of the ability and occupational ranges seems to have no effect. Factor 5 is extremely difficult to interpret, as is often the case with factors contributing only a small part to the total variance. It seems to be a

'neighbourhood' factor of some kind, but the direction of signs on the loadings for variables 15 and 4, for example, are puzzling.

The conclusions we may draw from Schutz's study are few. It indicates the extreme complexity of the problem, and, although it shows strong connections between educational achievement and a number of 'community characteristics', there is little clear pattern discernible. It is a pity that researches like this one, and that of Thorndike, have to be restricted to census data, for these form a mass of variables which are predominantly economic in nature, the inter-relations of which have not yet been fully explored. It is a pity, too, that Schutz did not include an intelligence test in his battery, to see whether a significantly different pattern of weighting emerged for this. There is some loss of information, too, in using mean test score as the basis of the educational variables. By adding measures dependent on spread (for example, the proportion of children scoring very high—or very low—marks) it might have been possible to demonstrate connections with the occupational factor 2.

Let us now look at some recent British researches which have concentrated on the connection between socio-economic level and educational attainment. The post-war controversy over comprehensive schools and the rightness or wrongness of educational selection was energized by a growing uneasiness over the effect of 'class-structure' on education, and a steady, if sometimes misguided, pressure towards a renewed egalitarianism. It is not surprising, therefore, to find researchers interested in the connections between social class and educational opportunity. Burt (1943*a*) reports a correlation of ·32 between children's intelligence and economic status (occupational category of parents), and after a careful comparison of the distribution of measured intelligence and the proportion of ex-elementary school pupils attending universities, concludes 'that in round numbers about 40 per cent, or 2 out of 5, among the pupils from the elementary school, who are capable of a university education, never obtain it' (loc. cit., p. 87). Glass (1954, p. 17) gives the preferences of parents for grammar school education: unskilled workers 50%, skilled workers 58%, supervisory grades 70%. The Crowther Report (Ministry of Education, 1960) showed that entrance to Services craft apprenticeships was 46% for their total sample, and 54% for the sons of skilled workers. The previous report on *Early Leaving* (Ministry of Education, 1954) showed that of those pupils

who obtained high marks in the selection examination for grammar schools, 10% of those with 'professional' parents failed to gain at least 3 G.C.E. 'O' level passes, but for the children of unskilled parents, with an identical level at entry, the figure was 54%. The research by Halsey and Gardner (1953) also brings out the connection between social class and early leaving, and stresses the greater tendency of middle-class boys in London grammar schools to benefit from school work and to participate in extra-curricular activities, as well as to be favourably regarded by their teachers. Spinley (1953) contrasted a 'deprived' group of children from a London slum area with a 'privileged' group from Public Schools (certainly a dramatic enough contrast) and suggests the possibility of the conflict between the social values represented by the teacher and those of the sub-culture leading to the 'blackboard jungle' situation. Griffiths (1959) studied 'academic deteriorators' in a grammar school and found that 37 out of the 39 of these (95%) belonged to occupational classes 5, 6 and 7 on the Hall-Jones scale, compared with 65% in the total school intake. It was judged that of the factors associated with deterioration 64% were 'home background' factors, prominent among which were the level of the parents' education and the amount of parental encouragement.

Perhaps the best known of the post-war researches is that of Floud, Halsey and Martin (1957), concerned with educational opportunity as reflected by success in the 11-plus examination. Two contrasting areas—S.W. Hertfordshire, and Middlesbrough—were studied, and an attempt was made to compare opportunities offered in 1950–3 with those existing earlier. They showed, for example, that the percentage of children of manual workers gaining a grammar school education rose from 11% in the period 1884–1900 to 34% in 1950–3 in S.W. Herts. The post-war picture showed 59% (Herts.) and 68% (Middlesbrough) of the children of professional and managerial parents in grammar schools, contrasted with 18% and 14% respectively of the children of skilled workers. If it can be assumed that measured intelligence is free from environmental influences, they conclude that the existing proportions are equitable—but they emphasize the bigness of the 'if'. There were significant differences revealed between the two areas studied. In Hertfordshire within each social class the attitude of the parents rather than the material conditions of the home or neighbourhood seemed to be the influential factor, but in Middlesbrough economic factors were predominant.

This difference between different districts was brought out by Derrick (1961) who compared the success of girls in gaining entry to grammar schools in Dundee and in a district of Lancashire. He found that 'in a comparison of items of the environment with the criterion no single item was significantly related to it in both districts' (p. 198). The factor of parents' education was of only slight importance in Lancashire, and 'in Dundee it seemed on occasion to be negatively related to their children's success' (p. 189). MacPherson (1958) found that, with I.Q. held constant, occupancy rate in the home —in Scotland—seemed a more important factor than the father's occupational class. It should be noted, however, that the variable 'occupancy rate' has a much wider dispersion in Scotland than almost anywhere else in Europe. Fraser, in a carefully controlled research, contrasted the correlations of environment and I.Q. with that of environment and educational attainment. Multiple correlations of the many environmental factors studied were ·687 with I.Q. and ·752 with attainment. 'Of the ten items which go to make up this composite assessment of home environment, three stand out as being mainly responsible for the higher correlation with school progress. These are in order: abnormal background,[1] income and parents' attitude to the education and future occupation of the child' (Fraser, 1959, p. 71).

Not all researches showed positive results, however. McIntosh (1959) found that 'encouragement to study is by no means in direct proportion to the economic status of the parents'. Blyth (1961), in a sociometric research, finds 'this study gives little support to the more dramatic views about socio-economic influence on sociometric affiliation' (p. 295). Dale (1952) suggests that recent research has failed to establish any connection, for university selection, between social background and academic attainment, a finding supported by Furneaux (1961) in the major Nuffield study: 'Occupational group membership acts as a very important determinant of academic history throughout the stages of education up to that of entry to sixth forms . . . the selective effect of occupational-group membership is virtually complete before the stage of university application is reached' (pp. 70–1). Furneaux's comment makes it clear that there is no necessary incompatibility between these results and Burt's finding (p. 44): the differentials appear to operate below the sixth-form level.

[1] I.e. illegitimacy, divorce, separation, adoption, father or mother dead, lack of harmony in the home, illness in the home.

Jahoda (1953), investigating the occupational aspirations of secondary modern school-leavers, remarks on the deep sense of working-class loyalty pervading the boys' remarks. They intend to stay with 'the lads'. Boys with semi or unskilled fathers wish to become skilled workers, but the sons of craftsmen are content to stay where they are. 'Girls are more ambitious, but their ambitions are less realistic. Moreover, many girls seem to experience conflict between the desire to move up and loyalty towards the group to which they are attached.' This reminds us that one of the results of a particular environment is the production of particular attitudes. It is superficial to think of the educational effects of poor environment as being due largely to physical causes, imposing limitations on the individual in spite of his desires. The desires themselves are often radically changed. The use of blanket terms such as 'middle class' and 'working class' conceal large differences. Within these classes are variations larger than exist between classes, and particularly in attitude and ambition. To generalize about the working class in this context is impossible (in spite of the title of Marsden and Jackson's (1962) recent book) since within it it holds such diverse groups as the skilled and the unskilled. It can be seen from Fraser's (1959) research that these two groups differ markedly in their views on education, and their children exhibit equivalent differences in response to education.[1] The same is true of the middle class (is there a middle class?) or of the occupational groups within it. Pear (1955) says of professional people:

> I am impressed by their different views concerning 'necessaries'. They expend, out of comparable incomes, very different amounts upon education, clothes, medical attendance, food and drink, tobacco, books, entertainment, clubs and societies, theatres, holidays and travel. For this reason, any concept of English 'socio-economic status' seems to me quite unworkable for understanding this section of society (p. 292).

Burt (1943*b*) suggests that researchers should consider the effects of good environments as well as bad, and comments: 'Social surveys in this country have hitherto been limited chiefly to economic conditions and the material standards of life. The social attitudes, ideals and behaviours of different groups are barely touched upon.'

Nevertheless 'social class' as a basic variable exerts a powerful

[1] One of the most disturbing features of the post-war world is the rapid shrinking of the wage-differential between skilled and unskilled workers. According to Cole (1955) it has dropped to 16% from the pre-war 50%.

magnetism on many research workers. And in some contexts dramatic differences can be shown. Consider the research of Schaffer and Myers (1954) who investigated the workings of an American psychiatric outpatient clinic. Sixty-five per cent of patients from the professional and executive class were assigned to senior psychiatric staff for treatment, as compared with 2% of the lowest class and 33% of the next-to-lowest class. Medical students treated no one in the top occupational class, 10% of level 2, 26% of level 4 and 24% of level 5. 'A patient of bottom-class status has between 5 and 7 times the likelihood of being "not recommended for therapy" as does a patient from one of the top classes' (Meehl, 1955, p. 362). It may be results of this kind that lead investigators to hope for similar demonstrable effects in the British educational system. Jackson and Marsden (1962) in a book which is a rich mine of reportage and quotations prove to their own satisfaction that working-class children are differentiated from middle-class children in their treatment in grammar schools, and in the treatment of their parents by school staffs and educational administrators. The unsatisfactory sample, and the absence of an adequate control group, fail to carry conviction against one's own observations and those of experienced teachers. That the factors they report do operate seems incontrovertible: that they operate in the 'working class' and not in the 'middle class' is almost certainly wrong.[1] The differences within any one of these amorphous groups are so great that the comparison is almost valueless. Socio-economic level and social status are units too coarse—and too question-begging—for productive enquiry. We must seek other variables before we can hope to understand the complexities of the impact of environment on educational opportunity and attainment. Some of these factors have already been mentioned—attitudes of parents towards education in particular—and we must now turn to research evidence dealing with factors other than economic.

Educational attainment and family background

We have seen already how 'parental encouragement' was found by Griffiths (1959) to be a determining factor in grammar school progress, and that Floud, Halsey and Martin (1957) found the parents'

[1] E.g. Derrick (1961), who personally interviewed the parents of all the 157 girls in his sample, found 'These working class parents, on the whole, gave the impression of having an adequate grasp of the country's educational system and definite ideas for its use in serving the needs of their families' (p. 186).

attitude to education correlated with success at 11-plus in S.W. Hertfordshire. Two recent American researches also emphasize this factor. Weigand (1957) compared groups of successful and unsuccessful college students and found 'parental reinforcement' positively correlated with academic achievement, while Carillo's (1957) 'comparison of 50 good readers and 50 poor readers of normal or higher intelligence in the middle grades documented the importance of encouragement and parental interest in the child's school life' (Beck, 1958). On the other hand, Freeman and Showel (1953)—although not dealing with educational attainment—suggest 'the possibility that the family has been overemphasized as an agent of socialization . . . it seems unlikely that the family influence is as important as our literature suggests' (p. 101).

Wiseman (1952), as part of a research into selection for technical secondary schools, developed a school report form which included the following questions:

1. Have the parents expressed a desire for technical education?
2. If so, what, in your judgement, is the strength of that desire?
3. Parents' vocational plans for the child.
4. What evidence have you of interest, aptitude or ability in practical subjects and for activities involving manual skill?
5. Confidential report on home atmosphere (e.g. would the child have good parental backing in the technical school?).
6. Strongest and weakest school subjects.
7. Teacher's estimate of ability to profit from technical education.

Report forms were completed for 254 boys of 13+, inter-correlations were calculated, and a multiple correlation obtained using the teacher's estimate as a criterion. A value of ·645 was found, with regression weights of ·39 for strength of parents' desire (2) and ·28 for home atmosphere (5). When a factor analysis was performed, including the Devon Interest Test in the battery (Wiseman, 1955), three significant factors were obtained. After rotation, the factors were identified as 'home', 'child' and 'school', with percentage variances of 23, 16 and 6 respectively. The 'home' factor 1 had high loadings in home atmosphere (·85), strength of parents' desire (·69), teacher's estimate (·57) and parents' vocational plans (·39). An aggregate score was obtained for the report form as a whole, and correlations of this with 13+ test scores were: verbal intelligence ·17, non-verbal intelligence ·20, arithmetic ·31, English ·00, practical interests ·25.

Campbell (1952) compared two groups of selection 'misfits' in secondary schools with two other groups of apparently correctly placed children. Home environment was judged on the basis of the response of the parents to an 'attitude to education' scale, on the cultural background of the home, and on the interests and attitudes of the child. He found 'that the respective groups of misplaced and rightly placed children had similar average levels of intelligence and primary school attainment but differed significantly with respect to home environment'. Pidgeon (1959) in reviewing work done by the National Foundation for Educational Research claimed that 'the most important factor bearing on the educational progress of all those so far investigated was the attitude of the child's parents'.

Fraser's (1959) research is perhaps the most illuminating and the most cogent on this aspect of the problem. She investigated the home environment of 408 Aberdeen children of 12 by visiting their homes and interviewing their parents. A detailed interview schedule was used and an impressive amount of information gathered. Aggregated school examination marks, scaled on I.Q., were used as the criterion of educational attainment, and a comparison made between the correlation of each environmental factor with the criterion, and its correlation with I.Q. As Fraser says,

> Since most, if not all, of the home items are closely related to intelligence, and since the Criterion itself is very highly correlated with I.Q. it follows that any item, if it is to add at all to intelligence as a predictor of school success, should correlate more closely with the Criterion than with I.Q. The greater the difference between the correlations, the more important is the home item from the point of view of school attainment (p. 41).

The correlations are given in Table 4.3, from which it will be seen that the three factors yielding the biggest differences are parents' attitude, income and living space. The two highest correlations with educational attainment are parental encouragement and parents' education. The occupation of the father was not dealt with by correlation, but an analysis of covariance was performed, removing the effect of I.Q. The result was highly significant ($P < \cdot 001$): 'although there is a close relationship between father's occupation and the intelligence of the child, there is a significantly closer relationship between the father's occupation and the child's school success' (p. 51). There are some interesting results from the subdivisions of the occupational scale, and particularly within the 'working class'.

TABLE 4.3

SUMMARY OF CORRELATIONS FROM FRASER (1959)

Variable	I.Q.	Criterion	Diff.
Parents' attitude to education and future employment	.297	.391	.094
Income	.350	.444	.094
Living space	.363	.447	.084
Parents' education	.423	.490	.067
General impressions of home background	.393	.460	.067
Parental encouragement	.604	.660	.056
Family size	-.404	-.458	-.054
General book reading of parents	.280	.329	.049
Newspaper and magazine reading	.381	.398	.017

The children of highly skilled parents show the greatest improvement in attainment over intelligence. 'As a group they are less intelligent than the children in the "clerical" group but yet are more successful in school.'

The *abnormal home background* variable (defined on p. 46*n*) was not susceptible to correlational analysis, but Fraser's graphs show clearly the effect of this factor on educational attainment, and the interesting point that the effects are more severe for the higher levels of ability. A χ^2 test shows this differential to be significant) $P < \cdot 001$) for a split at 100 I.Q. When the same method of graphical analysis is employed to contrast children of working mothers and those of non-working mothers the small differences that exist seem to favour the working mother. Interview material disposed of the frequent claim that the homes of working mothers are more often neglected: 'in only 2 out of the 107 cases was an adverse comment noted on the interview form about the care of the home' (p. 68).

The correlations on family size are interesting. We know that intelligence is negatively correlated with size of family (see Nisbet, 1953) but here we see educational attainment even more closely associated. This supports the Crowther Report: 'Tables 6 and 7 show that the less skilled the occupational group the larger the family is likely to be; and the larger the family, the shorter is the expectation of school life. It is, perhaps, less generally known that inside each

occupational group, it is a disadvantage to belong to a large family, if one hopes to stay at school after 15' (Ministry of Education, 1960).

Fraser's research seems to the writer to be by far the most significant and important of the enquiries into family background, not only because of its care and thoroughness, but because of its coverage and general plan. It is, therefore, somewhat ungrateful to introduce a critical note, and to suggest ways in which it might have been even more productive. In view of the conflicting and contrasting results obtained from some other researches when reading and arithmetic are dealt with separately, it is a pity that Fraser did not break down her criterion to permit analyses of this kind. Since she was using school marks, this would have been possible. We might then have seen some interesting results—not only on reading and arithmetic, but on, say, practical subjects versus more literary subjects. Again, when we study the pattern of correlations in Table 4.3, many questions occur which might have received an answer. What are the interconnections, for example, between parents' education, their attitude to education, and their encouragement to their child? Interactions such as this could have been revealed, at least partly, by a factor analysis of the correlations, and this might have thrown up some obvious lines for further attack. But we must not be churlish. We have here a most valuable study, and one which no future worker can afford to ignore.

There is a good deal of other material concerning family background in researches not directly concerned with educational attainment. Cohen (1956), for example, in dealing with delinquency points out that 'middle-class socialization, in comparison with working-class socialization, is conscious, rational, deliberate and demanding'. One wonders whether the inter-class differences here are anywhere near as great as the intra-class differences. But that there are large differences is indisputable. Chapman (1955) postulates the existence of 'dysfunctional' homes when comparing new housing estates with areas of old town housing. These are homes ruled by house-proud women who regard the quality and status of the home as an all-important end in itself, rather than a means to the end of better living. This may be contrasted with the 'feckless outlook, sluttish economy and high output of young delinquents' described by Judges (1955). McClelland *et al.* (1953) emphasize the influence of family situation on the development of the 'achievement motive'. Mothers of sons possessing a high achievement motive have an 'individu-

alistic' attitude, stressing early independent activity, while those with low achievement scores tend to be related to a 'protective family syndrome'. This kind of psychological analysis is carried still further in Davis (1948) who suggests that anal characteristics are highly valued by the middle class—thrift, cleanliness and thoroughness (cf. Freud's 'parsimony, pedantry and petulance'). Warburton (1962) commenting on Fraser (1959) sees her results as suggesting:

> a tentative scheme of friendliness and spontaneity (linked with a lenient, democratic family atmosphere) and the hostility-guilt complex (associated with a fairly autocratic, untrusting, disapproving family), i.e. ego strength and friendliness are related to 'good' homes and hostility to 'bad' homes. The super ego appears to be more dependent on a consistent home than a hostile one (p. 398).

Davis and Kent (1955) investigated the home discipline of 118 8-year-old children, and compared this with results (*a*) on the Binet test, (*b*) the W.C.S.C. performance sub-tests and (*c*) Schonell's vocabulary test. 'Demanding' homes tended to be associated with high scores on (*a*) and average scores on (*b*), while 'over-anxious' homes produced average Binet scores and low performance scores. They conclude: 'These results seem to show that intellectual development as measured by standard intelligence tests is influenced to a substantial degree by the discipline provided in the home . . . they suggest that the traditional views which attach over-riding importance to genetical factors should be revised.' Lack of precision in the reported results make this research unconvincing: the clearest result to emerge was that children from 'unconcerned' homes did worse on all three tests than did the other groups. Lynn (1955), in an endeavour to show the connection between anxiety and high reading ability, tested 80 children from a single primary school, and also gave them (oral) questionnaires to reveal 'personal' and 'impersonal' anxieties. Correlations of these scores with Schonell's Graded Word Reading Test were ·33 and ·24 respectively. Since the children were deliberately chosen as being good, poor or average readers, these *r*'s might be inflated by dispersion. And one suspects that part at least of the co-variance was produced by intelligence.

It seems to the writer that we need to clear a good deal more ground before the clinical psychologists can be very productive in this field. But the worker on the larger canvas would be unwise to ignore the approach of his clinical colleagues, if for no other reason

than for the hints and nudges it might give him in the choice and definition of the family variables to be included in his studies.

One other aspect of family background must be mentioned before we leave it. We have already seen that the study of twins has yielded important evidence on the nature–nurture controversy with reference to intelligence tests. Some of the studies already cited also give us information about educational attainments. Table 4.4 gives the correlations obtained by Burt and Conway and by Newman, Freeman and Holzinger. A comparison of this with Table 4.1, which gives the results for intelligence tests, is most interesting and presents a

TABLE 4.4

TWINS - CORRELATIONS OF EDUCATIONAL ATTAINMENT

(From Burt 1955, Table I)

	Freeman et al.	Burt and Conway		
	General Attainment	General Attainment	Reading and Spelling	Arith.
Identical twins reared together	.955	.893	.944	.862
Identical twins reared apart	.507	.681	.647	.723
Non-identical twins reared together	.883	.831	.915	.748
Siblings reared together	-	.814	.853	.769
Siblings reared apart	-	.526	.490	.563
Unrelated children reared together	-	.535	.543	.476

strong contrast. The correlation for non-identical twins reared together showed a sharp drop from that of identical twins reared together for intelligence test scores: ·58 as compared with ·92 (see p. 35). For attainment, this drop is very much smaller—from ·96 to ·88 for Newman, ·90 to ·83 for Burt. And when we look at the correlations for identical twins reared apart, instead of this lying roughly mid-way between the two other figures (as for intelligence) it shows a sharp and unmistakable fall. Indeed siblings reared together show a correlation substantially higher. If we average the results of Burt and of Newman for the correlations for general attainment, we get the following picture:

	Intelligence	*Attainment*
(*a*) Identical twins reared together	·92	·93
(*b*) Identical twins reared apart	·78	·59
(*c*) Non-identical twins reared together	·58	·86

No clearer indication could be given of the essential difference between intelligence and attainment tests, and of the much greater influence of home environment on attainment.

Burt's results also enable us to compare reading with arithmetic, and it seems from these that reading is more affected by environmental factors than is arithmetic. Burt has also compared brighter and duller children by splitting at 100 I.Q. and calculating separate correlations for the two halves of the ability range (Burt, 1943*a*).

> Both for twins and for ordinary brothers and sisters, the average correlations [for educational attainments] are decidedly higher for brighter children than for duller (with sibs over 100 I.Q. it is ·61; with sibs under 100 I.Q. it is only ·47). Thus, paradoxically enough, the influence of a good environment appears most conspicuous where the influence of a good heredity is also most conspicuous. There is an obvious practical corollary: it is *far more urgent to provide brighter children with an education appropriate to the ability of each than to do so for the dull, the backward, or the defective* (loc. cit., p. 91–2, Burt's italics).

Educational attainment and the neighbourhood

Family background is only one aspect of the environment of the school child: the neighbourhood also plays a large part in his life. As he grows up and becomes more independent the forces outside the home become more and more important, and few families, whatever their social level, escape the clash between the two sets of values. As he progresses towards adolescence his integration into the sub-culture formed by his friends, in sets and groups and gangs, becomes firmer. He adopts codes of behaviour, and attitudes towards authority, which may well conflict with the ideals set before him within the family. In part, this is the inevitable conflict between youth and age, but it may be strongly mediated by the culture-pattern of the neighbourhood. Such patterns exhibit great variability, particularly in large towns and cities, and it is not unlikely that family influences, in particular cases, may be swamped by neighbourhood forces, particularly when the two codes of values are in strong conflict. Few teachers are unfamiliar with the adverse effect of 'undesirable companions' on particular children, and the juvenile courts see many examples of bewildered and distressed parents, of unimpeachable integrity and often from well-to-do homes, faced with the revelation of a long-standing rejection of all their standards by a delinquent son. The connection between delinquency and educational backwardness has long been known (see, for example, Burt,

1925), and this is not surprising, for the teacher and the policeman are both representatives of an authority whose code of conduct is in direct conflict with that of the delinquent group. As we have seen, the attitude of the parents towards education is an important factor contributing towards the educational progress of the child: it seems probable that the child's own attitude towards school will be even more important. And this attitude in many cases is produced not by the home and its example, but by the outlook and values of the child's friends and his contemporaries in the neighbourhood, the code of conduct and opinion accepted in the teenage café, the club and the espresso bar. Studies of neighbourhood variables, therefore,

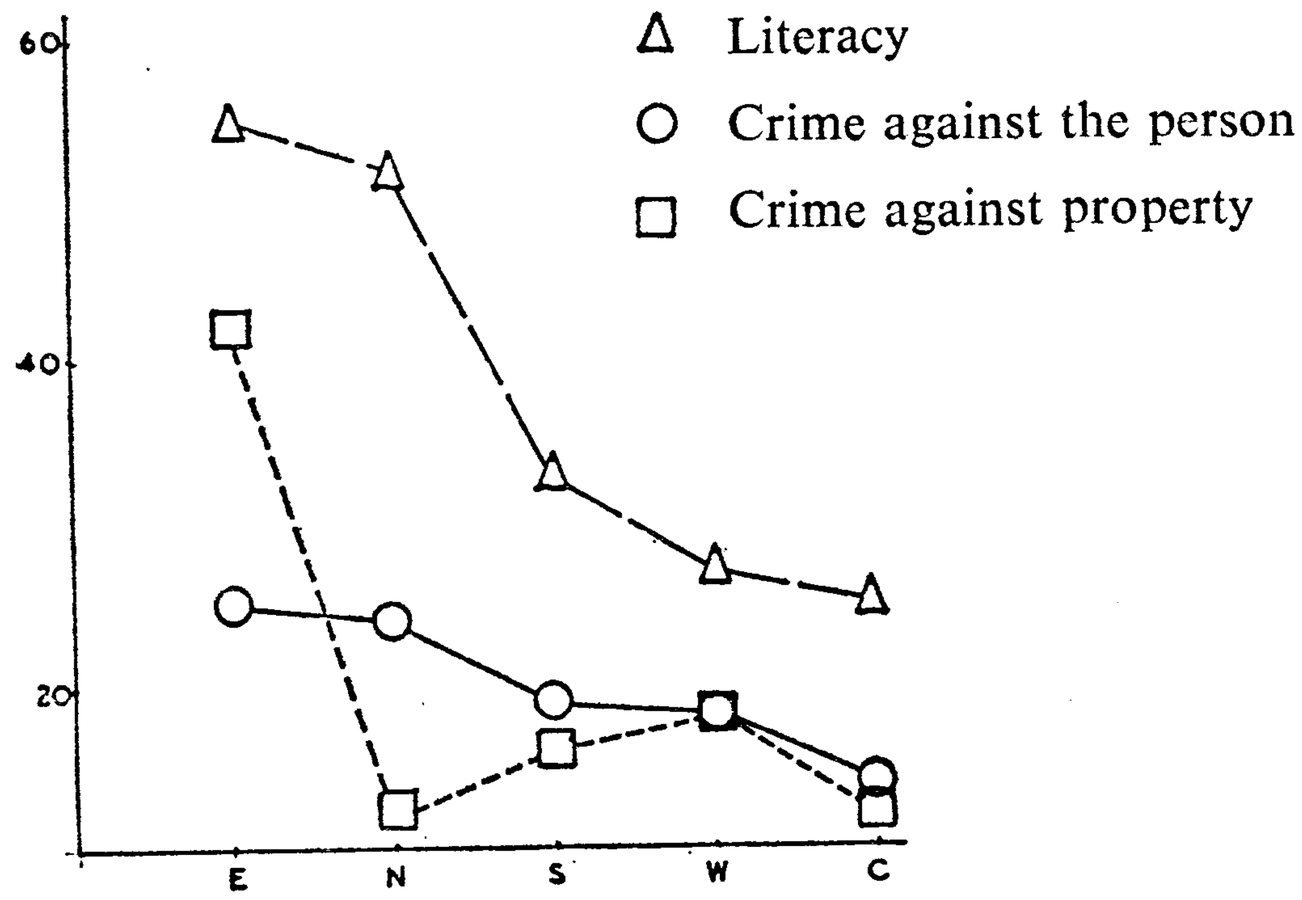

Fig. 4. Guerry's results: rates of literacy and crime for the five French regions, East, North, South, West and Central. (Data from Morris (1957), Tables 2 and 3.)
Units: Literacy, percentages; crime, rates (whole of France = 100).

are an essential part of any attempt to assess the effect of environment on education, and to these studies we now turn.

The earliest systematic investigation of this kind seems to have been that of the Frenchman Guerry (1833)[1] who was the first to use maps to illustrate the variation of intensity of particular factors over a region. His main purpose was to investigate the distribution of crime in France, but with the introduction, in 1827, of compulsory tests of reading and writing for French army conscripts, he found it possible to compare crime and literacy. Fig. 4, from Tables 2 and 3 in Morris (1957), compares the rates for crimes against the person, crimes against property, and literacy, for the five geographical regions of France. It will be seen that there is a positive correlation:

[1] I am indebted to Morris's (1957) book for the details of Guerry's results.

the higher the percentage of literacy, the greater the number of crimes. The explanation of this paradoxical finding is, of course, fairly obvious. As Morris says, 'in the populous urban centres which provide opportunity for crime, the facilities for education were more adequate than in the thinly populated rural areas where criminal opportunities were somewhat more restricted' (loc. cit., p. 50). Until comparatively recent times (and in some regions in this country, even now) facilities for education correlate highly with facilities for crime.

The first British contribution is found in two remarkable papers by an English lawyer (Fletcher, 1848, 1849), one read at the Statistical Section of the British Association at its Swansea meeting in 1848, the other read 'before the Statistical Society of London, present H.R.H. Prince Albert, 19th March 1849'. The second paper contained, in addition to very many pages of tables (the whole article takes up 184 journal pages!), no fewer than thirteen maps of England and Wales. Fletcher's main interest is in crime, but he is concerned to relate this not only to economic variables (*Real Property; Persons of Independent Means; Deposits in Savings Banks*), but also to measures of what he calls *morals* (e.g. *Bastardy; Improvident Marriages in England and Wales, those of Males under 21 being so designated*). His measure of education is interesting: *Ignorance in England and Wales as indicated by the men's signature by mark in the marriage register.* Fletcher's work is impressive not only for its thoroughness and width of coverage, and his adoption of Guerry's cartographic methods of recording data, but because of his liberal and sophisticated view of the necessary aims of such investigations. In his own words, 'his present endeavour [is] to distinguish the predominant from the subordinate influences, and their various effects under different conditions' (Fletcher, 1849, p. 236). Contemporary researchers could with profit follow his example. When we compare his *ignorance* map with his *crime* map, we find many similarities. He uses a seven-point 'shading scale' for maps, and we find, for example, that the northern counties of Cumberland and Northumberland are grade 1 (lightest) for *ignorance*, with Durham, Westmorland and the North and East Ridings grade 2; Lancashire is grade 6. For crime (assizes and quarter sessions, 1842–7) the grades are the same, apart from Lancashire which moves up to 5 (but still below the average). In considering *commitments for serious offences against the person and malicious offences against property* Fletcher

remarks on their 'universal excess whenever ignorance is in excess' (p. 232). Among his many conclusions the following is of particular interest to us:

> These various data afford a testimony of the educational influences generally associated with instruction far more powerful than any that has yet been supplied, and yet these influences are by no means unmixed with others, of which it is impossible to estimate the exact force, but every reasonable allowance for which will still leave a large balance to the credit of the school, so long as a deficiency of instruction among the population at large is accompanied by a proportionate excess of criminal commitments of the kinds least influenced by migration, and by every other indication of relative moral weakness and corruption (p. 234).

The investigations of Guerry and Fletcher are the first in a field which has come to be known as *social ecology*, a term borrowed from the biologists.[1] Although the pattern was set so long ago, there have been surprisingly few educational researches which have followed this lead. Some investigations already considered (e.g. Thorndike, 1951, Schutz, 1960) clearly fall into this category, but because of the restricted character of the variables involved have been dealt with under the socio-economic heading. Apart from these, the only significant ecological work has been in the field of crime and delinquency—with one honourable and distinguished exception, that of Burt (1937).

Many readers will be familiar with the map in *The Backward Child* showing the distribution of backwardness in London. Each London borough is graded on a five-point 'shading scale', and the map clearly shows the heavy incidence in the east central areas of Lambeth, Southwark, Bermondsey, Shoreditch, Limehouse and Bethnal Green, and the lighter shading in the outer boroughs. The estimate of backwardness was based on the results of the preliminary examinations for junior county scholarships, with an independent check. This was done by selecting the best, the worst and the median school in each division and testing complete age-groups. 'This enabled me to make a rough assessment for the percentage of backward children in schools of every grade or class, and so to compile an estimate for every electoral division in the county . . . the percentages computed in this way coincide very closely with those deduced from the results of the

[1] *Shorter Oxford English Dictionary:* '1873, 1. *Biol.* The branch of biology which deals with the mutual relations between organisms and their environment . . . 3. *Sociol.* Study of the spatial distribution of a population in reference to material and social causes and effects.'

preliminary examination for junior county scholarships' (p. 92). The definition of backwardness was the proportion of children in any division below the standard which cut off the bottom 10% in London as a whole. The results for the 61 electoral divisions (loc. cit., Table III) show the percentage of backwardness to range from 0·7 in Lewisham W. to 21·5 in Lambeth N.

Burt then proceeded to calculate the correlation of backwardness with various social factors. Here he used the metropolitan borough as the unit ($N = 29$). Table 4.5 abstracts from his Table I the

TABLE 4.5

CORRELATIONS OF BACKWARDNESS WITH SOCIAL FACTORS, FROM BURT (1937)

Variable	r
Infantile mortality (< 1 year)	.934
Mentally defective children	.914
Overcrowding	.890
Junior County Scholarships gained	-.875
Death rate	.873
Per cent below poverty line	.727
Juvenile Delinquency	.687
Unemployment	.676
Per cent of children attending Elementary Schools	.669
Birth rate	.623
Poor relief.	.568
Size of family	.343
Per cent of children in Special Schools	.257

coefficients obtained, in order of size. Notice that 10 of the 13 correlations are greater than ·6, and that two of them are over ·9. These are extremely high values. The figure of ·934 for *infantile mortality* is an extremely interesting one. Burt comments (p. 104), 'The various agencies which increase the death-rate during infancy presumably tend at the same time to lower the physical and mental vitality of the survivors, even when insufficient to cause their early death.' But he suggests that 'such correlations represent a somewhat complex set of influences' (p. 103*n*). It would be a mistake to think that such a relationship is caused entirely—or even mainly—by the physical

factors of the environment. Death in the first year of a baby's life depends, not only upon the economic level of the home or the sanitary conditions within it, but upon the quality of the mother's care. This variable may be seen as one bridging *neighbourhood* and *family* factors. Effective maternal care is undoubtedly more difficult in the dirt and disease of a slum tenement, in a neighbourhood of the kind which often acts as the focal point of an infectious epidemic. But it is also true that in more favourable environments neglect and stupidity, even active resentment and hostility, may jeopardize a child's chances of survival. The attitude and the common sense of the parents, and in particular the mother, is a factor which may over-ride completely the purely economic factors.

These, however, are clearly strong. Burt's researches covered the early '20s (1920–3) when economic conditions for large sections of the population were rigorous in the extreme. Burt's *poverty line* is the same as Seebohm Rowntree's, and corresponds roughly to classes A and B in Booth's *London Life and Labour*: 'earnings insufficient for the full maintenance of bodily health in all the members of the family. . . . It is possible to calculate for any given year a minimum standard in the cost of living. This minimum may be termed the poverty line: it marks the margin of a bare subsistence' (Burt, 1937, p. 119). The percentage of the population in the various London boroughs falling below this line was found by Burt to vary between 1·4 (Hampstead) and 24·1 (Poplar). Percentage on poor relief varied from 2·5 to 82·6 (loc. cit., Table IV). These figures indicate the contrast between 1922 and 1962. Nevertheless poverty, as such, is by no means the strongest factor influencing backwardness, as will be seen from an inspection of Table 4.5. Burt himself concludes, 'stupidity, therefore, is not the inevitable result of poverty, though poverty seems its commonest concomitant' (p. 105).

We are not given a complete table of inter-correlations between the social variables themselves so as to give a picture of inter-relations and interactions. One or two are quoted however. The correlation of *mental defective children* is ·58 with *poverty* and ·82 with *infantile mortality*; *junior county scholarships* has a correlation of —·63 with *poverty* and —·75 with *infantile mortality*. Notice that these are all lower than the corresponding correlations with backwardness. Burt proceeded to study the interaction of social factors by a more intensive enquiry on 391 individual and consecutive cases of backwardness, 193 boys and 198 girls, together with a control group of children

of normal educational attainment, each matched by sex, age and school with one of the backward group. Burt summarizes the results of this study as follows:

> 20 per cent of my backward cases came . . . from poverty-stricken families. In 8 per cent the child's health and vigour were gravely impaired by the material conditions of his life at home; in 16 per cent his education was seriously hampered by its low intellectual conditions; emotional and moral troubles were noted in 11 per cent; and in 3 per cent the conditions of the neighbourhood seemed definitely inimical. On the other hand, in the control group, even when poverty was present, these various concomitants of poverty were far less frequently discerned. If, however, I were to single out the one feature in the home which showed the closest relation to the child's school progress, it would be, not the economic or industrial status of the family, but the efficiency of the mother. . . . Wherever the child's mother is lacking in intelligence, in temperamental stability, or in general force of character, where she is indifferent to the mental welfare of her family, or herself overburdened by domestic worries or by frailties of heredity and health, there the child's whole mental and moral development suffers together (loc. cit., p. 133).

Burt's classic survey has never been paralleled, in this country or elsewhere. Although *The Backward Child* has been a bible for the discerning teacher for nearly thirty years, of the many promising avenues of research laid bare by his efforts, few have been explored further. This was a pioneer study: its implications have never been fully investigated.

About the time that Burt was collecting the data reported in *The Backward Child* a school of research was being built up in the University of Chicago whose major interest was the ecological study of delinquency. C. R. Shaw and his co-workers, following Park and Burgess, developed and extended the cartographical methods introduced by Guerry and Fletcher. They used square-mile areas of the city as their unit, and constructed rate-maps and zone-maps, and also invented radial maps which showed the variation in rates in the form of gradients drawn from the city centre. Since their main interest was in crime and delinquency, their detailed results are of only marginal interest to us here (they showed, for example, a strong connection between delinquency and truancy) but their methods are of direct relevance, as are some of their general conclusions. Shaw employed whatever statistical method seemed most appropriate to his purposes, and used factor analysis among other techniques. In his early researches (1929) he showed that crime, delinquency and truancy varied inversely with distance from the city centre, as did economic factors

and physical deterioration of homes. He suggested that criminal patterns of behaviour, once they arise in a particular neighbourhood, may be transmitted to succeeding generations in the way other social patterns are transmitted. In this way may grow 'delinquency areas'. In a later major work (Shaw and McKay, 1942) he emphasizes the role of the play-group as an 'educational' influence in the child's moral development, and as a mediating factor in the growth of delinquency areas. Burgess's introduction to this book suggests that the high inter-correlations between economic, social and delinquency factors point to the existence of 'some general basic factor. The common element is *social disorganization* or the lack of community effort to deal with these conditions' (op. cit., p. xi). This is an important concept, and one which, as we shall see, arises in other investigations too.

Although there have been criticisms of the work and theories of the Chicago school—for example, Alihan 1938, who points out the pitfalls inherent in taking a concept (ecology) from biology and applying it to human communities—nevertheless its work has been important and productive. Shaw is at pains to point out that a correlation between two variables does not necessarily imply causality: it may be caused by a third factor, uninvestigated and unknown.[1] Because there is a high correlation between the social conditions in slums and delinquency—and educational backwardness—it cannot be assumed that slum clearance will bring with it, automatically, an improvement in either of these rates. This kind of superficial reaction is bound to lead (and has led in the past) to considerable disappointment.

The value of ecological studies and the concepts arising from them is well illustrated by two studies of juvenile delinquency and family background. The clinical approach to delinquency has on innumerable occasions stressed the importance of the home as a causative factor, particularly in the early years. Strong associations between *broken homes* and delinquency have been reported, and even oftener

[1] The spurious correlation between the population of storks in Sweden and the birth-rate is well known. Perhaps the one cited by Ezekiel in *Methods of Correlation Analysis* (1941) is less familiar to British readers: 'If the number of automobiles moving down Sixteenth Street in Washington D.C., for each 15-minute period through a given 12 hours is correlated with the height of the water in the Potomac River during each of the same periods, a definite correlation will be obtained. On some days this correlation would be so high that its probable error would indicate that it would be very unlikely that it could have occurred by chance' (p. 451).

assumed. Two researches at least throw doubts on the universality of such an association. Faris (1944), speaking of delinquency, says: 'When the influence of age and [economic] area is removed, the difference in broken homes rate between delinquent and non, delinquent children is little or nothing. The more significant factor-then, is *neighbourhood disorganization* rather than family disorganization itself' (p. 745, my italics). Smith (1955) found that the study of

> family disorganization as a causative factor in delinquency indicated the difficulty of isolating interaction factors for the purpose of analysis and interpretation. It was noted that known delinquents as compared with non-delinquents came from structurally broken homes in disproportionate numbers but that the difference was much less pronounced when delinquents and non-delinquents were carefully matched by age, ethnic origin, socio-economic status and other factors (Beck, 1958).

Sainsbury (1955) in a highly competent study in a difficult field—suicide—follows Durkheim in seeing the problem as one of social psychology rather than individual psychology, and finds grounds for criticizing the Chicago school: 'In the American studies the coincidence of poverty and social disorganization at the city centre left in doubt the role of each in producing the high central suicide rates. The findings in London unequivocally support the view that *social disorganization*, not poverty, is the paramount factor' (pp. 69–70, my italics). Sainsbury found his high suicide rates not in the poverty-stricken areas of the East End, but in the areas of shifting population and bed-sitting-rooms, around the main railway stations and elsewhere. He found a correlation of ·44 between borough suicide rates and 'the proportion of the population professionally engaged in amusements—an occupational class closely associated with those aspects of city life which may connote social instability' (p. 78).

Lander (1954) in an ecological investigation of crime in Baltimore wrung the last drop of significance out of rather meagre data. With only seven environmental variables he employed partial correlation, multiple regression and factor analysis. The only educational variable was the median years of school completed by all persons of 25 years of age or over, and the zero order correlations of this with the other variables were (in order of size): Rent, ·89; Sub-standard housing, —·76; Overcrowding, —·71; Juvenile delinquency, —·51; Per cent of non-whites, —·41; Homes owner-occupied, ·39; Percent of foreign born, —·12. The factor analysis yielded two (oblique) factors (correlation ·684), identified by Lander as (1) *anomic* ('. . . the state of

disorganization where the hold of norms over individual conduct has broken down', p. 55) with high loadings in *Many Negroes* (·70), *Many Renters* (·62), *Delinquency* (·56), *Many Natives* (·47); and (2) *economic*, with high loadings in *Low Education* (·78), *Low Rent* (·75), *Sub-standard Housing* (·56), *Overcrowding* (·44). Lander's anomic factor is clearly comparable with the *social disorganization* of other workers.

In another study of delinquency, Dresher (1957) concluded 'that the factors contributing to delinquency were poor personal relationships, unsolved personal problems, social inadequacy, *social disorganization*, and moral and social deprival' (Beck, 1958, my italics). Social disorganization was one of 11 factors showing statistically significant differences between normal and anti-social groups. Blyth (1961) in a sociometric study of Manchester school children concluded, 'The aggregated findings from the field work indicate not only that ecological factors are important, but also that they may be of decisive importance . . . the results of the field work also bring out the significance of *neighbourhood groups* as a means by which these ecological factors are transmitted in the children's social life inside and outside school' (p. 299).

The final research to be considered in this section is that of Morris (1957). This is a study of crime and delinquency in Croydon in 1952, and the geographical distribution was plotted of 758 Croydon residents charged with at least one offence. No other environmental factors were treated in this way, and our interest in the research stems from a study of 79 individual cases of juvenile delinquency. The sample was drawn from those on probation or under supervision orders, or in approved schools, and included 64 boys and 15 girls. The small number of girls makes the analysis of sex differences hazardous, and the results given below are derived from Morris's Table 17 by totalling the figures for the separate sexes. Of the sample, 79% came from secondary modern schools, 14% from primary and 5% from grammar; half were under 14 years of age. Of the 23 'factors' investigated by Morris, those of educational interest are shown in Table 4.6. Notice the difference between the dull (15%) and the educationally backward (54%), a result paralleling practically all other investigators of delinquents. Poor attendance is rather surprisingly low. The low figure for bad conduct in school may be due in part to the fact that 'only direct evidence of misconduct was accepted, for example, stealing and lying, or bullying other children'

TABLE 4.6

79 CHILDREN PLACED ON PROBATION OR COMMITTED TO APPROVED SCHOOLS

(FROM MORRIS 1957, TABLE 17)

Factor	No.	%
I.Q. below 95	12	15
Below average educational attainment	43	54
I.Q. above 115, or above average attainment	11	14
Poor attendance (less than 80%)	18	23
Bad conduct reports from school	23	29
Member of youth group	18	23
Parental discipline : inconsistent	19	24
severe	11	14
lax	24	30

(p. 142). 'Inconsistent' parental discipline included inconsistencies between the parents as well as oscillations in the attitudes of both parents. In general, this research will be seen to bear little relationship to other ecological investigations, based as it is on case-studies rather than area comparisons. But Morris's book is noteworthy for its comprehensive survey of research in social ecology, with particular reference to delinquency, and researchers in this field will find it particularly valuable for this reason.

Educational attainment and school environment

Having considered the effect on attainment of family background and of neighbourhood factors, let us now turn to the school environment. Here we have a complex of variables which might be expected to have an immediate and direct impact on educational progress and success. Astonishingly few research workers have investigated this aspect of the problem. It will be remembered that Mollenkopf and Melville (1955) included 'school characteristics' in their enquiry, and found that the size of the average instructional class was one of the variables that added to the efficiency of prediction of achievement, and one or two other American researches included measures of 'school support' in their list of community variables. But the only research known to the writer which attempts to survey the many facets of 'school environment' is that of Kemp (1955). He collected data on 42 variables from 50 junior mixed schools in two educational

divisions of the London County Council. The variables were grouped under headings: school atmosphere and organization; size of school and size of classes; site and building; type of neighbourhood; attainments of the children, etc. Short tests of intelligence (non-verbal), reading comprehension, arithmetic (mechanical and problem), spelling, writing, composition and general information were given. Other variables were rated by Kemp after spending a day in each school. The 42 assessments were 'reduced to a smaller number of descriptive variables partly on the basis of common sense and partly by the use of factorial and other analyses' (p. 72). This gave 16 variables which were then inter-correlated. The make-up of some of these is given below:

Socio-economic status: J-index for the district; paternal occupational level; per cent of homes with telephone; size of family; cleanliness and respectability of neighbourhood.

Attainment (*comprehension*)*:* reading, problem arithmetic, general information.

Attainment (*rote*)*:* mechanical arithmetic; spelling; writing (speed and quality); composition.

Intelligence: Vernon's Abstraction Test (20 items); non-verbal intelligence (20 items).

School building: age; interior state of repair; sanitary facilities.

Adjustment: resourcefulness; co-operation; sociability.

School morale: school atmosphere; children's manageability; playground behaviour; regularity of attendance.

Progressiveness: Kemp's rating; inspector's rating.

Seven of the original 42 measures were dropped from this second phase, including per cent of children with working mothers; per cent of homes with a car; area of open spaces in catchment area. Neighbourhood characteristics were thus represented only within the socio-economic variable.

Kemp gives the complete table of inter-correlations for the final 16 variables, and this repays close study. In Table 4.7 are reproduced some of the interesting ones with the attainment and intelligence variables. The correlation of attainment (comprehension) with attainment (rote) was ·71, correlations of these with intelligence were ·73 and ·61 respectively. Kemp made some calculations of partial correlations, and comments:

When schools are considered as units, rather than individual children,

TABLE 4.7

CORRELATIONS FROM KEMP (1955)

Variable	I.Q.	Attainment	
		Comprehension	Rote
Socio-economic status	.52	.56	.47
Good morale	.45	.51	.48
Keen interest	.43	.20	.25
Large school	.18	.30	.39
Voluntary school	.17	.06	.08
Happy staff	.16	.14	.10
Progressive school	.10	.16	.13
Small classes	.02	.12	.00
Good building	-.07	.09	.01

it is still found that the greatest single factor determining level of attainment is intelligence. More than half the variance in attainment in reading, problem arithmetic and general information is accounted for by this factor. However, it must be noted that socio-economic status is correlated very significantly with both intelligence (·52) and this kind of attainment (·56). When the former is partialled out the correlation drops to ·62. If intelligence is held constant, the correlation between socio-economic status and attainment drops to ·30. The influence of socio-economic status on attainment appears thus to be much less powerful than that of intelligence. In the rote subjects, the same picture emerges. With intelligence the correlation is ·61; with socio-economic status, ·47. The former drops to ·50 when status is held constant; and the latter to ·23 when intelligence is held constant. Again it is clear that intelligence is the dominant factor determining attainment in mechanical arithmetic, spelling, writing quality and simple composition (p. 72).

It will be noticed that variables concerned with the physical environment of the pupil show low correlations with attainment. Size of school is the only one with significant coefficients: Kemp suggests that this might be explicable on the grounds of the best head-teachers securing promotion from smaller to larger schools. The size of classes has no correlation with attainment, a result which seems to parallel some other researches which have attempted to investigate this factor. Kemp noted, however, the tendency for class size to be correlated positively with school size. If the latter is held constant the partial correlation of class size with attainment (comprehension)

rises to ·24 and for rote ·14. Quality of building has no relationship with attainment, although it has negative (but barely significant) relationship with *interest*: 'the clustering of interest with small orthodox schools in old buildings under denominational control is quite clear'. The positive association of voluntary schools with attainment is a surprising result in Kemp's research: it is contrary to general experience. Our own results show county schools to be significantly superior to C. of E. and Roman Catholic schools in mean score and in proportions of bright and backward children (see Tables A.2, A.4 and A.5) and at least one other research (Pidgeon, 1960, Table 6) shows a highly significant difference in the opposite direction to that of Kemp for non-verbal intelligence, reading, mechanical and problem arithmetic at 10+. It seems likely that Kemp's sample of schools is far from representative, at least in this respect.

Kemp also combined the 'comprehension' and 'rote' scores to get a single measure of attainment which he expressed as an 'educational quotient' (E.Q.). He then used analysis of variance to test the significance of the difference in E.Q. between the upper and lower quarters of the distribution of scores for each of the 14 variables. Only four were found to be significant: intelligence (12·1 points of E.Q. difference), socio-economic status (8·0 points), morale (8·0 points) and school size (6·0 points).

For our purposes it is unfortunate that some neighbourhood variables were dropped for the final analysis, and others merged into the single socio-economic variable. Factor analysis of the final matrix might have thrown up some useful information. But in general the results seem to show that the physical factors of school and class size, and quality of building, have small effects on attainment level, and are quite negligible in comparison with the effect of intelligence. But more 'psychological' factors—such as *school morale* (which includes school atmosphere, manageability of children, playground behaviour and regularity of attendance)—are more promising. The possible connection of such factors with the *social disorganization* factor of the social ecologists opens up interesting speculations. This research of Kemp's is one rich in suggestions for further and more analytic enquiries, which could attempt to separate out the various constituents of the more conglomerate of his variables.

Summary

This chapter has shown the existence of a considerable amount of research bearing on the relationship between environment and educational attainment. Attacks have been mounted in a variety of directions, by researchers testing a variety of hypotheses. Some useful information has come as the by-product of enquiries primarily aimed at other targets: in particular from studies of crime and delinquency. Many different methods have been adopted by research workers, and techniques have grown more subtle, more comprehensive and more rigorous over the past few decades. And yet the over-all impression one gets from a survey of this kind is the picture of a complex and complicated field, with few clear and unequivocal relationships laid bare as yet. Research is still largely a matter of preliminary survey and exploration, seeking new insights to form the bases of more productive hypotheses. We know very little about the mechanisms underlying the variations of a multitude of environmental factors: with no firm grasp of these, too many research workers attack a small and ill-defined sector of the field, armed with little but a hunch or a prejudice, and using whatever variables may come conveniently to hand. Fortunately, every so often is thrown up a Shaw, a Fraser, or a Burt, who, with a larger comprehensiveness of view, begins to provide a network of relationships which permits us to attempt at least a tentative integration of part of the jigsaw.

The fact that research in this field is still largely in its primary phase of preliminary survey means that one of the main productive results of an over-view such as this ought to be the posing of questions, to form the stimuli for further investigation. A number of such questions have been made explicit in the foregoing pages; many more will have arisen in the mind of the reader. Let us pick out a few of these questions for particular emphasis.

One of the problems of educational research on almost any topic is that of *sampling*. How do we choose a sample so that it is representative, and so that the results of our experiments are capable of a productive degree of generalization? We know a good deal about sampling methods—the necessity for random sampling, the employment of techniques such as stratification. But it is difficult enough to circumvent the obstacles raised by school organization, time-tables, lack of enthusiasm on the part of head-teachers and administrators, when one is attempting to draw a sample of children. When our

sampling unit is the school, or the neighbourhood, these difficulties are immensely increased. In reality, the research worker studying environmental factors usually has to accept the fact that 'sampling', in the strict sense, is an impossibility. This raises the question of generalization, in an acute form. We have seen from some of the researches reviewed here how considerable regional differences may be (cf. Bloom, 1956; Floud, Halsey and Martin, 1957; Derrick, 1961). Some of the conflict in the results from different studies may arise from such differences: the contradiction between Thorndike (1951) on the one hand, and Fraser (1959), Burt (1937) and many others, on the relationship between socio-economic level and educational attainment; the conflict between Coster (1959) and most other investigators on the effect of attitude towards school; the contrast between Kemp's (1955) results for voluntary schools, and those of Pidgeon (1960) and of our own. Since sampling is so difficult, and regional differences so strong, the replication of researches is clearly desirable, and in districts widely different, geographically, economically and culturally.

Temporal differences are important too. Floud, Halsey and Martin (1957) show the changes over fifty years in Hertfordshire; Derrick (1961) suggests that some of the differences between his results and Floud's may be temporal in origin; Burt's (1937) figures for poverty in the '20s contrast markedly with conditions now. In *The Backward Child* Burt reports results of surveys he made in London in 1913, in 1920–3, and in 1932, and concludes, 'there was but little change in the distribution of backwardness from one decade to another. On working out correlations with the economic and social characteristics of the areas so reviewed, I find that the coefficients have on the whole tended steadily to decrease. This is consistent with an inference which might be drawn on other grounds—namely, that the progress of educational work throughout the country has come more and more to counteract the effects of deleterious conditions outside the school walls' (loc. cit., p. 99*n*). Is Burt justified in this hopeful conclusion? We need many more enquiries of this nature before we can answer this question with any certainty, but some of the work done in the last decade suggests that this is too optimistic a view.

Another interesting question raised by some researches is the possible differential between the bright and the dull in their response to environmental influences. It will be remembered that Schutz (1960) showed no connection between attainment and such area factors as the per cent of adults in the professions. Fraser (1959) found a highly

significant relationship between ability level and the effect of abnormal home background, while Burt (1943*a*) similarly found 'decidedly higher' correlations with environmental factors for brighter children than for duller. Is there any connection between these results and those of Crawford (1929), Dale (1952) and Furneaux (1961) who found no measurable environmental effect on the success of university students?

The few researches that consider the differences between reading and arithmetic in their response to environmental effects seem to show that reading is more prone to this than is arithmetic (Thorndike, 1951; Burt, 1955). A curiously conflicting result from Wiseman (1952) cannot carry much weight, since it was derived from teachers' judgements of family background, but Kemp's (1955) results lend little support to Burt and Thorndike. Further investigation of differentials within the overall field of 'attainment' would clearly be profitable, with subdivisions not only into reading and arithmetic, but also using such dichotomies as literary; practical and vocational; cultural. We are familiar with Vernon's *v–ed*, *k–m* factors found when we analyse batteries of cognitive tests. Is it possible that other classifications may emerge when school attainment is factorized in association with social and environmental variables? It would not be surprising if the attitudes of young adolescents towards vocationally useful subjects as compared with, say, general subjects such as history (see Jackson, 1962) did tend to produce some such effect.

The differential effect of environment on intelligence tests and on attainment tests is a particularly interesting and valuable aspect of the research field. We have seen that the sum total of evidence on environment and I.Q. leads Burt to a conclusion which seems sound and reasonable—that not more than 25% of the variance in measured intelligence can be ascribed to environmental influences. Fraser shows, and much other work supports her, that environment has a substantially greater effect on attainment than on intelligence. Kemp's results, however, lead him to conclude that intelligence is 'the greatest single factor determining level of attainment': when intelligence is held constant the correlation with socio-economic status drops from ·56 to ·30; when socio-economic status is partialled out the correlation with intelligence drops only from ·73 to ·62. But these correlations are with *measured* intelligence, which itself is dependent upon environment, so that Kemp may be correct and yet the total

contribution of *innate* intelligence be less than that of environment.[1] Burt's results for twins (Table 4.4) would suggest an environmental influence on attainment much stronger than that found by Kemp, particularly in reading and spelling. It seems highly probable that for some aspects of educational ability, in some schools in some regions, the effects of family and neighbourhood influences are stronger than those produced by the innate ability of the children.

Another question which raises itself when we try to reconcile the results of different researches is the comparability of correlations between schools and areas on the one hand, and individual children on the other. Can we, in fact, legitimately compare Kemp's correlations among schools with Burt's between twins? It is by no means certain that we can, or ought. Clearly there must be some connection between them, but it is very doubtful whether it is a simple one, and almost certain that it is not a straightforward equivalence. A significant correlation between schools or between areas may depend for its existence upon, for example, a relationship between only certain kinds of individuals (e.g. particular ability-levels) and their particular distribution in the chosen schools or areas. Robinson (1950) argues strongly that ecological correlations cannot be used as substitutes for, or assumed to be equal to, individual correlations. This points to the necessity for buttressing researches using neighbourhood variables with others employing family variables: to supplement ecological analyses with individual analyses.

From this point of view, Lander's (1954) use of *anomic* to describe one of his neighbourhood factors may be thought to be misleading. It is derived from Durkheim's *anomie*, defined by Parsons (1937) as 'precisely this state of disorganization where the hold of norms over individual conduct has broken down' (p. 377). Individual disorganization cannot be equated with *social disorganization*, and this latter name seems a preferable description for Lander's factor. It has been seen how this factor has emerged out of a number of ecological researches: its connection with educational attainment and opportunity is, however, far from clear. On *a priori* grounds one might expect a significant correlation, and yet Lander's study showed no

[1] Taking Kemp's correlations and squaring them; and assuming that 25% of the variance of measured intelligence is due to environmental factors, we can make a rough estimate of the total amount of variance in attainment dependent upon purely innate intelligence. This seems to be just *over* half. But it is obvious that slight changes in such correlations (and their stability is by no means strong: $N = 50$) could reverse this result.

educational loading on this factor. Since the researches demonstrating the existence of the factor of social disorganization have almost all been concerned with crime and delinquency, the educational concomitants have not been explored. But the correlations reported by Burt and by Fraser, of environmental factors and educational attainment, suggest the strong possibility of a causal connection. Burt's emphasis on 'maternal efficiency' may prove to be a link here.

In any survey of research the writer must perforce select his material. And herein lies a considerable hazard: that of biased choice (conscious or unconscious); the production of a repertoire that departs significantly from disinterestedness. The judgement on this will depend upon the reader's own interests and his attitudes—and, sometimes, his biases and prejudices. I cannot pretend that I am confident of having circumnavigated this hazard, but at least the attempt has been made. The context of this survey must be kept in mind when assessing its errors of omission and commission: it starts from a survey of the educational attainment of 14,000 children in a large conurbation. I have necessarily been concerned to emphasize area and neighbourhood enquiries, perhaps at the expense of researches dealing with the family and the individual. I am writing, too, from the standpoint of an educational psychologist, surveying a field which has been tilled (if that is not too inferential a word) by the sociologist, the criminologist and the medical man, as well as the social psychologist and the clinical psychologist. I cannot expect the adherents of any one of these disciplines to find my selection of research work satisfying or complete. But this lack of comprehensiveness must not be construed as indicating a disbelief in the value of these other approaches—or, indeed, in the great advantages of an inter-disciplinary attack on these major problems. For those who remain unmollified, may I urge them to redress the balance by producing their own counter-balance.

CHAPTER V

THE 1951 MANCHESTER SURVEY

IT will be realized that the greater part of the research work reviewed in the last chapter had not been published when we were planning our investigation in 1950–1. Our thinking was very largely conditioned by Burt's (1937) survey, and our main objective was to try to obtain comparative data for his pre-war and our post-war conditions. This direct connection with the only existing British enquiry had a strong effect on the design of our own survey, and in particular on the choice of variables. It will be remembered that Burt used the vital statistics provided by the medical services; such variables as infantile mortality, death-rate, per cent of mental defectives, and so on. The first question then arose: what was to be the neighbourhood 'unit' for the survey? What is required, ideally, is a unit which is small enough to yield a sufficiently large number of units in the area as a whole so as to make correlations and other statistics reasonably stable, and yet large enough so that the data from each unit are based on the results from an adequate number of children; a unit which is, socially, reasonably homogeneous and free from large variations in density and quality of housing; and, of course, a unit for which the relevant data are available. It was apparent that the only unit possible was the *ward*, the smallest unit of local government—and for the Lancashire area, the borough and the urban district. Such units are far from ideal. In size, they are too large, and the variation in size is too great. The smallest ward in Manchester had a population in 1951 of just under 12,000; the largest, one of nearly 37,000, while Table 2.1 shows one of the Lancashire County boroughs with a population of 62,000. What we require—ideally—is a unit of about 10,000 population, chosen so as to be reasonably homogeneous in terms of social and economic factors, and preferably with distinct geographical boundaries in the form of natural barriers. Our area of survey would contain about 140 of such units, and this would enable area trends to be studied in considerable detail. What we need are units like the 'census tracts' of the United States. For educational purposes, these are rather small

(3,000–6,000) and our suggested 10,000 would be preferable. These census tracts are areas

> into which a city is sub-divided, more or less arbitrarily, for statistical and local administrative purposes. The tracts are permanently established, so that comparisons may be made from year to year, and from census to census; they are laid out with a view to approximate uniformity in population and with some regard for uniformity in size; and each is designed to include an area fairly homogeneous in population characteristics. In cities where the ward lines are infrequently changed, the tracts form sub-divisions of the wards; in other cities they are laid out without regard to ward boundaries (Lander, 1954, pp. 16–17).

It is true that each decennial census can provide information for 'enumeration districts' smaller than wards, but gathering such data is an extremely expensive business and proved to be quite beyond our resources.

Having decided, with some reluctance, on the ward as the basic unit, we now turned to the annual reports of the Medical Officers of Health concerned with our designated area. Much to our surprise—and disappointment—only the Manchester report provided statistics for the separate wards. It appeared possible, but difficult, to secure such data from Salford and Stockport, but it also appeared that some of the variables in which we were interested might not be in strictly comparable form for the different boroughs. After much consideration, we decided to limit our investigation to the city of Manchester —which, with 36 wards (in 1951), ought to permit a useful analysis, using data of high reliability. It provides more than half the 13,751 children tested, in well over one hundred schools. In order to supplement—and extend—this limited survey, it was decided to use the *school* as a unit in a parallel investigation in Salford. This survey, carried out by Dr F. W. Warburton, is reported in Chapter VI.

Social variables

In drawing up our list we had Burt's research in mind. For this reason, death-rate, birth-rate and infantile mortality (deaths under one year) were first choices from the Medical Officer's report. We had no over-crowding data as Burt had: instead, we used population density (persons per acre) which is not so satisfactory from some points of view. Three of Burt's variables seemed obviously of little use in 1951 because of changed conditions: unemployment, poor relief and per cent below the poverty line. Juvenile delinquency was not

available on a ward basis, and in place of the per cent of mentally defective children we had to use the total figures which included adults. Additional variables used were tuberculosis rate (which seems likely to have an environmental aspect), the percentage of illegitimate children (clearly a factor likely to have a substantial 'psychological' element), and the rate of notifiable infectious diseases. This last seemed to be a variable which was unlikely to have any substantial *genetic* component—as contrasted, for example, with the distribution of mental defectives.

We had no specifically economic factor, so it was decided to use the juror index (J-index), or the number of jurors per thousand voters, a measure shown by Gray, Corlett and Jones (1951) to be highly correlated with socio-economic level. This was calculated for each ward by analysing the register of electors.

Finally, we included the distribution of 'neglected children'. We were fortunate to have available the results of Donnison's research in Manchester and Salford on 'long-stay' children in the care of the local authority during the first six months of 1951 (Donnison, 1954).

Educational variables

The punched-card analysis of our test scores had been carried out using the school and the authority as our main sorting variables. Moreover, the schedule completed for each child, and from which the data for the punched cards were obtained, did not include the child's home address. It would have been possible to secure this information, but with the many thousands of children involved we were unable to contemplate an analysis involving such great labour, and we were forced to rely upon the score-distributions for each school. Now came the task of matching these with wards. This was simple in the majority of cases, where the catchment area of the school clearly fell within a single ward. But there were many schools situated very close to ward boundaries. In such cases we consulted the school, and the education office staff, in order to decide from which ward the majority of the children were drawn. The school was then 'allocated' to that ward. It will be obvious that this introduces error which is likely to blur the results of the analysis. A few schools drew pupils from three wards: if, for one such school, 45% of its pupils come from ward A, 35% from ward B and 20% from ward C, the school is allocated to ward A even though less than half its pupils come from this ward.

Another serious handicap resulted from this method of allocating

schools to wards. This could only be done for schools with a local and fairly clearly defined catchment area. The selective schools (grammar, technical and central) could not be dealt with in this way, since each of them drew its pupils from a very wide area of the city. These schools had, therefore, to be excluded from the analysis—a loss of 1,935 pupils out of a total of 7,309 (see Table A.1). We had remaining the test results from 5,374 children in 125 secondary modern and all-age schools.

After the allocation of schools to wards had been made, it was found that eight wards were represented by only a single school, and another four had two schools only. This was not a tolerable situation. We know from other researches (e.g. those concerned with the follow-up of 11+ selection) that there may be large inter-school differences in results from particular tests. If a ward is represented by only one or two schools, any differences we observe between wards may, in fact, be differences between schools. We were driven, therefore, to combine certain wards in order to ensure a minimum of *three* schools per ward. Collegiate Church (1) was combined with Cheetham (4); Longsight (1) with Rusholme (5); Northenden (1) with Wythenshawe (4); Alexandra Park (1) with Barlow Moor (1) and Old Moat (1); Burnage (1) with Didsbury (1) and Withington (2); Crumpsall (2) with Blackley (5); Moston (2) with Lightbowne (3); and Moss Side West (2) with Moss Side East (7). Thus 18 wards were combined in order to produce 8 more viable units. The original 36 wards had thus shrunk to 26. Of these, 8 had 3 schools, 3 had 4 schools, 7 had 5 schools, 5 had 6 schools, one had 7, one had 8, and one had 9. The location of the wards, their grouping, and the number of schools in each, are shown in Fig. 5.

The next question which arose was the choice of statistic to be used for expressing the level of intelligence and attainment in our ward units. The commonest in other researches—and the most straightforward—is average score. We decided against this, however, in favour of the two measures already used in Chapter III for the comparison of school types: the rates of 'backwardness' and 'brightness'. This gives a richer and more meaningful result than using a single average score. Certainly from the teacher's point of view these two percentages mean much more than an average score, since they demonstrate so clearly the teaching problem by indicating the spread of ability. Two schools may have identical average scores, but if one has 10% backward children and 10% bright, while the other has 1%

KEY TO WARDS

AP	Alexandra Park
AR	Ardwick
AS	All Saints
BE	Beswick
BL	Blackley
BM	Barlow Moor
BR	Bradford
BU	Burnage
CC	Collegiate Church
CH	Chorlton-cum-Hardy
CM	Cheetham
CR	Crumpsall
D	Didsbury
GN	Gorton North
GS	Gorton South
H	Harpurhey
LE	Levenshulme
LI	Lightbourne
LO	Longsight
ME	Moss Side East
MO	Moston
MP	Miles Platting
MW	Moss Side West
NC	New Cross
NH	Newton Heath
NO	Northenden
NT	Newtown
OM	Old Moat
OP	Openshaw
R	Rusholme
SG	St Georges
SL	St Lukes
SM	St Marks
SP	St Peters
W	Withington
WY	Wythenshawe

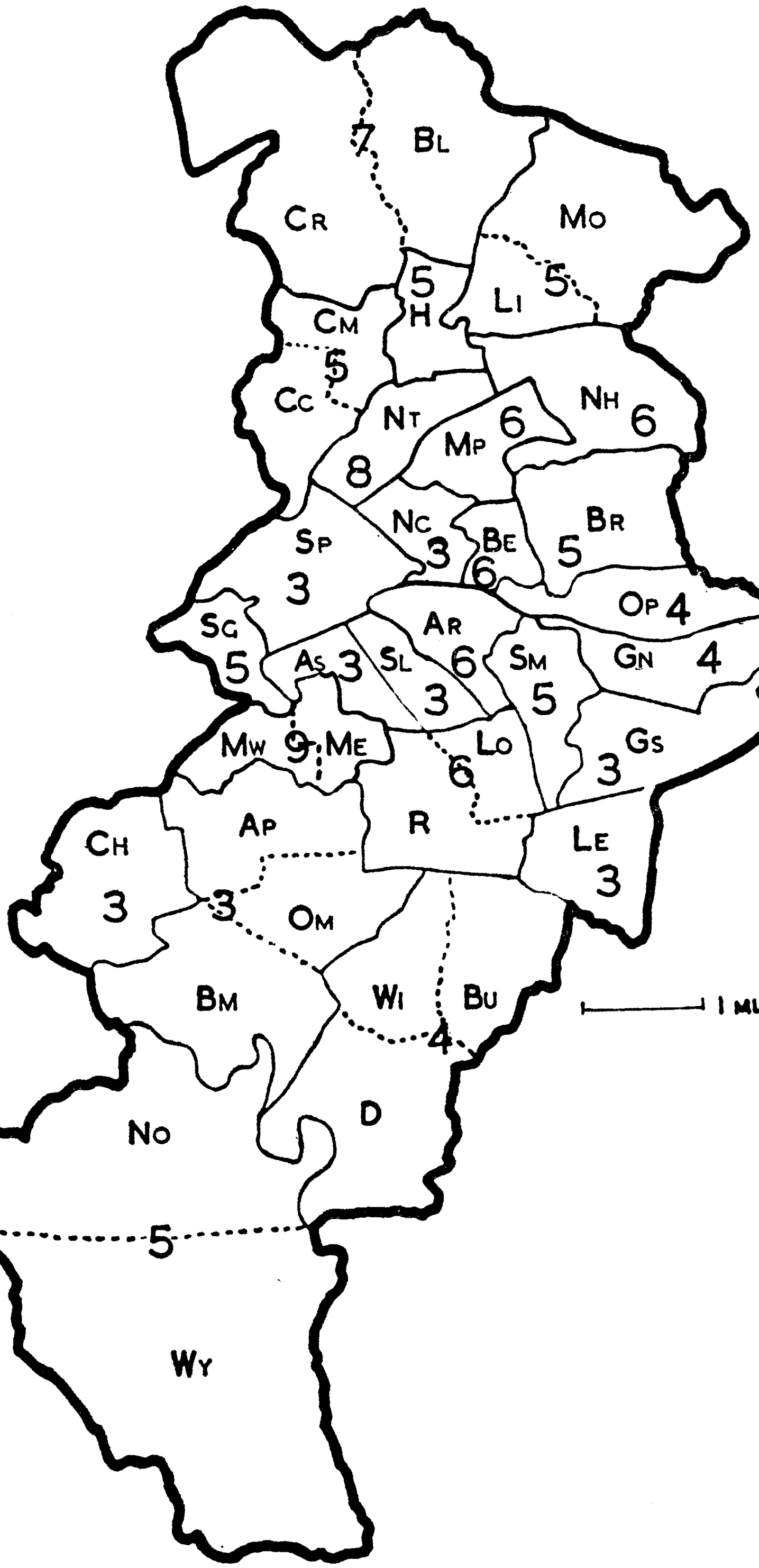

Fig. 5. Grouping of wards, showing numbers of schools in each ward-unit.

and 1%, they are very different schools to the teacher. For this reason, and because we suspected the possibility (in advance of Fraser's research) that backwardness and brightness might have different predisposing factors in the environment,[1] we chose these statistics instead of the more obvious average score. It should be noted, however, that the measure of *brightness* is not easy to interpret, because of the unsatisfactory nature of our sample of schools. We are dealing only with non-selective schools—those schools which have been 'creamed' at 11+. Therefore the children in them who are classified as 'bright' —those with standard scores of 115 and over—may be regarded in one sense as 'misfits' produced by the selection system. There will be relatively few of them, and the range of brightness will be much smaller than the range of backwardness (compare the last two lines of Tables 3.7 and 3.9). This means that the correlations of brightness with other factors will necessarily be smaller—because of the restriction of range—than the correlations of backwardness.

To summarize, our survey concerned itself with the distribution of 6 educational variables and 12 environmental variables over 26 wards of Manchester. The variables were:

Environmental	*Educational*
Death-rate per 1,000	Verba lintelligence (brightness)
Persons per acre	Reading (brightness)
Live birth-rate per 1,000	Mech. Arith. (brightness)
Deaths under 1 year per 1,000 live births	Verbal intelligence (backwardness
Per cent illegitimate to total live births	Reading (backwardness)
Notifiable infectious diseases per 1,000	Mech. Arith. (backwardness)
Death-rate, T.B., per 1,000	
Notification rate, T.B., per 1,000	
Total T.B. cases on register, per 1,000	
Mental Deficiency, incidence per 1,000	
Neglected children: no. of families/100,000	
No. of jurors per 1,000 voters	

It will be noticed that three separate measures of tuberculosis were included. Preliminary analysis of the final correlation matrix showed that *T.B. rate* seemed to be the most satisfactory of the three, so this was retained and the other two dropped. We were thus left with 10 environmental variables.

[1] Maxwell (1953) concluded from the results of the 1947 Scottish Mental Survey that 'high intellectual ability is more widely distributed over different social environments than is low intellectual ability' (p. 134).

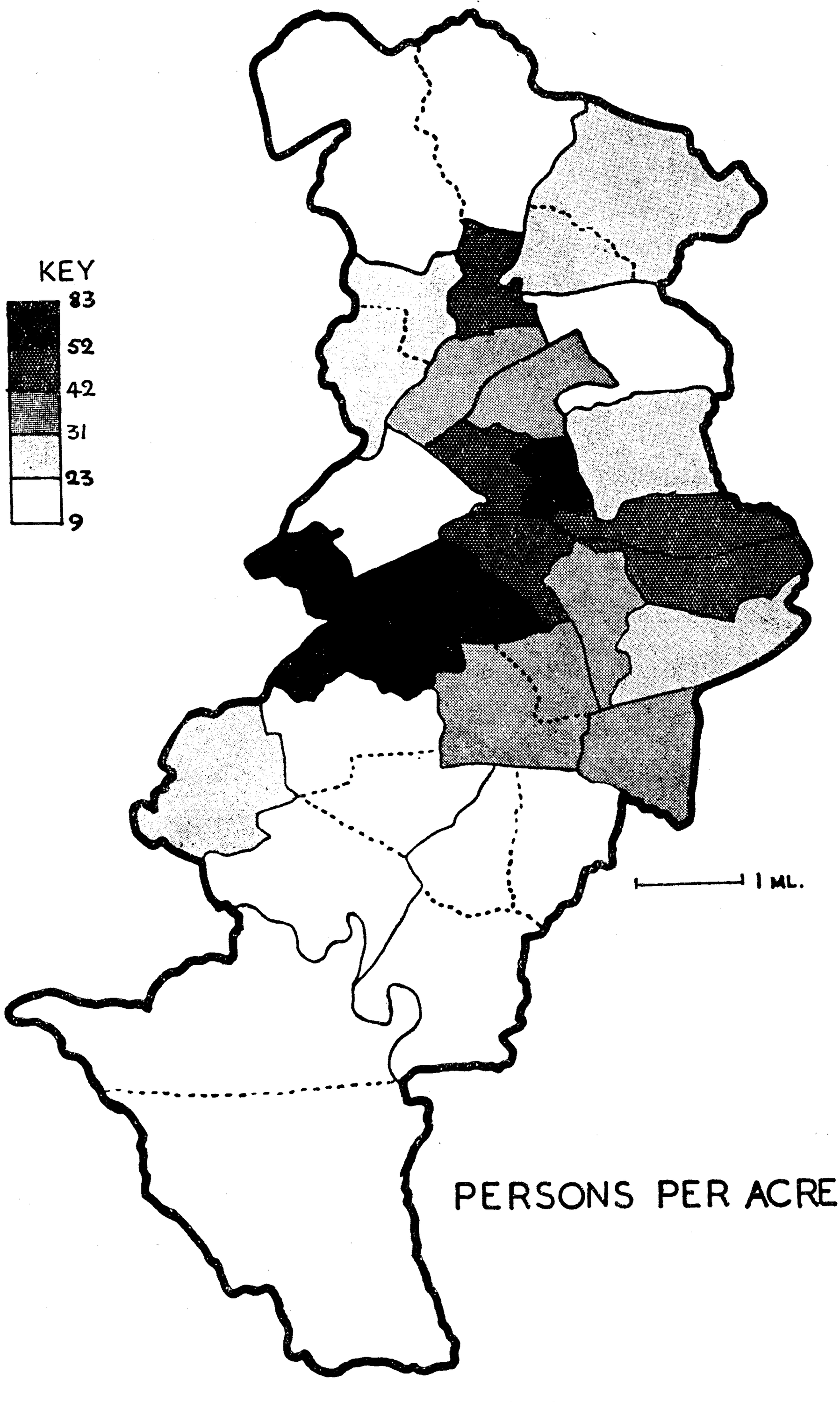

Fig. 6. Population density

Geographical variation

The density of population in our 26 ward-units is shown in Fig. 6. It will be seen that the greatest intensity of population comes across the centre of the city, with the northern extremity middling in density, and the south—with the suburbs of Didsbury, Withington, Burnage, Barlow Moor, Northenden and the well-known Wythenshawe estate —very much the best. The two rather unexpected white areas near the centre are easily explained. St Peter's is the city shopping centre and also contains all the main railway stations. The number of dwelling houses is necessarily small, and those that are there are by no means so favoured as the map-shading would suggest. Similarly Newton Heath in the north-east is an artifact, in that a large part of the ward is covered by railway lines and sidings (the Newton Heath Sheds well known to many generations of schoolboy train-spotters) as well as factories. The variable 'persons per acre', uncorrected, is not an entirely satisfactory variable.

The socio-economic variable—the juror index—is shown in Fig. 7. This has obvious affinity with population density, as might be expected, except that the darkest areas have shifted northwards a little. The wards of Moss Side East and West, All Saints, and St Luke's, have a higher juror rate than might be expected from the previous map.

Maps of birth-rate, illegitimate births and mental deficiency are all of very similar patterns to Figs. 6 and 7, but the distributions of *infantile mortality* and *neglected children* show a very marked difference (Figs. 8 and 9). Notice the heavy intensity in the northern areas, and the unexpected darkness of such wards as Chorlton-cum-Hardy, Northenden and Wythenshawe. While the data for *neglected children* might, with some justification, be regarded as possibly unrepresentative (based on only 131 children from 85 families coming into care over a relatively short period of only six months) nevertheless the points of similarity with the infantile mortality pattern suggest that the picture revealed is a significant one.

The general impression obtained from a scrutiny of the geographical spread of the environmental variables of Table A.6 is that of an elongated, sausage-shaped city, lying roughly north and south, having a west-central area (lying cheek by jowl with Salford) where social conditions are much the worst. As we go outwards from this focus, conditions get better: population intensity is reduced, socio-economic level rises, the birth-rate and death-rate both get smaller,

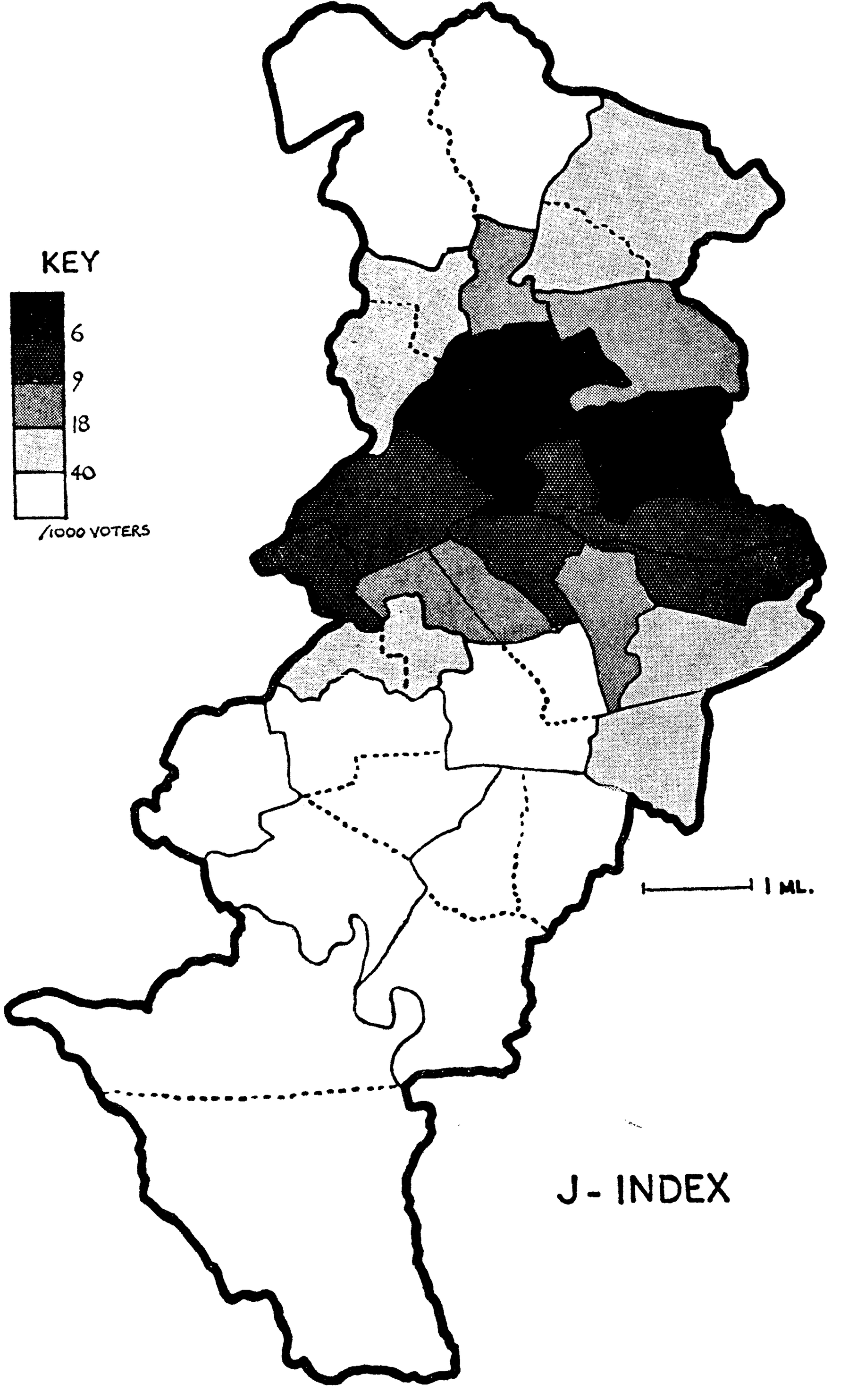

Fig. 7. Distribution of the Juror index

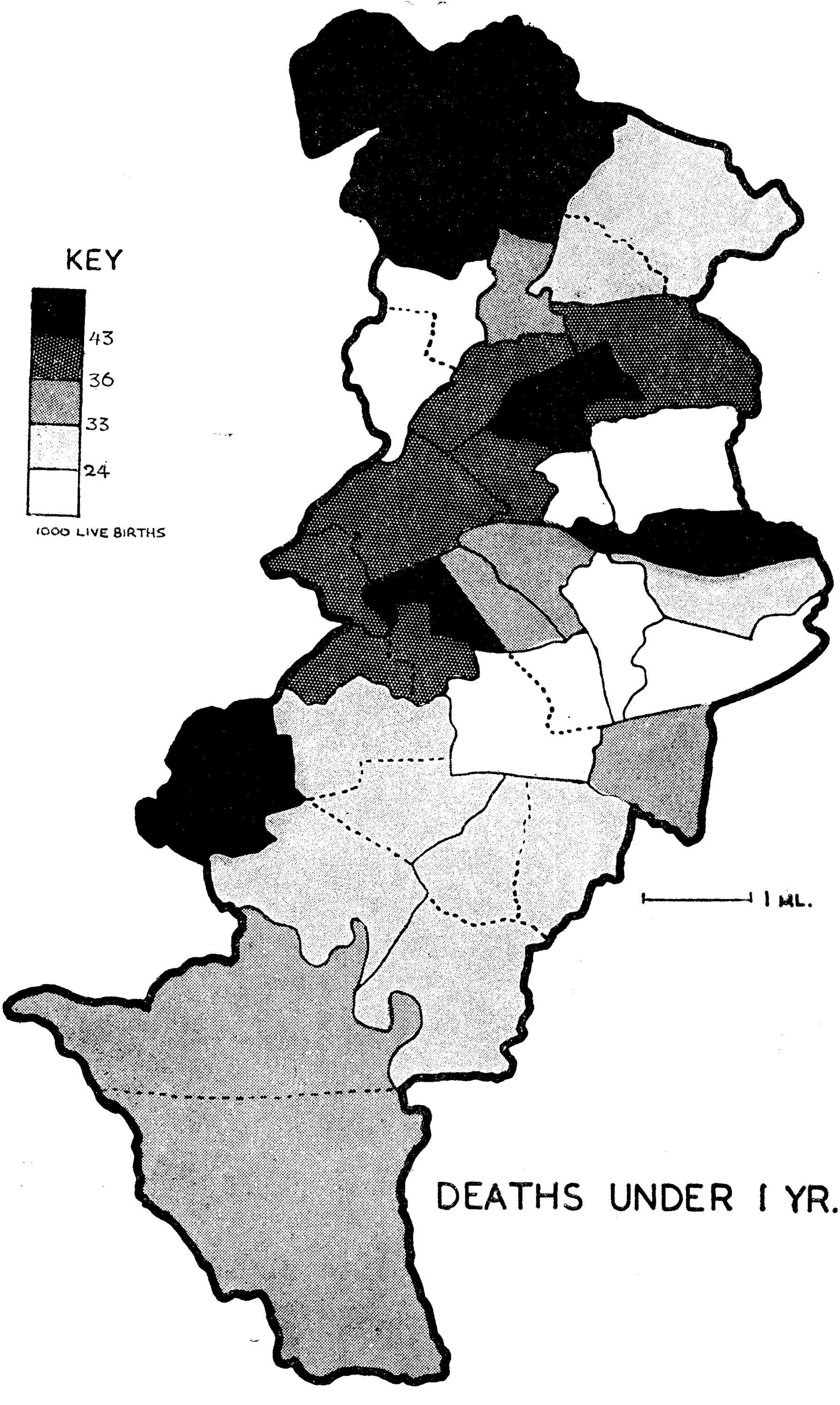

Fig. 8. Distribution of infantile mortality

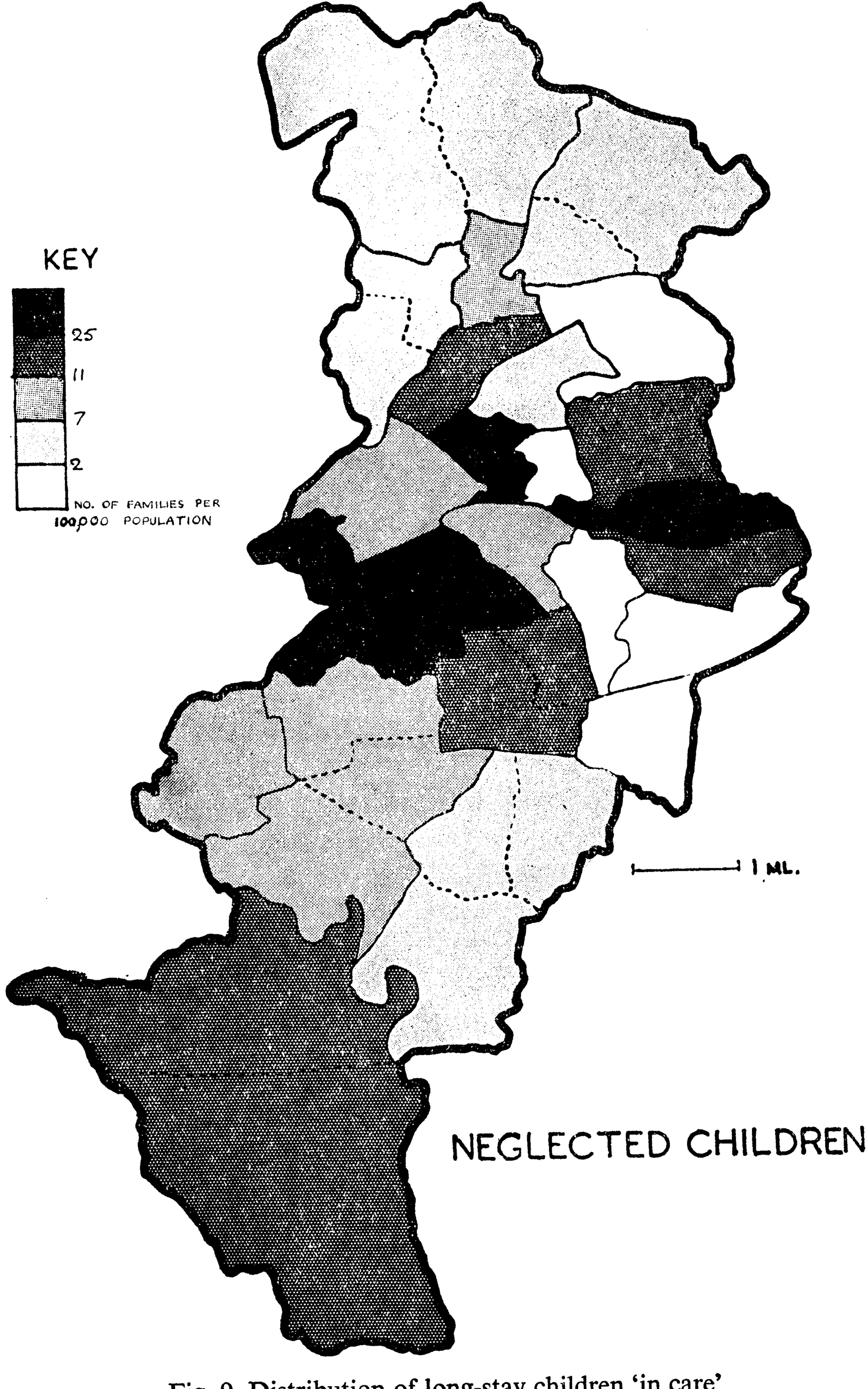

Fig. 9. Distribution of long-stay children 'in care'

the number of mentally deficients and of T.B. cases falls. The trend is not unbroken, however, and for deaths under one year, and number of problem families producing officially recognized cases of child-neglect in particular, the pattern departs significantly from the general picture.

Let us now consider the picture revealed when we plot the distributions of our educational variables. Figs. 10, 11 and 12 show the distribution of backwardness. For intelligence, this resembles the general environmental picture, with much backwardness in the central regions, but shows some rather unexpected light grey in Wythenshawe, Northenden, Didsbury, Burnage and Withington, and some equally unexpected white in Harpurhey, Moston and Lightbowne. Nevertheless there appears to be a clear correlation with the distribution of social factors. The map for reading (Fig. 11) shows an even closer correspondence. The areas of good home background in the south are now white, and, like the J-index map, the centre of gravity of the dark area has moved a little northwards. The arithmetic map seems remarkably light-coloured. For each of the social factor maps, the shadings were chosen to give roughly equal numbers of wards in each of five intervals. For backwardness, this was done for intelligence, reading and arithmetic *together*. Fig. 12 reveals that the amount of backwardness in arithmetic is rather less than in reading and in intelligence. (This is to be expected, in view of the results given in Chapter III showing the considerable overlap in this subject with the selective schools: these maps, it will be remembered, are based on results from non-selective schools.) In addition to this feature of Fig. 12, notice too the rather surprising white areas in the centre, as well as light grey at the extremes. There seem to be discernible differences from the results from the three educational tests, and the decision to avoid a single global measure of attainment appears to be well justified.

No maps are presented for brightness, since the spread of this, as has been pointed out, is artificially restricted by the form of the data, and a presentation using similar kinds of map shading might tend to suggest unjustifiable comparisons. The statistics show, however, a picture very similar to that of backwardness: low rates in the central areas, high in the southern suburbs, but with discernible differences between the results for reading and for arithmetic.

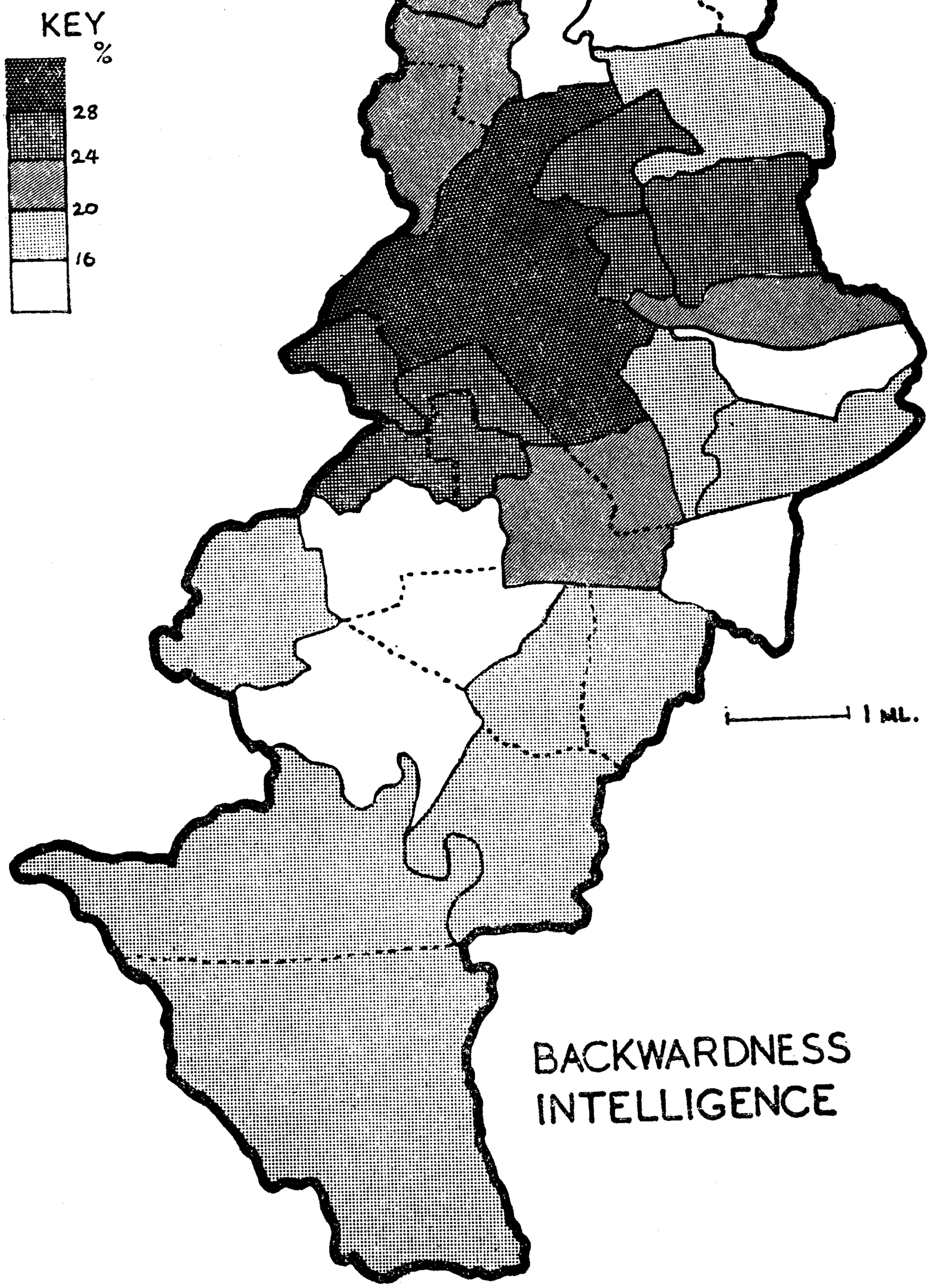

Fig. 10. Distribution of backwardness (IQ < 85) on General Ability test

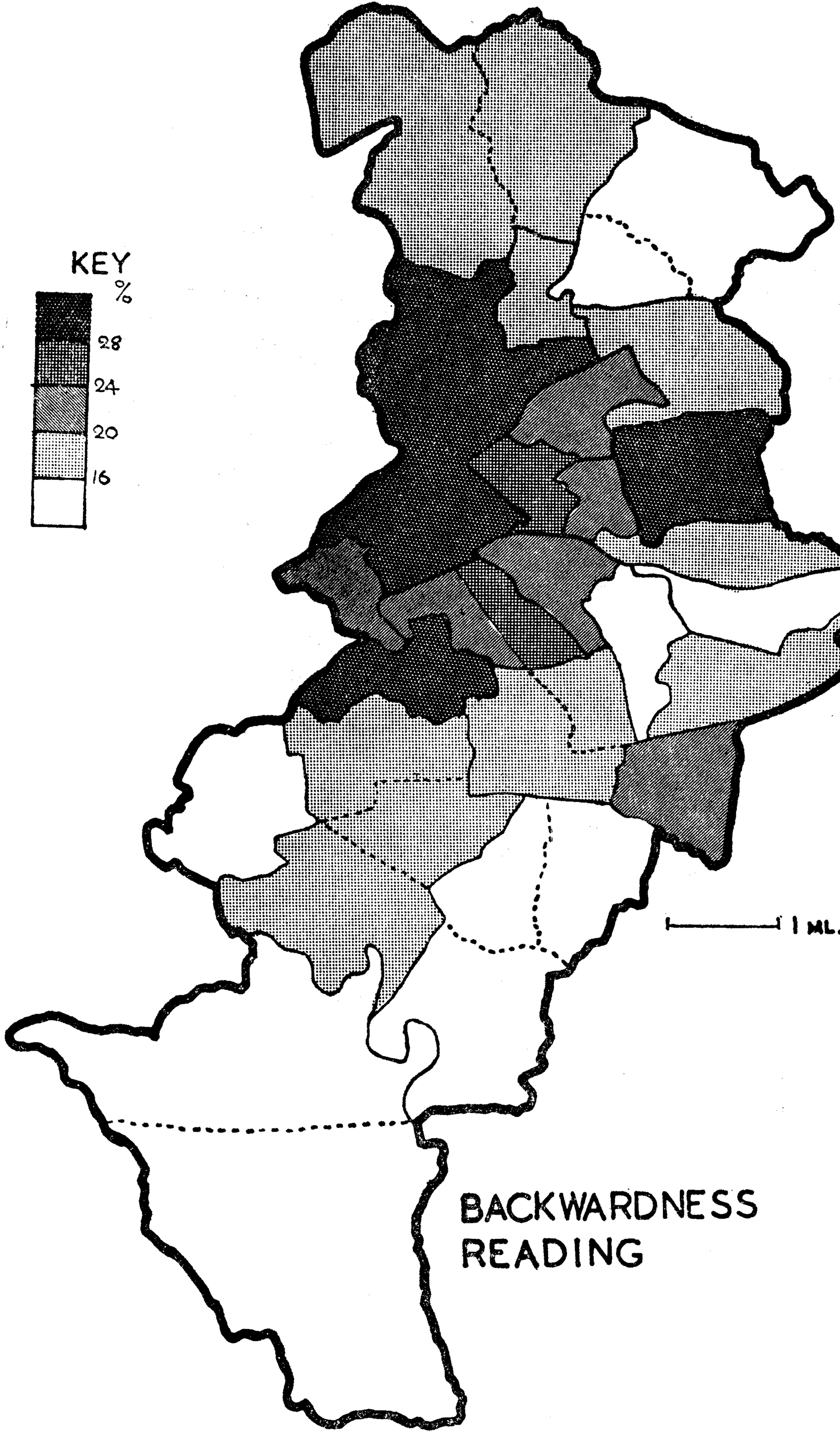

Fig. 11. Distribution of backwardness (RQ < 85) on Reading Comprehension test

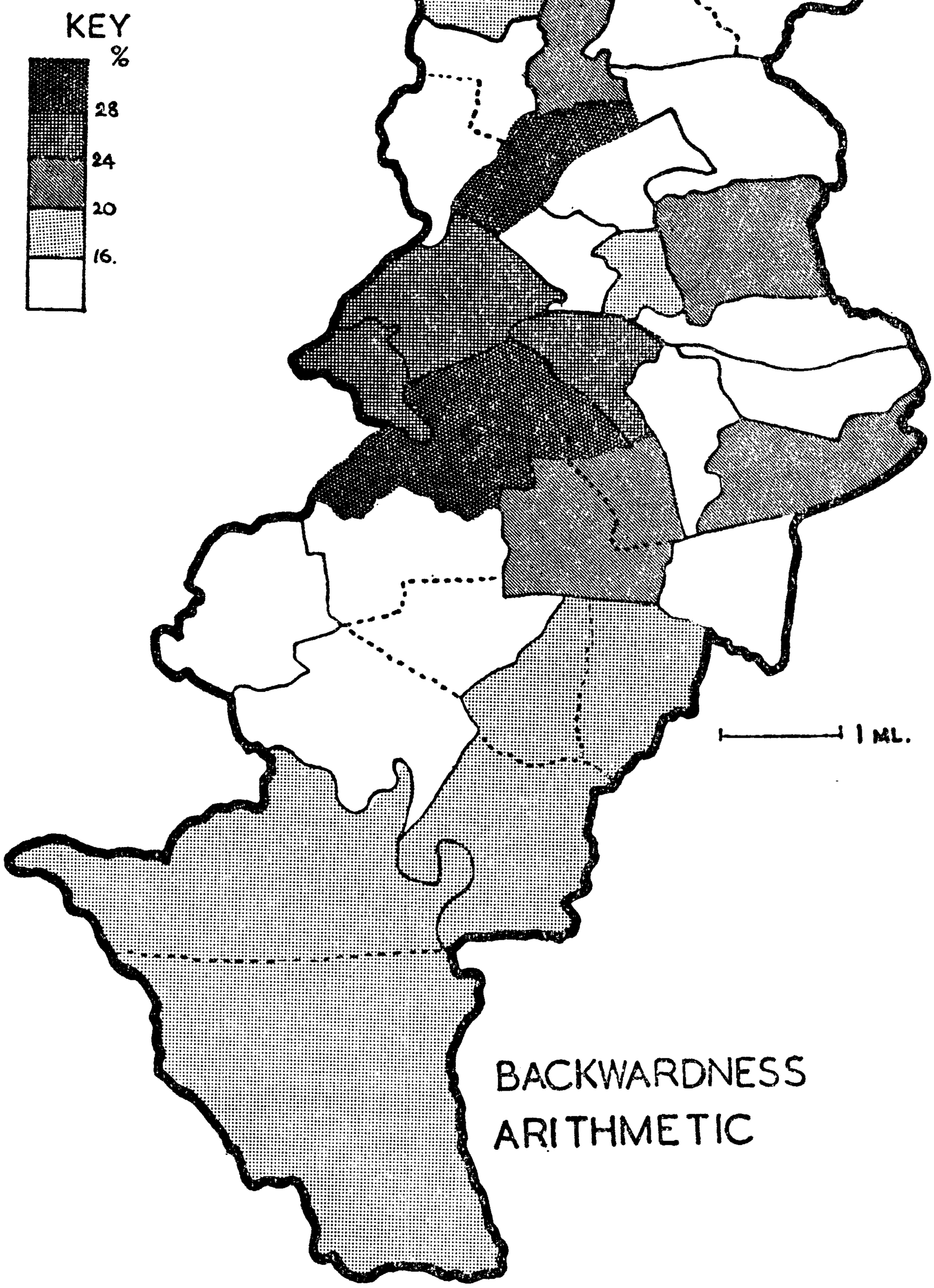

Fig. 12. Distribution of backwardness (AQ < 85) on Arithmetic test

Correlation analysis

A study of the maps so far presented, together with the comments on them, make it abundantly clear that subtleties of relationship which may exist are incapable of resolution by the human eye. We therefore turn to a more precise and statistical exploration of these possible relationships.

The first and most obvious attack comes through the product-moment correlation of our measures of educational attainment with the social variables. This was done by calculating the percentage of

TABLE 5.1

PRODUCT-MOMENT CORRELATIONS

VARIABLE	BACKWARDNESS			BRIGHTNESS		
	Intell.	Read.	Arith.	Intell.	Read.	Arith.
Mental Deficiency	.84	.64	.60	-.55	-.06	-.22
Birth-rate	.69	.37	.53	-.30	.02	-.28
Illegitimate Children	.66	.48	.72	-.43	.07	-.15
T.B. rate	.63	.32	.51	-.16	.16	-.22
Neglected Children	.50	.23	.57	-.23	-.25	-.21
J-index	.37	.35	.12	-.25	-.16	-.18
Death-rate	.36	.15	-.01	-.08	.14	-.20
Persons per acre	.33	.37	.51	-.19	.14	-.22
Infantile Mortality	.25	.16	.14	-.20	-.17	-.09
Infectious Diseases	.03	-.21	.08	.00	-.18	.00
Average Correlation	.47	.29	.38	-.24	-.03	-.18

backwardness and brightness in each ward, and correlating each of these with the separate rates for the social variables. *N* is thus 26. The correlation coefficients thus obtained are given in Table 5.1. It will be noticed that the correlations for brightness are a good deal lower than those for backwardness. This is what is expected from the nature of the statistics. But a more surprising result is the higher level of the coefficients for intelligence than for either reading or arithmetic. This corresponds with the result obtained by Thorndike (1951) but it is in striking contrast to most other research, particularly Fraser's (1959). It is possible that this may be caused, in part at least, by the nature of our sample and its exclusion of selective schools. If

selection is made at 11+ with a significantly greater weigh on attainment than on intelligence, then this would tend to produce a greater dispersion of intelligence in the rejected population, and hence an artificially higher correlation coefficient. Manchester's selection methods fall in line with the general pattern of 11+ selection, with the intelligence test bearing not more than one-third of the total load of selection. It is possible, then, that this may account for some of the discrepancy. But the differences revealed in the last line of the table (average correlations) are of a magnitude that is unlikely to be fully explicable on these grounds, particularly since our tested children are 14+. If we had been dealing with children in the first year of the secondary modern school, the differential effect of selection might have been more sizeable. After four years of schooling, however, any residual effect is likely to be small, or even non-existent.

The correlations with backwardness permit us to make a direct comparison with Burt's results from London data collected 1920–3.[1] Since Burt used only one measure of backwardness while we have three, it will be convenient to average our three coefficients to obtain a single figure. The comparison, on the four variables common to the two researches (remembering that Burt's 'M.D.' figure is for children and ours for adults), is given below:

	London, 1921	*Manchester, 1951*
Mental Deficiency	·91	·69
Birth-rate	·62	·53
Death-rate	·87	·17
Infantile Mortality	·93	·19

In making comparisons over a period of thirty years it is necessary to take particular care not to be misled by statistical artifacts. If, for example, the variability or spread of a particular statistic changes markedly from one period to another, this will affect correlations. And we know that social conditions have changed markedly in the period under review. Can such effects be responsible for the radical differences in the correlations for death-rate and infantile mortality? Let us compare the London and Manchester mean rates, and their dispersions. These are given in Table 5.2. It will be seen that in each case the Manchester data have a greater S.D. than Burt's: there is no ground here for attributing our lower *r*'s to shrinkage. Notice, too,

[1] It must be remembered that, although the Manchester results are based on the scores of over 5,000 children, the *N* for correlation is only 26. Any coefficient under ·4 is therefore not statistically significant. The *N* for Burt's research was 29.

that the 1951 rates for births and deaths are not sensibly different from the London ones—but infantile mortality is in strong contrast. The Manchester rate in 1951 is less than half Burt's figure. And this

TABLE 5.2

COMPARISON OF BURT'S (1937) STATISTICS WITH OURS.

Variable	Mean		Standard Deviation	
	London	M/cr.	London	M/cr.
Birth-rate	19.92	18.42	4.134	5.269
Death-rate	12.56	14.26	1.095	1.853
Infantile Mortality	76.25	34.15	10.501	11.172

(Approximate figures : calculated from the means of boroughs and the means of wards).

is the variable that produces the most dramatic differences in the correlations in the two researches. In the London research infantile mortality, with a correlation of nearly ·8 with economic grade, was strongly allied to poverty. In the Manchester enquiry, infantile mortality correlates —·01 with J-index (our only variable with a strong economic element). Its highest correlation in our own research is ·35, with neglected children. Clearly deaths under one year are not, in the welfare state, a product of poverty or low economic status, but rather seem to be associated with parental neglect. Heady and Morris (1955) comment:

> Different sections of the population have been very differently affected by recent social change . . . full employment, higher real wages and expanding social services have led to relatively greater improvement in the situation of building and dock labourers of Class V . . ., for example, than of clerks or professional people . . . however this different experience is not reflected at all in the infantile mortality rates, despite the fact that there was so much room for improvement in the worst rates.

The reference to occupational class V tends to give this comment a slant which seems to be mistaken in view of our results. There is no doubt that there is 'so much room for improvement in the worst rates', but Heady and Morris overstate the case when they suggest that post-war conditions have had no effect. A study of the overall rate of infantile mortality for England and Wales over the last sixty

years shows a steady fall: 1901, *137*; 1921, *84*; 1931, *65*; 1941, *60*; 1951, *31*; 1960, *22*. The Manchester figures follow the same trend, but at a higher level. At the time of Burt's rate of *76* in London, Manchester's was *97*; in 1951 the Manchester rate was *35* compared with *31* for the country as a whole. The latest figures show the gap to be widening a little (1960: *29* against *21*). It is not unlikely that the quality of *maternal care*, largely independent of economic status, now plays the part of pre-war poverty as the major concomitant of deaths under one year. Here is an interesting field for further research in social medicine.

If we take into account not only the correlations of our social variables with educational attainment, but the inter-relationship between them, correlation analysis can be made more precise and meaningful. It is possible, for example, to use partial correlations. The correlations of backwardness in reading and in arithmetic with the mental deficiency rate are ·64 and ·60 respectively. If, however, the effect of intelligence is partialled out—so that intelligence is held constant—these fall to ·02 and ·11. The calculation of large numbers of partial correlat ons, however, tends to produce a picture of such a complexity that it is difficult to see the wood for the trees. An alternative technique is to employ multiple correlation. This makes it possible, not only to discover to what degree the level of educational attainment may be predicted from a combination of social data, but also the *weights* which must be applied to the various social factors to achieve maximum prediction. When this is done for *backwardness*, the multiple *R*'s obtained are:

Arithmetic	·994
Intelligence	·963
Reading	·783

These are remarkably high figures. Even the lowest—for reading—is nearly ·8. The close approximation of the figure for arithmetic to the perfection of unity suggests that, given appropriate data on environmental factors, by suitable combination of these the amount of backwardness in arithmetic in a particular ward in the city could be predicted with high precision.

The regression equations yielding these high multiple correlations need not be given in detail. Perhaps it is enough to say that for arithmetic the strong positive beta-weights are *Birth-rate* (·89), *Mental Deficiency* (·52) and *Persons per acre* (·38); while the main suppressor

variables (with negative weights) are *J-index* (—·63), *T.B. rate* (—·56) and *Death-rate* (—·44).

For intelligence the positives are *Birth-rate* (·90), and *Mental Deficiency* (·79), with strong negatives in *T.B. rate* (—·44) and *J-index* (—·40).

For reading, *Mental Deficiency* (·81) and *Persons per acre* (·35) contrast with *Death-rate* (—·37) and *Neglected Children* (—·29).

For short batteries of only three variables, and rounded weights, the following combinations are offered. It cannot be guaranteed that they yield the highest possible multiple *R* for any combination of three variables, but they are certainly near the maximum:

Intelligence:	(9 × Mental Deficiency) + (4 × Birth-rate) − (4 × J-index)	$R = ·86$
Arithmetic:	(6 × Illegitimate Children) + (5 × Persons per acre) − (4 × Death-rate)	$R = ·83$
Reading:	(8 × Mental Deficiency) + (2 × Infantile Mortality) − (3 × Neglected Children)	$R = ·68$

Factor analysis

The use of multiple regression analysis does not clear the air very much, and it seemed obvious that the most powerful tool that could be used for exploring the inter-relationships of these undoubtedly complex environmental variables was factor analysis. The ten social variables and the six educational variables were accordingly subjected to a principal components analysis using the Manchester University electronic computer.[1] The matrix of correlations is given in Table A.6. The unrotated loadings are shown in Table A.7, and the quartimax solution in Table 5.3.

Factor I seems to have a substantial *genetic* component, with heavy loadings in *Mental Deficiency* and the two measures of *Intelligence*. The weight given to *Illegitimate Children*, *Birth-rate* and *Neglected Children* suggests that this factor, contributing over 30% of the total variance, represents what the ecologists have called 'social disorganization'. There is only a small loading on *J-index*, suggesting that

[1] The first four of the sixteen factors were examined, and graphical rotations carried out with the object of producing approximate simple structure among the six educational variables only. At the same time a quartimax rotation was performed—using the computer of the University of Illinois, since at this time our own Mercury computer was not programmed for factor rotation. I am grateful to Dr Frank Warburton and Professor Raymond Cattell for this courtesy. After some 1,500 rotations a solution was obtained which was extraordinarily close to that obtained from the sixteen or so graphical rotations.

TABLE 5.3

ROTATED FACTOR LOADINGS.

	I	II	III	IV	h^2
Mental Deficiency	+.80	+.41	-.03	+.11	.82
Birth-rate	+.52	+.72	+.13	-.11	.82
Illegitimate Children	+.80	+.14	-.16	-.10	.70
T.B. rate	+.51	+.73	-.23	-.11	.86
Neglected Children	+.51	+.55	+.26	-.11	.64
J-index	-.32	-.60	-.06	-.19	.50
Death-rate	+.14	+.63	+.01	+.64	.83
Persons per acre	+.43	+.56	-.20	+.30	.63
Infantile Mortality	+.14	+.14	+.65	+.19	.50
Infectious Diseases	-.08	+.56	+.19	-.64	.77
BACKWARDNESS					
Intelligence	+.87	+.23	+.03	+.07	.82
Reading	+.80	-.10	+.01	+.32	.75
Arithmetic	+.84	+.10	-.03	-.29	.80
BRIGHTNESS					
Intelligence	-.74	+.17	-.39	-.07	.73
Reading	-.03	+.03	-.78	+.24	.67
Arithmetic	-.40	-.05	-.23	-.20	.26
Percentage variance	32.5	19.1	9.3	8.4	69.4

economic factors are not of primary importance in defining this factor: moral standards rather than monetary standards seem strongest, with a clear element of intellectual inferiority.

Factor II seems to be an environmental factor of a more material kind. The key is in the single significant negative loading on *J-index*, with supporting evidence from *T.B. rate*, *Death-rate*, *Birth-rate*, and *Persons per acre*. This seems reasonably designated as 'economic background'.

Factor III differentiates *Infantile Mortality* and, to a lesser extent, *Neglected Children*, from all the other social variables. The only other positive loadings are in *Infectious Diseases* and *Birth-rate*. This factor, contributing 9·3 % of the variance—and based on $N = 26$—is far from stable in this analysis, and obviously needs to be verified by further and wider enquiries. It will be noticed, however, that its composition supports our speculations about the causative factors behind *Infantile Mortality*. The factor can perhaps best be described as 'lack of parental (or maternal) care'.

Factor IV is very difficult to interpret, with positive loadings in

Death-rate, *Persons per acre* and *Infantile Mortality*, and negative loadings in *Infectious Diseases* and *J-index*. Notice, too, how it differentiates backwardness (and brightness) in reading from backwardness (and brightness) in arithmetic. Its small contribution to the total variance, together with the relatively large potential error component in our correlations, make it probable that its shape is largely fortuitous.

Now let us consider how our measures of educational attainment fit in with the factor pattern. The genetic factor I of *social disorganization* contributes very heavily to all three measures of backwardness. The loadings fall for brightness—not far for intelligence, but well down for arithmetic, while reading has a zero loading. The singular nature of our brightness measures, and the low level of their correlations, would account for a general fall in loadings on this factor, but does not explain the internal differences between the three measures.

The *economic background* factor II has very little indeed to contribute to either backwardness or brightness, the heaviest loading being only ·23 (intelligence, backwardness). But *maternal care* is strongly significant for reading brightness, and, to a small degree, brightness in the other two measures. It seems to have no connection with backwardness.

The overall result of our analysis seems to be that backwardness, as we have defined it, can be accounted for almost entirely by the effect of our factor of intellectual inferiority which we have called *social disorganization*. Brightness, on the other hand, is more complex. If we average the loadings for each of the first three factors, we get I, −·39; II, +·05; III, −·47. The *maternal care* factor appears to have the strongest connection with the percentage of children in non-selective schools gaining high marks on our three tests. But *social disorganization* contributes nearly as much. These two factors clearly differentiate reading from the other two measures. Good reading seems to depend very heavily on the third factor, and has no connection with Factor I. Intelligence and arithmetic, however, find their main loadings on *social disorganization*, with significant support from *maternal care*.

It seems clear that backwardness and brightness are not just simply the obverse and the reverse of a single coin; and it seems true, too, that reading and arithmetic—to say nothing of intelligence—have

important differences in a context such as this. But the limitations of our experiment, and particularly the unsatisfactory nature of our measure of brightness, make it impossible to regard our results as more than suggestive. The names we have suggested for the three factors can be no more than tentative in view of the limited nature of our social variables. Both the *maternal care* factor and that of *social disorganization* need fuller exploration before we can be reasonably satisfied that they 'exist', and this can only be done by widening the scope of the enquiry.

Twins

It will be remembered that the schedule filled in by the schools for each of the tested children asked the question, 'Has the child a twin taking the test?' From an examination of the schedules 55 pairs of twins were found, 41 of like sex and 14 of unlike sex. The first question which arises is how this total compares with the expected figure. From the Registrar General's statistics it appears that the twin rate for newly born children is about 24 per thousand. We should, then, have expected to find about three times as many twins: our figure corresponds to a rate of 8 (individual) twins per thousand. How does this compare with the results from other investigations? Mehrotra and Maxwell (1949), analysing the data from the 1947 Scottish Mental Survey, found 1,070 twins from a total population of 11-year-olds of 75,451. This corresponds to a rate of 14 per thousand. Sandon (1957) found a rate of 16 per thousand in a county authority over a period of 'several years', and a rate of about 10 per thousand in a county borough over eight years. All these results, it will be noted, are well below the 24 per thousand 'expected' on the basis of records of birth, but none are as low as the 8 per thousand found in our enquiry.

It is known that the survival rate of twins is lower than that of other children. Karn (1952, 1953) estimates their death-rate as being five times as great as that of other children. Sandon (1957) points out that if we assume a correlation for death-rate between pairs of twins of ·5, then a survival rate of 85% for *individual* twins (i.e. assuming a death-rate of 15% for twins as against 5% for other children, since Karn's figures relate to the early months of life when the death-rate is heaviest) will produce a survival rate of only 75% for *pairs* of twins. This would account for at least part of the deficiency found by Mehrotra and Maxwell and by Sandon, since it brings the expected rate down to 80% of the rate at birth. It does not, however, provide a complete

explanation. From the Registrar General's figures it appears that the ratio of like-sex to unlike-sex twins is 2 : 1, so that our ratio of 41 : 14 shows a marked deficiency in those of unlike sex. This is understandable. We relied upon the schools to identify the twins, and where we are dealing with single-sex schools it is quite likely that the school is unaware of the existence of a twin of the opposite sex attending some other school.[1] If the 'identification rate' for both kinds of twins had been the same, we could have expected 20 or 21 unlike-sex twins in our sample, bringing the total up to 61 or 62 pairs: a rate of nearly 9 per thousand. This is still well below the expected figure, although quite close to Sandon's 10 per mille for a county borough. This low rate he obtained from the analysis of selection examination data, and puts it down to the fact that only those children whose parents wished it took the examination, and that (as we shall see) twins are markedly lower in ability than other children, so that a higher proportion might be expected to 'opt out' of the selection process. Such a mechanism cannot have operated in our own enquiry, which included the whole age-group at school. Both Sandon's enquiry and that of the Scottish sample dealt with 10-year-olds, while our children are 14–15. It is possible—even likely—that the differential death-rate acting over a longer period would produce a greater overall difference in numbers, but it cannot explain the whole of the deficiency. We are forced to conclude that our sample includes only about half of the existing twins in the tested population.

Let us now consider the ability level of the twins we have identified. The mean scores of the 110 children are given below, together with the mean scores for the total sample:

	Twins	*Total sample*	*Difference*
Intelligence	20·81	32·20	11·39
Reading	24·78	32·39	7·61
Arithmetic	20·85	28·34	7·49

It will be seen that the performance of twins in each of the three tests is lower than average. Since the S.D.'s of the tests are not equal (see Table 3.5) the differences shown in the final column cannot be compared directly. Expressed as sigma-scores, these are ·53, ·62, and ·50 respectively, thus showing the greatest difference in reading. The differences are equivalent to 7·8, 9·2 and 7·5 points of standardized score respectively. Mehrotra and Maxwell found the I.Q. (Moray

[1] Of our 55 pairs, only 7 came from different schools.

House standardized scores) of their twins to be about 5 points lower than the population average; Sandon's figures are higher: his county sample show differences ranging from 8 to 11 points (transforming his S.D. figures to equivalent standardized scores) and from the county borough 3–9 points. The Scottish report comments that 'there appears to be . . . a fairly uniform superiority of non-twins over twins at all levels of intelligence' (loc. cit., p. 297). It points out that this is not caused by size of family, since 'there is no evidence that twinning and fertility are related' (p. 300). The physical inferiority of twins, as revealed by the differential death-rate, seems paralleled by an equivalent mental inferiority.

TABLE 5.4

INTELLECTUAL RESEMBLANCE OF TWINS:
CORRELATIONS OF INTELLIGENCE TEST SCORES
(Based on Table 8 of Mehrotra and Maxwell, 1949)

Author	Like Sex		Unlike Sex	
	N	r	N	r
Merriman, 1924	67	.87	38	.50
Lauterbach, 1925	134	.77	78	.56
Wingfield, 1928	76	.82	26	.59
Herman and Hogben, 1933	267	.66	138	.53
Mehrotra and Maxwell, 1949	286	.73	182	.63
Sandon, 1957	122	.86	55	.62
Weighted average	952	.749	517	.580

Let us now consider the correlations of twins on test scores. There have been other investigations, in addition to Mehrotra and Maxwell, and Sandon, which have investigated this for intelligence tests. Table 5.4 summarizes the data given in Mehrotra and Maxwell's Table 8, and adds Sandon's figures. It will be seen that the correlations for like-sex twins are all higher than for unlike-sex twins. The average correlations, based on substantial numbers of children, are ·75 and ·58 respectively. This is not surprising, since unlike-sex twins are necessarily fraternal and not identical, and thus exhibit correlations of the order usually found between non-twin siblings, while like-sex twins consist of both identical and fraternal twins (probably in roughly equal proportions). The correlations obtained from the

Manchester twins are given in Table 5.5. Little reliance can be placed on the *r*'s for unlike-sex twins, based as they are on only 14 pairs, but they are lower than those for like-sex pairs, which themselves tend to be lower than the figures reported for larger samples in Table 5.4.

TABLE 5.5

MANCHESTER TWINS - CORRELATIONS OF TEST SCORES

	Intelligence	Reading	Arithmetic
Like-sex	.610	.656	.722
Unlike-sex	.591	.621	.521

We cannot compare these correlations with those obtained by Burt, and by Freeman, Holzinger and Newman, given in Table 4.4 since their figures relate to *identical* twins. The identical twins in our own survey are included in the 41 pairs of like-sex twins, and how many there are is unknown. Sandon (1957) devises a method of estimating the correlations for identical and fraternal twins from the data from like-sex twins by analysing the difference-scores and thus partitioning

TABLE 5.6

ESTIMATED r's FOR IDENTICAL AND FRATERNAL TWINS
COMPARED WITH BURT'S RESULTS

		N	Intelligence	Reading	Arithmetic
Manchester :	Identical	21	.920	.737	.926
	Fraternal	34	.509	.421	.561
Burt :	Identical	83	.925	.944	.862
	Fraternal	172	.551	.915	.748

the distribution. This method was applied to our own data, using the distribution of difference-scores of the aggregate marks on the three tests. The results are given in Table 5.6 together with Burt's results for comparison. The results for intelligence are closely similar to Burt's figures, but for reading and arithmetic there are considerable differences. Burt finds reading to be strongly affected by genetic factors (·944) but also highly dependent upon environment (·915). Arithmetic

shows a different pattern. He concludes 'the correlations which are most conspicuously increased by similarity of home environment are those for verbal or literary attainments; those for arithmetical attainments are, if anything, increased more by similarity of genetic constitution' (Burt, 1955, p. 169). His comment on arithmetic is derived not only from the figures given in Table 5.6, but also from the correlations for identical twins reared apart (Intelligence, ·876; Reading, ·647; Arithmetic, ·723). The Manchester figures show arithmetic to be highly dependent upon genetic factors, but the correlations for reading are both very low and suggest that the influence of environment is far from strong. The results from our Reading test again show a marked contrast with those from the other two measures. One cannot put much weight on the correlations in Table 5.6: they are merely estimates, based on rather hazardous assumptions. But the pattern revealed is one which supports the other results we have obtained, from the analysis of attendance records, from the correlational analysis and from the factor analysis. All these produce results which differentiate reading from arithmetic. Poor attendance has a greater effect on reading (Fig. 3); multiple correlation reveals that our environmental factors predict backwardness in reading with less precision than they do for arithmetic (·78 against ·99); reading brightness has no loading on our factor of *social disorganization* (—·03) but a strong loading (—·78) on *maternal care*, whereas for arithmetic the balance is reversed. All this suggests that the environmental concomitants of reading seemed to be 'psychological' rather than economic or physical, and that home background and parental care are more important than the majority of neighbourhood variables included in our analysis.

The analysis of twins thus underlines the necessity for an enquiry with a wider scope, embodying a greater variety of environmental variables. The kind of additional information which might repay inclusion in such an extended survey would be data on crime and delinquency, on suicide, on divorce-rates, and—if we had data not from wards but from census tracts, or local neighbourhoods, or even streets—intensity of occurrence of pawn-shops, brothels, amusement arcades and milk-bars (and perhaps bingo-halls and betting shops). This initial survey has, perhaps, cleared a little of the ground, and has succeeded in raising a number of particular questions and in suggesting ways in which further work might profitably be undertaken. More than this could not, perhaps, have been expected.

CHAPTER VI

ATTAINMENT AND THE SCHOOL ENVIRONMENT

by

F. W. WARBURTON

THIS chapter is concerned with the relationship between brightness, backwardness and the school environment in the 48 schools in Salford in which children of secondary age were taught, excluding grammar schools, private schools and schools for handicapped children.

The field covered is similar in many ways to that described by Kemp (1955) in his article on environmental and other characteristics determining attainment in primary schools. He points out that

> there have been many investigations into factors associated with the educational progress of school children, and it is likely that characteristics of a school are also important in determining attainment. Teachers as well as educational theorists and administrators are naturally concerned with such things as the school buildings and amenities, the size of classes and methods of school organization and of teaching. But on all these points far less attention has been focused than on the characteristics of individuals.

Kemp studied 28 social variables, subsequently pooled to make 12 (including all those used in the Salford enquiry), in 50 junior mixed schools in two educational divisions in London. He used two criteria of attainment: (i) comprehension attainment, comprising arithmetical problems, silent reading and general information, and (ii) rote attainment, comprising mechanical arithmetic, spelling, handwriting speed and handwriting quality. Intelligence was measured by combining Vernon's Abstraction Test and a non-verbal test. His main conclusions were: (i) that the main factors determining level of attainment in the formal school subjects are, in decreasing order of importance, intelligence, socio-economic status, and large enrolment; and (ii) that progressiveness, new buildings and class size are little (although positively) related to level of attainment.

Kemp's research aroused a good deal of interest among educationalists. *The Times Educational Supplement* commented that 'most remarkable of all, the investigation provides no evidence to show that large classes have a deleterious effect on educational attainment', and added that 'cherished notions are not going to be shrugged off for one research, but no more can scientific work be ignored'.

The present investigation duplicates some of Kemp's research. A complete sample was taken of the 48 secondary modern and all-age schools in the City of Salford, the total number of children tested in these schools being over 1,700. Attainment in each school was expressed as the percentage of bright and backward children (i.e. those scoring either one standard deviation above or below the mean in the Greater Manchester sample) in reading comprehension, mechanical arithmetic and intelligence respectively. Eight 'school environment' variables were studied:

(i) *progressiveness*, a rating made by the local education authority of the type of education provided in each school on a 'formal-free' scale, ranging from the extremely formal, rigid and orthodox to the most informal, free and progressive, with a curriculum organized through activities related to the interests of the children;

(ii) *size of class*;

(iii) *size of school*;

(iv) *percentage attendance*;

(v) *school neighbourhood*, ratings made by inspectors of schools, the medical officer of health, the educational psychologists and the superintendent of school welfare officers on the socio-economic status of the school neighbourhood, taking into account such factors as the type and age of houses, their state of repair and attractiveness, the presence of front gardens and other buildings and the general appearance and tidiness of the streets;

(vi) *school buildings*, a similar rating on school buildings and equipment, including the age of the building, its interior state of attractiveness and repair and the adequacy of the classrooms, playground and sanitary facilities;

(vii) *age of school buildings*;

(viii) *J-index*, the number of jurors per thousand voters living within a quarter of a mile of the school.

These variables were chosen because they appeared to be the more important, reliable and easy to obtain. The enquiry differs from that of Kemp in the following respects: (i) the children are 14 years of age,

not junior school children; (ii) the data are examined by analysis of variance as well as by multiple correlation and factorial methods; (iii) fewer variables are investigated: since our experimental sample comprised all the children in the age-group attending secondary modern schools and departments in Salford, those variables omitted were either socio-economic variables, for which it is difficult to collect the data from *individual* children (e.g. size of family, paternal occupation, percentage learning musical instruments, percentage of mothers at work, percentage of homes without piano, percentage of cars and percentage of telephones); or personality characteristics (e.g. resourcefulness, co-operativeness, sociability, playground behaviour, manageability of children, interest in school, staff spirit and school atmosphere) which are difficult to assess reliably.

Very few researches have been carried out which are strictly comparable with the present investigation. The author has managed to find only one other in addition to that by Kemp.

Mollenkopf (1956) in the U.S.A. tested 17,957 ninth- and twelfth-grade pupils in 206 schools. He studied 34 social variables, including number of school facilities available (similar to our own rating on school buildings), size of school, attendance, size of class, percentage attendance, and, as a socio-economic index, the percentage of fathers who are professional people. His academic tests included four measures of attainment: (1) vocabulary, (2) sentence completion, (3) arithmetic reasoning and (4) arithmetic computation, and a single achievement test in English.

Statistical methods

The statistical methods employed in the analysis included:

(i) analysis of variance based on differences between attainment scores;

(ii) correlation coefficients for each school environment variable with reading, arithmetic and intelligence;

(iii) partial correlations (intelligence held constant) between the school environment values and reading achievement and arithmetic achievement. (Scholastic performance is termed *attainment* and scholastic performance with intelligence held constant is called *achievement*.) Partial correlations were also calculated between the school variables and intelligence with attainment held constant;

(iv) factor analysis of all the variables included in the research. Factorial methods group the variables objectively into their main

categories, on the basis of the complete matrix of 66 correlation coefficients.

Several difficulties arose in the course of the investigation. Firstly, the trend lines showed a very close relationship between scores in the attainment tests (reading and arithmetic) and the intelligence test score. It is obvious that intelligence is an important factor in scholastic attainment and that, if we do not pay heed to this, differences which are at first sight due to social factors might, in fact, merely reflect differences in the intellectual capacity of the children. For example, the apparent superiority of progressive methods of education could be due solely to the fact that they might have been applied to more intelligent children, who would have done better anyway, by whatever method they were taught. This difficulty can be handled statistically by calculating partial correlations, which indicate the degree of relationship between the attainment and the social variables with intelligence held constant, i.e. they provide an estimate of the amount of correlation that would have been found if the children were all of the same intelligence.

The second difficulty was that differences among the mean scores for schools do not give a fair indication of the results. The total number of children is over 1,700, and a population of 48 schools is clearly a better standard of comparison than the samples of 100 or so children usually studied in educational research. It must be borne in mind that the *mean* scores of classes of 36 children may be expected to differ among themselves only about one-sixth as much as their *individual* scores, which makes statistically significant differences very difficult to obtain. It was found, however, that significant differences between means could sometimes be obtained by pooling categories. For example, in the ratings of school neighbourhood there is no significant difference between categories A, B, C, D, E and F in respect of brightness in intelligence, but a significant difference exists between category A and categories B, C, D, E and F combined.

A third difficulty is due to the fact (pointed out in Chapter V) that the range of mean scores for brightness is considerably less than that for backwardness. This is because the brightest children in the city were attending grammar schools, and are therefore not included in the present sample. It follows, by a well-known statistical principle, that the correlations between the social variables and brightness will be lower than those for backwardness. Factor loadings for brightness will also be lower than those for backwardness. This difference is a

statistical artifact, and does not imply any inherent tendency for the school environment to be less closely related to brightness than to backwardness. Differences between the size of the correlations for backwardness and brightness thus bedevil interpretations either of the coefficients themselves or of the factor analyses based upon them, and make comparison between these two measures difficult, e.g. between arithmetic brightness and arithmetic backwardness or reading brightness and reading backwardness. Statistical corrections for range could be used, but there are two objections to this method. First, these corrections sometimes give rather unreal results, and in the present instance they appeared to boost the correlations for brightness unduly. Secondly, since this enquiry is concerned with the practical problem of the social factors present in the secondary modern schools of Salford in 1951, it seems rather pedantic to imply by means of a statistical correction that there were as many bright children as backward. On the other hand, it could be argued that statistical adjustments for this inequality would give a more accurate picture of the general educational problem. On balance, the advantage appeared to lie with not boosting the correlations for brightness, and consequently no statistical corrections were applied to these correlation coefficients.

Hypotheses

Hypotheses cannot be advanced with any confidence in a field in which so little previous work has been carried out. However, the following general hypotheses were put forward before the research began:

(i) that good performance in all three tests, i.e. in reading, arithmetic and intelligence, is related to progressive methods of education, good social background and good teaching conditions, i.e. there will be positive correlations between (*a*) brightness and lack of backwardness in reading, arithmetic and intelligence and (*b*) progressive methods of teaching, high percentage attendance, small classes, good school buildings, good school neighbourhood and high juror index. (No hypotheses were advanced concerning the part played by size of school, as this appears, even on *a priori* grounds, to depend on other environmental factors.)

(ii) that the attainment measures in arithmetic and reading have higher correlations with the above school environment variables, than the intelligence test has. It has been amply shown by Burt (1955),

Burt and Howard (1956), Freeman, Holzinger and Newman (1937) in their work on the relative contribution made to the variance of test scores by hereditary and environmental components that hereditary factors play a relatively greater part in the determination of intelligence test score than they do in determining scholastic performance.

(iii) that attainment in reading, since it rests considerably on the social and home environment, and depends partly on the facilities and encouragement given outside as well as inside school, and is clearly related to the personal contacts that the child has around him in everyday life, will be more closely related to socio-economic measures than arithmetic will be; i.e. reading will correlate more highly than arithmetic with school neighbourhood and the J-index.

(iv) conversely, it was hypothesized that since arithmetic is a technical skill used very infrequently in everyday life compared with reading, and is dependent largely on instruction from a professional teacher, it will correlate more highly with teaching conditions than reading will; i.e. that arithmetic will correlate more highly than reading with small size of class, good school buildings and high percentage attendance.

(v) that reading will correlate more highly with progressiveness than arithmetic will, since progressive teachers give more emphasis to broad cultural factors and less to the acquirement of techniques.

Results

Table 6.1 shows the correlations obtained between the school variables and the school scores for backwardness and brightness. It should be remembered that with $N = 48$, a first-order correlation coefficient must be ·28 or over to be significant at the 5% level. Table A.9 shows the analysis of variance calculations for all comparisons where a significant difference was found. The absence of any variable from this table indicates that the F ratio found was not significant. Let us now consider the results obtained for each of our environmental variables in turn.

Progressiveness. The most important educational variable studied is progressiveness. Attainment, whether expressed as brightness or backwardness, is consistently higher in the more progressive schools. When allowance is made for the effect of intelligence the direction of the relationship (as shown by the correlation coefficients of achievement) is unchanged, but the only coefficient of any marked size

TABLE 6.1

CORRELATIONS

	BACKWARDNESS					BRIGHTNESS				
	Attainment			Achievement*		Attainment			Achievement*	
	Rdg.	Arith.	Intell.	Rdg.	Arith.	Rdg.	Arith.	Intell.	Rdg.	Arith.
Progressiveness	-.42	-.23	-.32	-.29	-.09	+.19	+.14	+.34	+.13	+.07
% Attendance	-.28	-.25	-.27	-.10	-.14	+.26	+.42	+.24	+.22	+.39
Small size class	-.11	-.19	-.14	+.01	-.14	+.04	+.07	+.17	+.01	+.03
Large size school	-.14	-.06	-.07	-.15	-.03	+.21	+.13	+.52	+.13	+.01
Good school neighbourhood	-.33	-.18	-.51	+.19	+.09	+.22	+.32	+.27	+.18	+.28
Good school building	-.23	-.19	-.34	+.10	+.03	+.14	+.21	+.34	+.08	+.14
New buildings	+.14	-.01	+.07			+.07	-.01	+.25		
J-Index	-.01	-.08	-.08			+.03	-.02	-.04		

* Partial correlations with intelligence held constant.

(—·29) is with backwardness in reading. Thus, the chief effect of progressive education appears to be to raise the reading capacity of the children, particularly the backward readers, progressive teachers apparently emphasizing comprehension of language rather than the acquirement of arithmetical techniques. Kemp found correlations of +·16 and +·13 with comprehension and rote attainment respectively. The results thus suggest that children in the more progressive schools learn to read with comprehension, irrespective of their ability, but that if ability is taken into account, the type of education makes little difference to their efficiency in mechanical arithmetic; i.e. the more progressive schools stress learning with understanding rather than mechanical efficiency, and are more successful in inducing meaningful learning. Thus, the main effect of progressiveness appears to lie in preventing backwardness in reading, even when the influence of intelligence is held constant. Emphasis on help for the needy is, of course, one of the main characteristics of what is termed 'progressiveness' both in education and in other fields of activity.

The positive correlations found between progressiveness and attainment could conceivably be due to 'halo' effect, since the assessors of progressiveness might have held the view, either consciously or unconsciously, that a good scholastic record is an essential feature of a progressive school. This seems very doubtful, however, as progressiveness was specifically defined for the judges in terms of the method

of approach to teaching and education adopted by the teachers, and was not in any way said to be related to the level of efficiency attained, the assessors being asked to rate schools on a scale varying from the very formal, rigid and orthodox to the most informal, free and progressive, with a curriculum organized through activities related to the needs and interests of the children.

These results for reading comprehension and mechanical arithmetic confirmed the experimental hypotheses laid down before the experiment began, that progressiveness would correlate more highly with reading than with arithmetic; the mean correlation with reading is +·31 compared with ·18 for arithmetic (Table 6.9). However, the correlations with intelligence test score were the highest obtained.

TABLE 6.2

DISTRIBUTION OF BRIGHTNESS AND BACKWARDNESS BY SIZE OF CLASS

Size of Class	Over 38	32-38	Under 32
Brightness			
Intelligence	2.0%	2.6%	2.5%
Reading	6.0%	5.3%	3.7%
Arithmetic	4.4%	8.3%	4.0%
Backwardness			
Intelligence	28.6%	22.0%	33.4%
Reading	24.9%	19.8%	34.8%
Arithmetic	21.0%	19.7%	31.9%

This result was contrary to expectation, and since it was found for several other variables as well as progressiveness, it is discussed in the general conclusions.

Size of class. The findings in respect of size of class are complex, the distributions (except for reading brightness) being U-shaped, with optimum attainment (i.e. more brightness and less dullness) being shown by the middle-sized classes. Table 6.2 shows this clearly. In Salford the optimum size of class is about 35, possibly because organization is easiest with middle-sized groups. Evidence from the Kent Education Authority shows that the highest percentage of passes in the eleven-plus examination tends to be obtained by schools in which the age-group sizes lie between 30 and 40, or some multiple of this figure. Schools with less than 30 are the least successful, but those

between, say, 45 and 60 are also below average. Poorer attainment is to be expected, of course, in large classes, but it is rather surprising to find that in this sample small classes also tend to be less successful. In a large authority, such as Kent, with many rural schools, small classes will often have a wide age range, so that the teacher has the difficulty of taking several small groups in a single classroom. In an urban area such as Salford the situation is somewhat different. Small classes are more homogeneous, but tend to be found where the conditions are cramped, and an association is found between poor buildings, poor socio-economic status, poor attainment and small classes. It might be better in future research to take the size of the room into account and perhaps to study classroom density, i.e. the number of children per square yard, rather than classroom size. Incidentally, since the present research was carried out in an industrial city, this finding suggests that the poorer results usually obtained by small rural schools are not entirely attributable to lower average intelligence, but may also reflect difficulties of organization and accommodation. It follows, for statistical reasons, that in view of the U-shaped distribution product moment correlation coefficients will be low, and it is not therefore possible to draw adequate conclusions about the effect of size of class on reading or arithmetic. However, the results are all in the direction predicted, namely, the smaller the class the higher the attainment. This is more marked for arithmetic than for reading as hypothesized at the beginning of the research. Do arithmetical skills depend relatively more than reading skills on the expertise of the teacher and less on home background, so that teaching conditions such as the size of class have greater effect? When intelligence is held constant very little relationship with attainment remains except with backwardness in arithmetic. The highest correlations for size of class (as for progressiveness and several other variables) were found with the intelligence test, but all the correlations for class size are low, and the conclusions consequently carry little weight. Kemp and Mollenkopf also found low but positive correlations in favour of small classes. It will be noticed from Table A.9 that the only significant result for analysis of variance was with backwardness in arithmetic.

Size of school. The distributions tend to be U-shaped, i.e. the highest attainment is found in medium-sized schools with an enrolment of 250–300 pupils. There is no obvious reason for this, but it seems less likely than size of class to be related to problems of

organization. If a crude division is made into two sizes of school, it is found that the larger schools are more efficient. The trend is clear in Table 6.3. However, this is probably due to the fact that the intelligence test level is higher in the large schools, since very little relationship between school size and attainment is found when the correlations are adjusted for differences in intelligence. The correlation coefficients and the differences between mean scores were not large enough to permit any very definite conclusions to be drawn about optimum school size and scholastic success. The average unadjusted correlation is +·14. This compares with Kemp's figure of

TABLE 6.3

SIZE OF SCHOOL

Size of School	299 and over	Under 299
Brightness		
Intelligence	3.9%	1.3%
Reading	5.8%	5.3%
Arithmetic	8.1%	6.0%

Size of School	178 and over	Under 178
Backwardness		
Intelligence	23.3%	27.6%
Reading	20.6%	28.3%
Arithmetic	21.0%	24.7%

+·35; Mollenkopf found no constant relationship. It seems possible in view of the inconsistency of these results that the size of the school is not itself a determining factor but attainment is subsidiary to other educational and social factors, although on balance the larger schools are the more efficient.

No hypothesis was made before the research began concerning the relationship between size of school and attainment, as it appeared even on *a priori* grounds to be subsidiary to other educational and social factors. In fact the correlations, although low, are higher with reading than with arithmetic. They are relatively high, however, with intelligence. It is possible that larger schools attract better head-

teachers, who in turn appoint better assistant teachers, using better methods. It may be, too, that in a large school equipment and text-books may be deployed more effectively. Such speculations cannot be tested by our own investigations, but they are perhaps worthy of further enquiry.

Percentage attendance. As might be expected, the more frequently children attend school the more they learn. This tendency is somewhat less marked after allowance has been made for differences in intelligence test score—i.e. it is the more intelligent children who benefit most from instruction, *relatively* as well as absolutely. It

TABLE 6.4

SCHOOL ATTENDANCE

Attendance	92% and over	Under 92%
Brightness		
Intelligence	4.5%	1.2%
Reading	6.0%	4.7%
Arithmetic	11.5%	4.2%

Attendance	Over 92%	88.8-91.9%	Under 88.8%
Backwardness			
Intelligence	18.2%	24.5%	35.2%
Reading	15.9%	21.6%	35.8%
Arithmetic	17.2%	23.5%	31.5%

will be remembered that the analysis of attendance categories (Chapter III) for the total population of children from the conurbation as a whole showed the greatest effect on the mean score in the reading test. The more detailed analysis of the Salford sub-sample shows little difference for backwardness, but the results for brightness are quite distinct. The hypothesis that high attendance would show beneficial effects chiefly in arithmetic was confirmed, the mean correlation between attainment and achievement in arithmetic being ·34, compared with ·27 for reading. This was the only variable for which the average correlation with the school environment was lower for intelligence than for attainment. Kemp did not study this variable

in separation from others, but Mollenkopf found very low correlations and even negative correlations with reading.

Good school neighbourhood. It is clear that good school neighbourhood is positively related to attainment even when allowances are made for differences in intelligence level. As hypothesized for variables based on socio-economic background, the correlations are higher for reading than for arithmetic, but the differences are slight, and once again, contrary to expectations, intelligence test score has higher correlations than either of the attainment scores. Kemp's figures were higher: +·56 for comprehension and +·47 for rote attainment, but his criterion of socio-economic status was different, being based on the J-index, paternal occupation and size of family as well as on the school neighbourhood. Mollenkopf also found consistent positive correlations between socio-economic status and attainment. One of the main research findings from variance analysis, correlations or factorial analysis is that good social background is associated with good scholastic performance, and that this factor is somewhat more powerful than material or educational conditions within the school.

Good school buildings. The general trend is clear. Good school buildings are clearly associated with superior attainment in respect of reading and arithmetic, although, judging from the partial correlations much of this tendency is basically determined by intelligence. It was expected that since good school buildings should facilitate teaching, a higher correlation would be found with arithmetic than with reading. To a slight extent this is true, when the effect of intelligence is taken into account, but this hypothesis was not confirmed by the remaining correlations. One most unusual finding was that after allowance had been made for differences in intelligence level, backwardness in reading correlates with good instead of bad school buildings, poor achievement correlating +·10 with good buildings. Kemp found only very low correlations of +·09, between new (and good) buildings and rote, +·01 between new buildings and comprehension and +·01 between new buildings and rote attainment. On the whole, however, this verifies our own findings, and the well-known relationship between verbal ability and good social environment.

Date of school buildings. This variable was included because of its objectivity. The results were chaotic, no trend being evident and the curves mere zigzags, the apparently random up and down movements

suggesting the influence of common factors other than those of date of building. Nevertheless, this variable correlates satisfactorily with other social variables, e.g. +·69 with ratings of school buildings.

Juror index. The J-index gave unexpected results, particularly with backwardness, the lowest attainment tending to be in the middle of she range, i.e. with medium socio-economic status. There is no significant relationship between this index and attainment. The reason for these very poor results is not known. Presumably the index itself was insensitive for the present sample, as such findings are unusual in studies of the relationship between socio-economic studies and scholastic attainment.

The difficulty may be that in a predominantly working-class area such as Salford there are so few jurors that the proportion is generally too low to vary significantly from one part of the city to another. Moreover, those who are liable to jury service in an area like Salford Docks, e.g. doctors, are not likely to be strictly comparable to those in the better residential areas, where jurors are drawn from a wide variety of occupations and professions.

Multiple correlations

Correlations can be calculated not only between single variables, e.g. A *v*. B, but also between a number of variables and a single variable, e.g. A + B + C *v*. D. These are known as multiple correlations. For this purpose, standard scores for the individual variables, A, B, and C, are each multiplied by certain multiple regression weights. This process maximizes the multiple correlation coefficient. For example, it may be found that the highest possible correlation is obtained by multiplying scores in A by ·1, B by ·2 and C by ·3.

The multiple correlation coefficients shown in Table 6.5 thus indicate the degree of association between the seven social variables combined and each of the attainment measures. Despite the fact that the first-order correlations are higher for backwardness than for brightness, and that one would consequently expect the same to hold true for the multiple correlations, the two most predictable criteria are, in fact, the two intelligence test measures (+·659 and +·654 respectively for brightness and backwardness). The low multiple correlation for backwardness in arithmetic (+·390) was completely unexpected, and strikingly at variance with the result obtained from the Manchester data reported in Chapter V (p. 92). Mollenkopf calculated similar multiple correlations, and found that they varied

TABLE 6.5.

MULTIPLE AND UNIT WEIGHT CORRELATIONS AND MULTIPLE REGRESSION WEIGHTS

Criteria	Size of school	Size of class	% Attend.	Progress-iveness	School Buildings	School Neighbour-hood	J-Index	Multiple Correlation	Unit Weight Correlation
Intelligence (brightness)	+.270	+.048	+.044	+.002	+.036	+.027	+.008	+.659	+.534
Reading (brightness)	+.057	+.000	+.064	+.001	−.058	+.097	+.003	+.404	+.328
Arithmetic (brightness)	+.023	−.002	+.176	−.011	−.098	+.196	+.001	+.535	+.369
Intelligence (backwardness)	+.012	+.002	+.023	+.082	−.131	+.446	−.007	+.654	+.502
Reading (backwardness)	−.005	+.013	+.042	+.157	−.069	+.153	+.000	+.539	+.441
Arithmetic (backwardness)	+.000	−.048	+.060	+.057	+.037	−.040	+.019	+.390	+.305

from +·45 to +·65. It is rather surprising, however, that attainment scores can be reproduced to the extent represented by a correlation of ·65 from a suitably weighted combination of assessments of environmental characteristics. However, from the point of view of prediction, multiple correlations are somewhat misleading, since lower correlations are invariably obtained if the same weights are applied to the variables on a second occasion. A more reliable, although very rough guide to future prediction is provided by giving the variables equal (unit) weights, instead of differential multiple regression weights. These unit weight correlations are lower than the corresponding multiple correlations, but there is no reason why coefficients of this order of size should not repeatedly be obtained in future replications of the research. They range from +·305 to +·534, and once again are highest for the intelligence test.

Factor analysis

A factor analysis[1] was carried out on the electronic computer of Illinois University (Table 6.6). This is a method of separating out the

[1] The results were rotated to an orthogonal quartimax solution, a method which minimizes the variance of the squared factor loadings and hence leads to an analysis resembling 'simple structure', with a large number of relatively high and low loadings and few medium loadings. Quartimax rotations usually give similar, though clearer, results to those obtained by hand, but since electronic computers tend to be mechanical, it is sometimes advisable to give the solution a final twist. In the present analysis 465 machine rotations were followed by 2 hand rotations.

main factors underlying a matrix of correlations. The results are expressed as correlations between the experimental variables (school environment and attainment) and the 'factor'. Factor I accounts for some 24% of the variance. It correlates very highly with school neighbourhood (+·98) and school buildings (+·92), and has a lower positive value for the juror index. It is clearly a *socio-economic* factor. The loadings tend to be higher for backwardness than for

TABLE 6.6.

ROTATED FACTOR LOADINGS - SALFORD

	I	II	III
Progressiveness	+.25	+.31	-.26
% Attendance	+.20	+.21	+.40
Small Size of Class	+.34	-.03	+.57
Good School Neighbourhood	+.98	+.00	-.03
Good School Buildings	+.92	-.16	+.08
J-Index	+.36	-.11	-.47
READING			
Brightness	+.22	+.50	+.07
Backwardness	-.40	-.86	+.00
ARITHMETIC			
Brightness	+.36	+.29	+.22
Backwardness	-.28	-.59	-.17
INTELLIGENCE			
Brightness	+.30	+.09	+.16
Backwardness	-.50	-.76	+.01
Percentage Variance	24%	18%	7%

brightness because the range of scores is higher for the former than the latter variable.

Factor II accounts for 18% of the variance and seems to represent what might be called *school atmosphere*, since it has its highest correlations with progressiveness and percentage attendance. These correlations are considerably lower than those for the socio-economic variables in Factor I. On the other hand, the second factor has higher correlations than the first factor in the scholastic tests, i.e. scholastic performance seems to be more strongly related to school influences than to socio-economic climate.

Factor III is of lesser weight, accounting for only 7% of the variance. It may be interpreted as *good teaching conditions* as it is related chiefly to good attendance and small classes.

The factor analysis may also be interpreted in terms of the three pencil and paper tests. Factor I, the socio-economic factor, rather surprisingly has somewhat higher correlations with the intelligence than with the attainment tests. The association found by Wiseman and by Thorndike between intelligence test score and the environment is thus repeated, suggesting to environmentalists that environmental influences play a large part in determining measured intelligence, and setting hereditarians hunting for excuses. We were unable, of course, to find separately reared identical twins in our population in order to gain any real insight into this problem.

TABLE 6.7

ROTATED FACTOR ANALYSIS - LONDON

	I	II	III
Good socio-economic level	.64	-.07	.16
Good morale	.61	-.08	-.26
Keen interest	.41	-.48	-.09
New school buildings	.02	.84	-.05
County school	-.15	.82	.04
Large size school	.33	.62	.37
Large size playground	-.25	.39	-.03
Taller children	.10	.17	.17
Happy school atmosphere	.10	.17	-.07
Small size class	-.08	.13	-.02
Progressiveness	.05	.12	.52
Male head-teacher	.12	.04	.91
Rote attainment	.85	.07	.03
Comprehension attainment	.90	.11	.09
Intelligence	.83	-.14	.11
Percentage variance	21.5%	14.4%	8.7%

Factor II, the school atmosphere factor, represents chiefly the association between progressiveness and reading comprehension, although it is also clearly related to a considerable extent to the other tests.

Factor III, teaching conditions, is associated with arithmetic rather than with reading or intelligence test score. A relative superiority in

subjects requiring a knowledge of techniques, such as those required in arithmetical computation, is to be expected in this factor, as it is under good teaching conditions that the professional expertise of the teacher and his ability to impart technical skills comes into full play.

The fifteen major variables studied by Kemp (1955) were factored for purposes of the present study. In the first factor, *socio-economic level* is linked with good morale and with good all-round academic performance as in the Salford sample, but the other two factors which resemble (II) our *teaching conditions* (correlation with school buildings = ·84) and (III) *progressiveness* (correlation with progressiveness = ·52) bear very little relationship either to attainment or

TABLE 6.8

ROTATED FACTOR ANALYSIS - U.S.A.

	I	II	III
Small size class	.07	.97	-.02
Small pupil teacher ratio	.09	.18	-.06
Percentage fathers professional	.14	-.09	.98
Vocabulary	.88	.13	.16
Sentences	.90	.10	.11
Arithmetical computation	.47	.07	.07
Arithmetical reasoning	.40	.07	.05
English achievement	.36	.08	.08
Percentage variance	12.7%	26.9%	12.7%

intelligence test score. (It is interesting that the progressive headteachers appear to be chiefly men, since male sex has a loading of ·91 in this factor.)

The American data studied by Mollenkopf included eight variables which were roughly comparable to those obtained in the Salford schools and for which the data required for factor analysis were available. These were factor analysed. The first factor is a *scholastic* factor, loading highly on all five tests; the second factor represents *teaching conditions*, with a correlation of ·97 with small size of class, and the third factor is *socio-economic status* with a correlation of ·98 with 'high percentage of fathers in professional class'. But unfortunately there is no link-up whatsoever between the school

environment and the scholastic factors, except a tenuous relationship in the first and third factors between socio-economic class and good vocabulary.

The three factor analyses thus appear to agree in differentiating between *socio-economic* and *teaching* conditions, and the analyses for Salford and London both add a third factor of *progressiveness*. They differ, however, in that at Salford test performance appears to be related to both socio-economic and teaching factors, whereas in London it is associated only with the former.

Conclusions

Some of the hypotheses put forward concerning the relationship between attainment and the school environment were confirmed, and others were refuted by the findings of the research.

Table 6.1 shows the inter-correlations between the test variables. Brightness and backwardness fall into two distinct groups with the positive and negative signs in the expected directions. Correlations are lower, however, between the brightness variables than between the dullness variables. This is largely due to restrictions in range, the standard deviations for backwardness being roughly twice as large as those for brightness. Table 6.9 summarizes the correlation data, presenting mean correlations with signs ignored.

TABLE 6.9

MEAN CORRELATIONS FOR ATTAINMENT (IGNORING SIGNS)

	Reading	Arithmetic	Intelligence
Progressiveness	.31	.18	.33
% Attendance	.27	.34	.26
Small Size Class	.08	.13	.16
Large Size School	.18	.10	.30
Good School Neighbourhood	.28	.25	.34
Good School Building	.18	.20	.34
New Buildings	.11	.01	.16
J-Index	.02	.05	.06
Overall Mean	.18	.16	.24

Progressive methods of education, good social background and

good teaching conditions are shown—both in the correlation table and in the factor analysis—to facilitate attainment, as hypothesized. But as in the research described in the previous chapter of the present volume, the most surprising single finding is that the correlation coefficients are higher for intelligence than they are for either reading or arithmetic, in precise contradiction to theoretical expectations. Burt (1955) and Freeman, Holzinger and Newman (1937) have shown in a series of genetic studies that in Britain and the U.S.A. the variance in intelligence test score due to hereditary influences is greater than that due to the environment in the proportion of about three to one, and that in scholastic attainment, hereditary and environmental factors are roughly of equal weight. The results of these researches are most compelling, since they are based on the performance of identical twins reared apart. The most logical method of investigating the relative effects of environment and heredity (or the relative effects of anything else) is to keep each factor constant in turn and to compare the results, obtained in the present instance, by taking measurements, first for children of identical heredity brought up in different environments and secondly for children of different heredity brought up in the same environment. These investigations are the only ones to approach the problem by the fundamental scientific method of isolating and controlling the major factors and to measure their separate and conjoint effects. Thus one would expect that in the present research the environmental variables would be more closely related to scholastic attainment than to intelligence, even allowing for the fact that intelligence tests are by no means entirely measures of innate capacity. Yet the mean correlations are higher (+·24) for the intelligence test than for reading (+·18) or arithmetic (+·16). Moreover, according to the factor analysis the intelligence test is the most highly loaded variable on the socio-economic factor.

The same trend is clearly shown by the partial correlations (Table 6.10). One would have expected a fairly high degree of correlation to remain between the environment and attainment, even when intelligence is partialled out, since attainment can obviously be influenced by good teaching, opportunity, an educated home, and so on. On the other hand, one would have thought that considerably less relationship would have been shown between the school environment and the intelligence test after differences in attainment, particularly in reading, had been taken into account by partial correlations,

TABLE 6.10

PARTIAL CORRELATIONS WITH INTELLIGENCE TEST SCORE

	READING HELD CONSTANT		ARITHMETIC HELD CONSTANT	
	Backwardness	Brightness	Backwardness	Brightness
Progressiveness	+.06	+.31	−.24	+.32
% Attendance	−.07	+.25	−.17	+.16
Small Size Class	−.09	+.17	−.06	+.16
Large Size School	+.03	+.50	−.05	+.51
Good School Neighbourhood	−.47	+.24	−.49	+.22
Good School Buildings	−.27	+.32	−.29	+.31

since, in theory, there can be no association between *innate* capacity and the external environment. Yet the opposite result is found. The mean partial correlation for the environmental variables (with intelligence held constant) is only +·13, but with attainment held constant it is +·24. Again, in theory, the environmental variables should show higher multiple correlations with attainment than with intelligence. In fact, the opposite is true whether multiple regression weights or unit weights are used. And significant differences between mean scores, as shown by the analysis of variance tables, are found no less frequently for intelligence than for attainment. Of the 10 significant variance analyses in Table A.9, 2 are with reading, 4 with arithmetic and 4 with intelligence.

On every count, these findings give more weight to the environmentalist than to the genetic viewpoint of the nature of ability required in intelligence tests. It is possible, as Wiseman points out, that the higher correlations with intelligence may be caused, in part at least, by the nature of our sample and its exclusion of selective schools. If selection is made at 11+ with a significantly greater weight on attainment than on intelligence, then this would tend to produce a greater dispersion of intelligence in the rejected population, and hence an artificially higher correlation coefficient. Nevertheless, the evidence from this investigation suggests that the ability to do well in the intelligence test is simply another form of attainment on a similar footing to reading and arithmetic. No doubt the ability to do well in these tests depends partly on innate and partly on acquired capacity, but they do not appear to differ markedly in these respects

from the attainment tests. Sociological evidence of this sort is very weak compared with the powerful methods of analysis based on separately reared identical twins in which the basic influences are under proper scientific control. But it gives rise to doubt whether the results of earlier investigations would be repeated if the researches were carried out again. No doubt in more recent times practice, coaching, habituation in the home and school, and social attitudes to education have played a part in decreasing the role of innate capacity. Even so, it remains surprising that tests expressly designed to be non-teachable as distinct from reading and arithmetic, which are essentially teachable, should give these results.

Moreover, in any comparative study between different groups of persons, the relative importance of heredity and environment varies with the magnitude of the differences between the environments studied, the more heterogeneous the environments the greater their relative effect compared with hereditary factors, e.g. common hereditary factors count for little in the learning development of identical twins, if one of them is caught by bandits and spends his days buried up to the neck in sand. Conversely, the more homogeneous the environments, the greater the opportunity for hereditary differences to reveal themselves. But Salford is a far more homogeneous community than the range of society in Britain and the U.S.A. included in earlier researches, and one would consequently have expected intelligence test scores in this city to be related less (not more) to environmental differences than in the very wide geographical areas investigated by other workers.[1]

The third hypothesis put forward was that reading, since it partly depends on the child's cultural background, will be more highly correlated than arithmetic with socio-economic factors or with good school neighbourhood. This is true for backwardness, good school neighbourhood correlating —·33 with reading but only —·18 with arithmetic. Similarly in the factor analysis the loadings on the socio-economic factor are —·40 for reading backwardness but only —·28 for backwardness in arithmetic. On the other hand, the figures for brightness, although of similar size, are in the opposite direction, i.e. schools in the 'better' social areas are particularly characterized by

[1] But see Chapter VIII for a fuller discussion of this point, and for an explanation which demonstrates that these results—and those of Kemp and Mollenkopf—do not necessarily conflict with those of Burt, Fraser, and Freeman, Holzinger and Newman.—*S. W.*

having more brighter children in arithmetic and fewer poor readers (rather than having both brighter children in reading and fewer poor readers, as hypothesized). Thus the emphasis in the 'better' social homes appears to be on the avoidance of bad reading rather than the acquisition of outstanding reading ability, their particular advantage at the top end of the scale lying in arithmetic rather than reading.

The fourth hypothesis was that mechanical arithmetic, since it is largely a matter of learning basic operations, will be particularly influenced by professional teaching, and that consequently it will correlate more highly than reading with teaching conditions, viz. with small size of class, high percentage attendance and good school buildings. This may be taken to have been verified. On the whole, the correlations are certainly in the expected direction, and Factor III, which stresses school conditions, with its highest loadings on small size of class and high attendance, is clearly associated with arithmetic rather than with reading.

The final hypothesis was that progressive teachers give more emphasis to reading, with its broader educational implications, than to the relatively narrow subject of mechanical arithmetic, and that consequently progressiveness will be associated with reading rather than with arithmetic. This is verified both by the correlations and the factor analysis, the second factor *progressiveness* loading on all tests, with particularly high loadings on reading.

A finding of some methodological interest was that the subjective estimates of progressiveness, socio-economic status and school buildings, proved more valuable than the objective measures of attendance, school and class size, date of school building and the J-index.

In summary, the main findings are that good attainment is associated with progressive education, small classes, good school accommodation, high attendance and good school neighbourhood. The influence of the size of school is ambiguous and may be subsidiary to other factors. The newness of school buildings proved an unsatisfactory measure and gave negligible results. The juror index gave meaningful results on the factor analysis only.

There appear to be three main factors affecting scholastic attainment and intelligence test score: (i) *socio-economic level*, showing chiefly as good school neighbourhood, high juror index and good school buildings, (ii) *progressiveness*, and (iii) *good teaching conditions*, based mainly on small size of class and good attendance.

In summary, socio-economic level is related to much the same

extent to good performance in all three tests, reading, arithmetic and intelligence. Good teaching conditions lead to relatively high attainment in the classroom techniques of mechanical arithmetic, and progressive methods of education to a relatively high attainment in the broader subject of reading comprehension. Unexpectedly, the social factors appear to have more influence on intelligence test score than on either reading comprehension or mechanical arithmetic.

Comparison with other researches

It was possible to make a fairly close comparison between results for the three different researches in respect of some variables (Table 6.11). There is clearly a considerable measure of agreement

TABLE 6.11

CORRELATIONS BETWEEN SOCIAL AND SCHOLASTIC VARIABLES IN SALFORD, LONDON AND THE U.S.A.

SOCIAL VARIABLE	SALFORD			LONDON			U.S.A.				
	Mech. Arith. (mean)	Rdg. Comp. (mean)	Intelligence (mean)	Rote	Comprehension	Intelligence	Vocabulary	Sentences	English Achievement	Mech. Arith.	Problem Arith.
Socio Economic Status	+.18	+.20	+.34	+.47	+.56	+.52	+.31	+.27	+.20	+.20	+.17
Small Size Class	+.13	+.08	+.16	00	+.12	+.02	+.15	+.17	+.18	+.16	+.14
Large Size School	+.10	+.18	+.30	+.39	+.30	+.18	+.12	+.07	+.01	-.04	-.10
Good Buildings	+.18	+.20	+.34	+.09	-.07	-.05					
Progress-iveness	+.19	+.31	+.33	+.18	+.31	+.33					
Attend-ance	+.34	+.27	+.26				-.08	-.12	+.02	+.14	+.04

between the three researches, all of them showing that high scholastic performance is associated chiefly with socio-economic status. Small size of class, resembling our third factor of *teaching conditions*, is also important in the three investigations. Our second factor of *progressiveness* is confirmed in the London research, but this variable was not included in the American investigation. Large size of school (but not newness of buildings) is also associated with good performance in London as well as Salford. Mollenkopf describes his Vocabulary, Sentence Completion, Arithmetic Reasoning and Arithmetic

Computation as academic aptitude, i.e. intelligence tests, and his English as an achievement (attainment) test. Bearing this classification in mind, the general comparisons as shown in Table 6.12 can be made.

TABLE 6.12

MEAN CORRELATIONS (IRRESPECTIVE OF SIGN)

Sample	Intelligence	Attainment	English	Arithmetic	Comprehension	Rote
Salford	·24	·17	·18	·16	·18	·16
London	·20	·17	—	—	·18	·15
U.S.A.	·22	·14	·18	·15	·18	·14

Although it is by no means possible to make a strict comparison between the findings of the three investigations in respect of either the school environment or the scholastic measures, the mean correlations are very similar. In all the researches, the coefficients are higher (i) for intelligence than for attainment, (ii) for English than for arithmetic, and (iii) for comprehension than for rote learning. The superiority of English and tests requiring comprehension is to be expected, since these abilities seem more likely to be related to the general social background than arithmetical and rote learning are. It is highly interesting to note that the unexpectedly high correlations between intelligence test and the social variables in the present investigation were also found both in the London and in the American samples.

Our results differ from those of Kemp in (i) that progressiveness and small classes are associated with higher attainment, a finding of very considerable, even maximal importance, in educational administration, and (ii) that the size of school is not so important. On the whole, however, there is general agreement between the results for the three researches.

Future research

The next step in research ought to be to define these factors more clearly. On the socio-economic side, the ratings for school neighbourhood and school buildings are satisfactory, with the juror index based on the addresses of individual children attending the school. Perhaps the mean height of the pupils could also be included. The school factor is more complicated. To progressiveness, attendance, size of class and size of school (using perhaps a correlation ratio instead of

product moment correlations for variables that show U-shaped distributions) other measures such as the number of staff changes per annum, the teaching experience of the staff, the staff–pupil ratio and the existence of a parent-teacher organization might be added. If the two main factors which influence the scholastic attainment of schools can be reliably separated, it will help to clarify many problems in which they have previously been confused. The distinction between (i) the purely educational factors such as the quality and efficiency of the teaching, and (ii) the social milieu, including the provision of light and space, is well known. That you can have good teaching in a poor building has long been the boast of some education authorities, but you can also have good teaching in a good building (and for that matter good teaching no doubt takes place in a leper colony), and the further statistical investigation of the part played by these factors in determining scholastic performances seems well worth pursuing.

The findings also suggest that in designing educational experiments involving a large number of schools an attempt should be made to control or balance the major factors in the school environment. For example, investigations into the efficiency of different teaching methods, such as the use of teaching machines, might result in misleading findings, if the various methods are not systematically allocated to schools varying in respect of (i) the school neighbourhood, (ii) teaching methods and (iii) teaching conditions. Similar considerations also apply to test standardization and the drawing up of norms. It seems likely that we have, at least, gained some insight into the nature of the main environmental factors, both within and outside the school, which influence scholastic attainment.

CHAPTER VII

THE 1957 SURVEY

THE interesting nature of the results from the 1951 survey and, in particular, the questions posed by the factor analysis of the Manchester data, led us to consider a second experiment. If this were done, we could hope to remedy some of the deficiencies of the earlier work, and to examine more thoroughly some of the tentative hypotheses thrown up by this. The trend of our thinking gained strong impetus from the expressed desire of the Manchester Education Authority to have a repeat testing. The two national surveys on reading ability (Ministry of Education, 1950 and 1957) had shown clear gains from 1948 to 1956. Not only had the average improved—by about nine months of reading age at 11, five months at 15—but the number of good readers in the primary schools had doubled, and the proportion of pupils classed as illiterate and semi-literate had shrunk from 5% to 1% (6% to 4% at 15). It seemed as if the handicaps of the war years were being overcome, and a significant improvement in educational standards was being witnessed. Since we had such soundly based norms for our own area for 1951, it was natural that the Manchester L.E.A. should be interested in seeing how their own school system was improving in the basic skills of reading and arithmetic. The publication of *Standards of Reading 1948–1956* (Ministry of Education, 1957) thus provided the final stimulus to action, and we carried out our second survey in 1957.

This was much more restricted in scope than the 1951 survey. Only the Manchester Authority was involved, and this time only a sample of schools was tested: provided that such a sample is randomly drawn its results can reflect the population with considerable fidelity. In 1957 there were 102 secondary schools of all types within the Authority. A one-fifth sample of 20 schools, stratified by type, was calculated to be adequate for our purposes. This would yield a total tested population of about 1,500 children of 14+. Each school was given a serial number, and schools selected within each stratum (type) by using tables of random numbers. Table 7.1 shows the total

TABLE 7.1

1957 SURVEY : 20% SAMPLE OF SCHOOLS

School Type	Total number		No. in Sample
	1951	1957	
Grammar	8	9	2
Secondary Technical (County)		10	2
Secondary Technical (Voluntary)		3	1
Selective Central	10	2	0
Modern (County)	26	39	8
Modern (Voluntary)	0	7	1
All-age (County)	30	8	1
All-age (Voluntary)	73	24	5
Total		102	20

number of schools, together with the numbers in the sample. It will be seen that the sample contained 2 grammar schools (representing 9), 3 secondary technical (representing 13), 9 modern (46) and 6 all-age (32). The numbers of schools in the various categories in 1951 are also shown in the table. Notice how vigorous had been the re-organization over a period of only six years: 103 all-age schools reduced to 32; 46 modern in place of 26 six years earlier. The virtual disappearance of the selective central school is explained by a change of policy, whereby most of these schools were converted to secondary technical schools.

TABLE 7.2

MEAN RAW SCORES AND S.D.s BY TYPE OF SCHOOL

School type	N	Intelligence		Reading		Arithmetic	
		M	σ	M	σ	M	σ
Grammar	270	61.19	12.195	48.48	5.940	46.53	7.527
Technical	252	47.02	12.605	44.76	6.392	40.31	9.981
Secondary Modern	770	21.97	16.825	30.20	10.476	28.76	14.019
All-age C.E.	60	18.52	14.468	24.64	11.963	21.76	13.085
All-age R.C.	77	18.38	17.978	25.47	12.864	19.62	12.600
All-age County	60	20.34	13.925	28.60	9.080	26.65	12.495
Total	1,489	32.93	22.490	35.45	12.597	33.10	14.762

The children tested were, as before, all those, present on the day of the testing, aged 14 but not yet 15. The schools were not asked to mark the scripts this time: with the smaller numbers involved it was possible to do this centrally, with adequate checks on accuracy. No information was sought on attendance, nor were twins identified. The numbers of twins expected in a sample of this size was less than 20.

Table 7.2 gives the numbers of children tested in each type of school, together with the mean and standard deviation of raw scores. The first point of interest is the comparison between these results and those obtained from the 1951 survey. This comparison is made in Table 7.3. Since the numbers in the all-age sub-categories are so

TABLE 7.3

COMPARISON OF 1951 AND 1957 MEAN SCORES

School Type	RAW SCORES						STANDARD SCORES					
	Int.		Read.		Arith.		Int.		Read.		Arith.	
	'51	'57	'51	'57	'51	'57	'51	'57	'51	'57	'51	'57
Grammar	62.50	61.19	46.90	48.48	44.36	46.53	119	118	117	119	114	116
Technical and Central	46.52	47.02	41.48	44.76	38.65	40.31	110	110	109	114	108	109
Modern	22.19	21.97	27.20	30.20	22.33	28.76	96	96	94	97	95	99
All-age	21.95	19.02	27.68	26.84	22.55	22.89	96	94	94	93	95	95
Total	32.20	32.93	32.39	35.45	28.39	33.10	102	103	99	102	99	103

small in 1957, these have been amalgamated. And since re-organization had merged technical and selective central schools, these categories are combined for the 1951 data. It will be seen that the differences in intelligence are small, as might be expected. Only that for all-age schools is significant, with a drop from 1951 of 2·93 points of raw score. With reading and arithmetic, however, all but one of the differences (all-age, reading) shows an increase from 1951 to 1957, and all differences are significant at the 1% level with the exception of all-age schools (reading and arithmetic). Improvements range from 1 to 5 points of standard score.

Calibration of reading test

The two national reading surveys carried out by the Ministry of Education in 1948 and 1956 used the Watts–Vernon test. With the completion of the second survey this test was made available to us so

that we could carry out a comparison with the Manchester Reading Comprehension Test, and so calibrate our test in terms of levels of reading ability in the country as a whole.[1]

The 1948 national survey made some comparison of the Watts–Vernon test with other tests (e.g. Schonell's Silent Reading Test, Vernon's Graded Word Reading Test) which had been standardized before the war. This permitted a tentative calibration of Watts–Vernon in terms of pre-war reading ages. This calibration was approximate, since the norms for the pre-war tests had been derived, for the most part, from local rather than national samples. Nevertheless some comparison was made possible between reading ability in 1948 and pre-war standards, and this suggested that there had been a fall of about $1\frac{3}{4}$ years of reading age in the 15-year-old sample, and one of about 1 year in the 11-year-old sample.

The Ministry provided us with the Watts–Vernon scores of those 14-year-old children in the Manchester area who were included in the Ministry's 1956 sample. We tested these children with the Manchester test. This, however, did not give us a large enough sample, so we selected other schools in the area and administered both tests to the 14-year-old classes. The total number of children used in the calibration was 467, distributed over 13 schools. There were grammar, technical, secondary modern and all-age schools in the sample, giving a very full range of reading ability. The calibration was done by equating percentile levels on the two tests and graphing the points so obtained. From the graph the Manchester Reading Test score corresponding to any particular Watts–Vernon score can be read off immediately.

In addition to the two categories of illiteracy and semi-literacy in terms of reading age (below 7 years; 7 to 9 years) both the Ministry pamphlets distinguish four further categories for 15-year-old pupils; 9 to 12 years, 12 to 13·7 years, 13·8 to 17 years and above 17 years. This gives a useful (even if arbitrary) broad classification of reading ability. The categories are given in Table 7.4. For the purpose of comparing the results of our two surveys with the national results, these broad categories have been used. First, the Manchester Test scores corresponding to the Watts–Vernon boundary scores of 2·5,

[1] We are grateful to the Ministry for their help in this, and in particular to Mr G. F. Peaker, C.B.E., H.M.I., a member of our Research Committee and the person mainly responsible for the highly competent sampling design used in the Ministry's surveys.

8·5, 17·5, 22·5 and 30·5 were read off from the calibration graph. They were 1·5, 10·8, 25·7, 35·2 and 52·2. The numbers of children falling between these limits in the two Manchester testings were then calculated.

Three national surveys are reported in *Standards of Reading, 1948–1956*, surveys carried out in 1948, 1952 and 1956. Our own testings were done in 1951 and 1957, so that with significant temporal change in standards a direct year-to-year comparison cannot be made. Moreover, our surveys omitted children in direct grant schools although these were included in the Ministry's surveys. (Both excluded private schools and special schools.) This will affect our own figures, more particularly at the upper end of the ability range. Another difference

TABLE 7.4

CATEGORIES OF READING ABILITY
(from Ministry of Education, 1950 and 1957)

Class	Description	Reading Age	Watts-Vernon Score-range
A	Superior	17+	31 - 35
B	Average +	13.8+	23 - 30
C	Average -	12+	18 - 22
D	Backward	9+	9 - 17
E	Semi-literate	7+	3 - 8
F	Illiterate	Below 7	0 - 2

lay in the ages of the children. Our age-group ranged from 14.0 to 14.11: the Ministry samples were drawn from 'a three month age-range, centred on 15'. Average ages, then, differ by six or seven months. The total effect of these differences will be to tend to reduce the number of our children in categories A and B, and to increase those in D, E and F. Table 7.5 shows the proportions in each of the broad categories in the three national surveys and in our own two surveys.

Apart from the superior readers of category A, the Manchester figures compare well with the national averages. There seems little doubt that the absence of direct grant schools from our tested samples accounts for part—and probably the major part—of the category A deficiency. The most impressive thing about Table 7.5 is the improvement in the figures for the City of Manchester between 1951 and 1957.

TABLE 7.5

READING ABILITY - COMPARISON OF NATIONAL AND MANCHESTER SURVEYS

Reading Category	National Surveys			Manchester Surveys		
				Greater Manchester	City of Manchester	
	1948	1952	1956	1951	1951	1957
A Superior	9	9	9	3.9	3.1	7.7
B Average +	34	39	43	39.8	38.6	45.0
C Average -	27	22	23	25.9	26.9	21.2
D Backward	24	25	21	26.2	27.1	23.6
E Semi-literate	5	4	4	4.0	4.1	2.4.
F Illiterate	1	1	0	0.2	0.1	0.1

The progress in the re-organization of secondary schools, already noted, has been paralleled by a major improvement in the standards of reading. Notice that in 1951 41·7% of 14-year-olds were in the two top categories of reading ability: six years later this has risen to 52·7%. At the other end of the scale, the proportions of illiterates and semi-literates have been nearly halved. Unfortunately we have no national figures for arithmetical ability to put beside these cheering results for reading. Notice, however (Table 7.3), that in terms of standardized score, the improvement in arithmetic from 1951 to 1957 is rather greater than that for reading.

Distribution of backwardness and brightness

We repeated our 1951 procedure, and found the number of children scoring below a standard score of 85 in each of the three tests. From

TABLE 7.6

DISTRIBUTION OF 'BACKWARDNESS' BY TYPE OF SCHOOL

(percentages)

Type of School	N	Intelligence	Reading	Arithmetic
Grammar	270	0	0	0
Technical	252	0	0	0
Modern	770	19.6	14.2	11.2
All-age	197	24.7	27.9	21.8

this the percentage of backward children in each school type was calculated. These are shown in Table 7.6. This table may be compared with Table 3.8 which gives the 1951 results. With small numbers of schools in the various categories, no ranges of percentages are given. Although these followed the expected pattern of significant differences among schools, the variation was not as great as in 1951. The highest percentage of backwardness in any one school was 40%, as compared with 75% in the earlier survey.

The figures for brightness (> 115 standard score) are given in Table 7.7. Comparison may be made with Table 3.6. Notice the

TABLE 7.7

DISTRIBUTION OF 'BRIGHTNESS' BY TYPE OF SCHOOL

(percentages)

Type of School	Intelligence	Reading	Arithmetic
Grammar	65.2	71.9	58.9
Technical	31.6	39.7	29.8
Modern	9.6	6.1	12.9
All-age	1.6	4.1	3.0

increases for grammar schools, secondary technical schools and secondary modern schools in reading and arithmetic. The 'overlap' between selective and non-selective schools, commented on in Chapter III, is still evident, but it has been reduced somewhat since 1951.

We took care, in 1957, that the home address of each of the 1,489 children tested was recorded. Thus each child could be allocated to a particular ward with complete objectivity (even though this meant some intensive geographical research in the case of some addresses in long streets passing through two, or even three, wards). This avoided the gross approximations involved in allocating individual schools to wards, and also permitted us to use the results of all the children, instead of omitting those attending selective schools. Our measure of 'brightness' was therefore a much sounder one in 1957.

We were strengthened in our belief in the value of using the two tails of the attainment distributions as our variables by some of the results of the researches available to us in 1957 but not known in

1951—particularly those of Maxwell (1953) and Fraser (1955)—but we decided to use average score as well, since so many other enquiries used this as a variable. It was conceivable, too, that the analysis might reinforce the 1951 suggestion that brightness and backwardness differed in certain important respects in their relationship with social factors. The presence of *average score* as a variable would then provide a norm from which we could judge which of the two other variables was atypical in this respect. This gave us three measures for each of the three tests—nine educational variables in all.

Although 1,489 children had completed the tests, all these results were not usable for the social factors analysis. It was found that 111 of the tested children were 'extra-territorial', living outside the Manchester boundary. This reduced the total number to 1,378. Another factor reduced the number still further. It will be remembered that the random sample of schools was stratified by school type, but, unfortunately, not by geographical location. This did not matter for the selective schools, since they are not restricted in their catchment area, but each of the 9 modern and 6 all-age schools served its own neighbourhood only, so that the extent to which they provided an adequate coverage of the city as a whole was a matter of pure chance. Fig. 13 shows the locations of the schools used, together with the numbers of children living in the various wards. It will be seen that some wards housed a very small number of the tested sample, and it was decided to omit seven of these wards from the analysis. These form a band running S.W.–N.E. across the city, just north of centre: *St George's*, *St Peter's*, *New Cross*, *Beswick*, *Miles Platting*, *Newton Heath* and *Lightbowne*. In the 1951 survey, wards with too few schools were combined to form larger units. This seemed a legitimate and sensible process when the school was the unit, each with a large and somewhat indeterminate catchment area. But when we are working with the precise location of the homes of the tested children, to combine wards is merely to blur whatever precision our data have: the omission of under-represented wards seems preferable. We made one exception to this rule, by combining *Moss Side East* and *Moss Side West*, partly because the fusion appears to give a viable social unit, and partly because we were reluctant to omit this area from our social analysis, containing as it does the densest population in the city and being among the 'blackest' for environmental factors in general. The omission of seven wards, and the fusion of two others, left us with 30 wards as the basis of our analysis, containing within

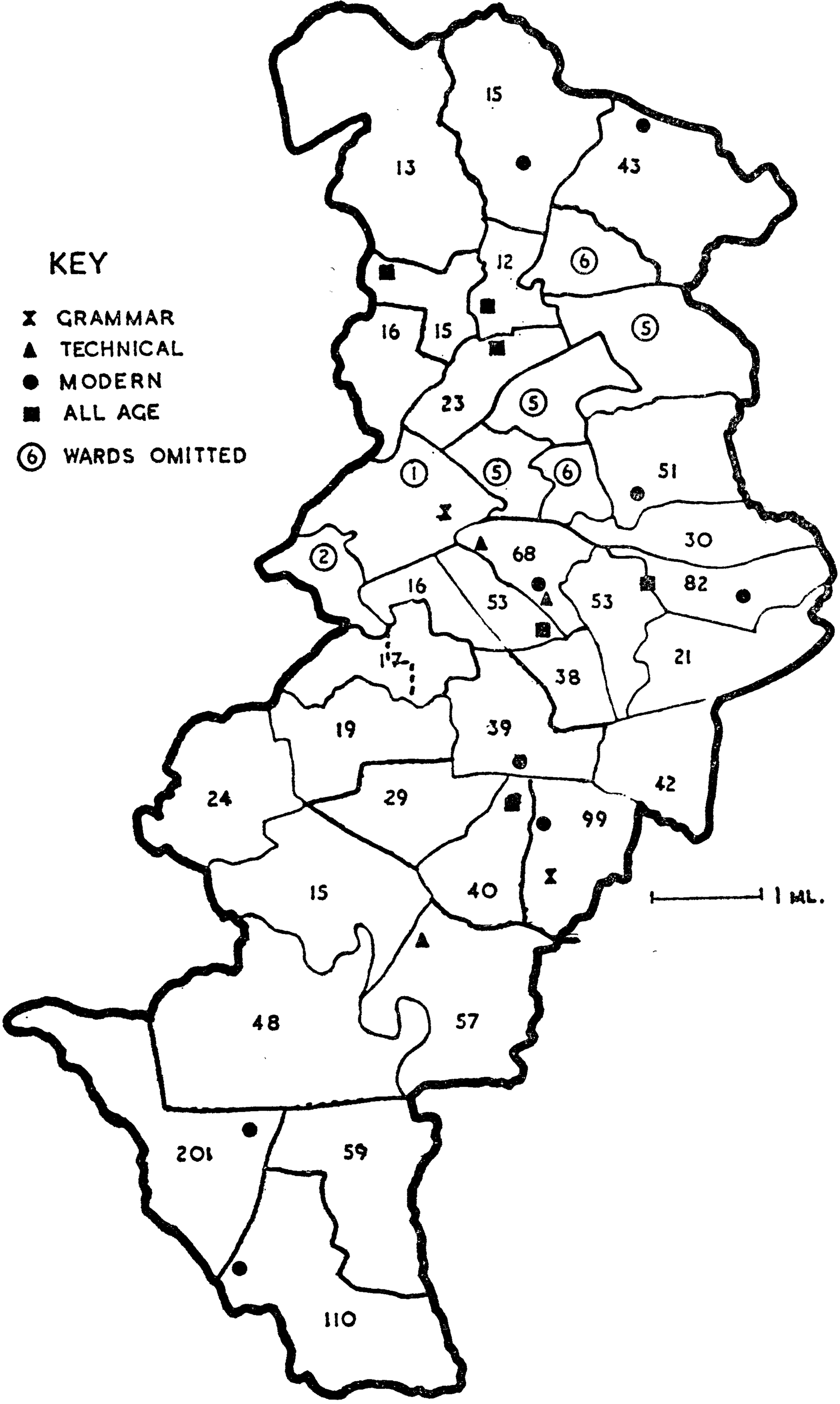

Fig. 13. 1957 Survey: location of schools and number of children in each ward

them 1,348 children out of the total tested sample of 1,489. It will be remembered that the 1951 analysis was based on 26 ward-units, so our correlations in 1957 are rather more stable than those of the first survey.

It will be noticed that the ward boundaries in Fig. 13 are not exactly the same as those in Fig. 6. In the period between the two surveys there had been a revision of ward boundaries. This involved only the southern extremity of the city, where *Northenden* lost its south-western corner, and the large *Wythenshawe* ward was split into three: *Baguley*, *Benchill* and *Woodhouse Park*. At the same time the north-central ward of *Newtown* was re-named *Hugh Oldham*.

Social factors

The results of the 1951 factor analysis led us to seek new variables in the environmental field, and particularly those which were likely to have some connection with the tentative 'maternal care' factor. One of the obvious gaps in the first survey was the absence of any data on juvenile delinquency. Through the kindness of the Children's Officer we were able to get the figures for those *on probation*, *children* and *young persons* separately.[1] We also sought variables connected with cleanliness, and through the co-operation of the housing and health departments of the Corporation we secured ward rates for *scabies*, *verminous conditions* and the issue of *cleansing notices*. Rates for *immunization*, both *diphtheria* and *whooping cough*, were also used. We investigated the provision of free (or partial-cost) shoes and clothing under the Education (Miscellaneous Provisions) Act, 1948, Section 5. Shoes and clothing are provided (*a*) free, (*b*) at one-third cost or (*c*) at two-thirds cost, according to the net income of the household. For example, with three children, a net income of £5 10*s*. 0*d*. or under qualifies for free shoes and clothing, £5 11*s*. 0*d*.–£6 5*s*. 0*d*. one-third cost, £6 6*s*. 0*d*.–£7 0*s*. 0*d*. two-thirds cost. Those who apply for free clothing and who are in receipt of National Assistance are required to pay the full cost of the clothing. They still make a saving, however, because the cost charged is lower than would have to be paid retail. Here we have a variable which is clearly related to economic level, and probably also to parental care, and it merited inclusion in our analysis. We found that, in the period under review, 373 families received free clothing, 53 paid one-third cost,

[1] 'Children' were those under 14 years of age on the date of hearing; 'young persons' 14–16.

8 two-thirds and 364 paid full cost (i.e. N.A.B. cases). We judged that both *clothing* (*free*) and *clothing* (*full-cost*) were worth including in our list of variables, with *clothing* (*total*) as a combination of these should there prove to be no significant difference between them. Two further variables were provided by the co-operation of the N.S.P.C.C. who very kindly gave us access to their statistics, from which we obtained the ward-rates for *cruelty and neglect* and for *advice sought*.

Thus we had twelve new variables to add to those used in 1951. Two of the previous ones were dropped (infectious diseases and tuberculosis rate) in view of their apparent low level of relevance to the factors involving educational attainment. This finally gave us 20 social variables to put with the 9 educational measures:

J-index
Persons per acre
Death-rate
Deaths under one year
Birth-rate
Illegitimate births
Committals to care
Mental Deficiency
Verminous conditions
Scabies
Cleansing notices
Immunization: Diphtheria
Immunization: Whooping Cough
Free shoes and clothing
Shoes and clothing (full-cost)
Shoes and clothing (total)
Cruelty and neglect
N.S.P.C.C. advice sought
Probation: under 14
Probation: 14–16

Many of the distributions of these variables over the 30 wards showed marked asymmetry, so it was decided to re-scale them all to normal distributions. This was done by converting the ranked data to a sigma scale ranging from +5 to −5.

The variation in intensity of these variables over the wards of the city gives us much the same sort of picture as was obtained in 1951, and illustrated in the maps of Chapter V. Wards such as Moss Side, All Saints, St Luke's and Hugh Oldham which were 'black' on the 1951 variables are equally so in 1957 on the new factors. Didsbury, Burnage, Barlow Moor and Withington are still predominantly white, and the northern wards (e.g. Crumpsall, Blackley, Moston) show the same intermediate pattern, good on some factors, poor on others. The 1951 survey merged together the two very large wards of Northenden and Wythenshawe, and this southern region showed some interesting divergencies from the expected pattern in this first survey. It was 'white' for *Death-rate*, *Persons per Acre*, *Illegitimate Children*, *Mental Deficiency* and *J-index*; 'black' for *T.B. rate*, *Birth-rate*, *Infantile Mortality* and *Neglected Children*. This area is a special one from many points of view. It consists, very largely, of the vast

Wythenshawe estate, a project of municipal housing which has been developed over the past thirty years and which was, and is, famous throughout Europe as an early, and fine, example of civic enterprise. From a social point of view it is enormously interesting, since it contains within it hundreds of re-housed families from slum clearance areas. This process has been going on for so long that within this enormous estate, big enough to be a town in its own right, are families which are old inhabitants, having been settled there for more than a generation, cheek by jowl with those newly arrived from the black central areas. It was unfortunate that our earlier survey had to

TABLE 7.8

WYTHENSHAWE WARDS - SOCIAL FACTORS

Reading Category	J-index	Persons per acre	Death-rate	Birth-rate	Illegitimate births	Deaths under 1 year	M. D. rate	Committals to care	Cruelty and neglect	N.S.P.C.C.Advice sought	Probation <14	Probation 14-16	Verminous conditions	Scabies	Cleansing notices	Free shoes and clothing	Shoes & clothing (full cost)	Shoes & clothing (total)	Immunisation Diphtheria	Immunisation Whooping Cough
Baguley	+4	-3	-5	+1	-1	-3	-2	0	0	0	+1	+5	+1	-1	0	-4	+1	0	+4	+2
Benchill	+3	-1	-3	+2	+1	-1	0	+2	+3	+5	+5	+4	0	-1	+1	+3	+5	+5	+5	+2
Woodhouse Park	+5	-2	-4	+3	0	0	-1	+2	+3	+3	+2	+1	+1	-3	+1	+5	+2	+3	+3	+3
Moss Side (E. & W.)	-1	+5	+1	+2	+5	+1	+2	+5	+3	+1	+1	+1	+3	+3	+3	+1	+3	+2	+1	+1
Didsbury	+3	-3	-3	-1	-3	-4	-4	-3	-5	-4	-4	-3	-5	-3	-3	-3	-3	-3	+1	+4

amalgamate Wythenshawe and Northenden, since this area would obviously repay very close study.[1] But even this crude approach did not succeed in hiding the interesting contrasts in the social characteristics of the district. Our 1957 analysis not only separates Northenden from Wythenshawe, but also breaks down the latter into the three new wards of Baguley, Benchill and Woodhouse Park. The sigma scores for the social variables for these three wards are interesting enough to be abstracted from the main mass of data, and they are given in Table 7.8, together with comparable figures for a typical

[1] I am glad to say that one of my research students, Miss Marjorie Allen, is at present engaged on an intensive study of Wythenshawe, on a family rather than an area basis. Her investigation ought to prove a valuable supplement to our own work.

'black' ward (*Moss Side*) and a 'white' ward (*Didsbury*). Notice the similarity of the three Wythenshawe wards with Didsbury for *J-index*, *Persons per Acre* and *Death-rate*, and the affinity with Moss Side on the variables *Birth-rate*, *Committals to Care*, *Cruelty and Neglect*, *N.S.P.C.C. Advice Sought* and *Probation* (both measures). Although the physical factors of the Wythenshawe environment are very different from the clearance areas of origin, the measures dependent upon attitude towards social norms, upon child care and family standards, demonstrate a marked similarity to the worst areas of central Manchester. How far this is a function of time and length of residence cannot be answered from our data. But it is possible that the blackest parts of Wythenshawe are not those with the newest families: Carter and Jephcott (1954) found 'black' and 'white' streets in Radby: '. . . although both streets are situated in a working-class area, two different sets of standards are upheld. Dyke St. and Gladstone Rd., in fact, constitute two well-defined sub-cultures, exhibiting in many directions contrasting ways of life' (p. 275).

Correlations

The inter-correlations of the 29 variables in our study are given in Table A.8. Let us look first at the correlations of the 20 social measures with the 9 educational variables. With 28 degrees of freedom, coefficients of ·361 and over are significant at the 5% level, and those of ·463 and above significant at 1%. Out of the 180 correlations of the 9 educational measures with the 20 social variables, 19 are significant at the 1% level, and a further 37 at 5%. These 56 significant coefficients are derived from 13 social variables, as shown in Table 7.9. This table also shows how unevenly they are spread over the 9 educational measures: 26 are with brightness, 20 with average score, and 10 with backwardness; 19 are with intelligence, 21 with reading, and 16 with arithmetic. *Brightness* and *reading* show themselves to be strongly associated with our social variables. Notice, too, how the first six of the 13 social variables are responsible for 43 of the 56 significant correlations, and 16 of the 19 highly significant coefficients. The element of child care among these six variables seems to predict a factor pattern of the kind obtained in 1951.

Factor analysis

A centroid analysis of the 29 variable matrix was performed on the electronic computer, followed by a varimax orthogonal rotation

TABLE 7.9

SIGNIFICANT CORRELATIONS : SOCIAL VARIABLES WITH EDUCATIONAL VARIABLES

(decimal points and plus signs omitted)

Variable	Backwardness			Brightness			Average Score		
	Int.	Read.	Arith.	Int.	Read.	Arith.	Int.	Read.	Arith.
Cruelty and neglect	446	525	400	-556	-590	-506	-506	-529	-476
Birth-rate	400	450		-535	-570	-491	-460	-418	-418
Probation 14-16	361	415		-565	-487	-361	-444		-445
Mental Deficiency		397	372		-429	-500	-423	-400	-418
Cleansing notices				-533	-428	-472	-401	-371	-441
Verminous				-531	-434	-399	-361	-384	-430
N.S.P.C.C.advice				-412	-469		-364		
Committals to care		388		-411	-425				
J-index						-519			-407
Probation < 14					-455		-434		
Diphtheria Imm.					-551				
Illegitimate births				-424					
Shoes and clothing (total)					-417				

(90 rotations). The solution obtained is given in Table A.10 (first six factors). It will be seen that the major part of the educational variance is accounted for by Factor I, with the remainder spread thinly over the remaining five factors. A more illuminating solution was sought by graphical rotation, and the result, after 15 rotations, is given in Table 7.10. It will be seen that the loadings on the educational measures have been reduced to near-zero on Factors IV and V, and that the other four factors exhibit interesting patterns of loadings. Let us consider each one in turn.

Factor I

About two-thirds of the variance of the educational measures is accounted for by this factor, and it covers 26% of the total variance

		%
J-index	—·286	14·2
Cruelty and neglect	·278	27·6
Cleansing notices	·266	39·9
Verminous conditions	·265	52·1
Probation 14–16:	·214	60·1
Probation 14:	·203	67·2
Illegitimate children	·172	72·4
Mental Deficiency	·171	77·4

TABLE 7.10

FACTOR LOADINGS : GRAPHICAL ROTATION

(Decimal points and plus signs omitted)

Variable	I	II	III	IV	V	VI	h^2
1 Backwardness: Intelligence	786	420	098	089	-080	100	828
2 " Reading	680	533	089	000	-012	070	815
3 " Arithmetic	840	267	136	053	-094	181	840
4 Brightness: Intelligence	-755	-304	-479	026	-052	-053	898
5 " Reading	-577	-587	-315	-071	024	118	796
6 " Arithmetic	-694	-416	-337	038	-032	-309	866
7 Average: Intelligence	-871	-369	-176	-109	052	-105	951
8 " Reading	-779	-460	-130	020	-068	000	840
9 " Arithmetic	-838	-347	-304	-028	063	-198	959
10 Persons per acre	118	174	064	173	291	634	565
11 Birth-rate	035	690	493	260	367	066	927
12 Illegitimate Birth-rate	172	274	276	152	569	111	540
13 Deaths under 1 year	007	076	063	073	475	-085	248
14 Death-rate	003	-075	-153	-242	742	107	650
15 Cruelty and neglect	278	474	446	423	455	-173	917
16 N.S.P.C.C. Advice sought	093	448	423	317	440	-286	764
17 M. D. rate	171	460	166	447	446	395	823
18 Probation - young persons	214	300	626	306	083	-269	701
19 Probation - children	203	379	294	588	263	-343	804
20 J-index	-286	-100	-031	-107	-542	-648	818
21 Verminous conditions	265	039	582	437	371	122	754
22 Scabies	027	097	447	178	474	257	532
23 Immunisation: Diphtheria	088	-492	-729	-311	219	162	952
24 " Whooping Cough	221	-550	-472	-023	181	-174	638
25 Shoes and clothing (total)	141	184	204	843	105	-216	864
26 Free shoes and clothing	035	446	-018	710	107	049	718
27 Shoes and Clothing, full cost	143	-048	437	691	131	-221	757
28 Cleansing notices	266	037	614	508	233	206	804
29 Committal to care	088	441	303	474	420	020	696
Variance (tests only)	5.238	1.666	.619	.031	.031	.210	7.794
Percent " "	67.2	21.4	8.0	0.4	0.4	2.7	100.1
Variance (total)	5.814	4.126	3.848	3.640	3.033	1.803	22.267
Percent	26.0	18.5	17.3	16.4	13.7	8.1	100.0

of the 29 variables. Eight of the twenty social variables account for over three-quarters of the 'social' variance. In the list on p. 139 the factor-loading for each of these eight variables is given, together with a (cumulative) percentage of the total 'social' variance.

This has obvious affinities with the first factor of the 1951 analysis (Table 5.3), but the 'social' loadings are all much lower. Notice that the heaviest single educational loading is in intelligence (average score). The average loading (ignoring signs) for the three measures of intelligence is ·804, for reading ·679 and for arithmetic ·788. This may be labelled a general educational-social or *ed-soc* factor.

Factor II

Notice the high loadings on this factor for the three measures of *reading*. Indeed, they account for 53·8% of the total educational variance on this factor, while intelligence contributes 24·3% and arithmetic 21·9%.

When we look at the social variables heavily involved in this factor, we find seven of them responsible for three-quarters of the social variance:

		%
Birth-rate	·690	19·3
Immunization: Whooping Cough	—·550	31·7
Immunization: Diphtheria	—·492	41·5
Cruelty and neglect	·474	50·6
Mental Deficiency	·460	59·2
N.S.P.C.C. advice sought	·448	67·4
Free shoes and clothing	·446	75·5

Note that the three 'dirt' variables (*verminous conditions*, *scabies* and *cleansing notices*) have near-zero loadings on this factor, while *committal to care* and *probation* < 14 have substantial loadings. The addition of these last two would bring the cumulative percentage up to 90. This factor seems to be, without doubt, a factor of lack of *maternal care*, but notice how it is concerned with what might be called the *psychological*, as opposed to the physical, aspect of this.

Factor III

Nearly two-thirds (62·8%) of the total educational variance on this factor is accounted for by the three measures of *brightness*. Less than 6% is produced by *backwardness*.

Eight social variables account for 78% of the total social variance:

		%
Immunization: Diphtheria	—·729	16·4
Probation 14–16	·626	28·6
Cleansing notices	·614	40·3
Verminous conditions	·582	50·8
Birth-rate	·493	58·3
Immunization: Whooping Cough	—·472	65·2
Scabies	·447	71·4
Cruelty and neglect	·446	77·5

This factor, almost as important as Factor II in its contribution to the total variance, seems to be another facet of *maternal care*, supplementing and complementing the second factor. Notice its heavy loadings on the 'dirt' variables, which seems to emphasize the *physical*

aspects of care, as against the psychological aspects of Factor II. It fits in well with Wofinden's (1950) description of children from problem families in Bristol:

> These children are often verminous, suffering from impetigo, ill-clad and ill-shod, dirty and generally neglected, frequently absent from school with consequent prosecution of the parents, but, withal, generally happy. . . . In few cases, if any, was there deliberate cruelty to children.

Factor VI

This contributes only 8·1% of the total variance of the 29 variables. Of the total test variance, *arithmetic* accounts for practically 80%.

Two of the social variables stand out as contributing over half of the social variance:

		%
J-index	—·648	26·4
Persons per acre	·634	51·6

This seems to be a clear *economic* factor.

Factors IV and V

These factors, contributing 16·4% and 13·7% respectively to the total variance, have no significant loadings on the educational variables. Less than 1% of the test variance is covered by both together.

Factor IV is notable for the high loadings in the three variables concerned with the supply of *shoes and clothing*, variable 25 (the *total* of 26 and 27) having a loading of ·843. These three variables contribute 46·9% of the total variance. Factor V, on the other hand, with low loadings on these headings, finds 46·5% of its variance from *Death-rate*, ·742; *Illegitimate Birth-rate*, ·569; *J-index*, —·542 and *Infantile Mortality*, ·475. All these variables have low, or negative, loadings on Factor IV. A tentative interpretation might be to identify IV with *family disorganization* and V with *neighbourhood disorganization*. This reading is somewhat strengthened by noticing the strong loadings on IV for *cleansing notices* (·508) and both *probation* variables (·588 and ·306). On the other hand, the differential in favour of Factor V in *infantile mortality* is difficult to fit in to this interpretation. Indeed, the whole pattern of correlations for *infantile mortality* is perplexing. It is in strong contrast to the results obtained in 1951, when, it will be remembered, it had apparently clear connections with educational attainment. The 1957 factor pattern shows nearly all its

variance concentrated in Factor V, a non-educational factor. Its correlations with the nine educational measures (see Table A.8) are near zero, the highest being —·131 with brightness in arithmetic.

Discussion

The variance of the educational tests has been distributed over four factors. Table 7.11 shows in summary form the factor pattern we

TABLE 7.11

SUMMARY OF FINAL FACTOR PATTERN

VARIABLE		Ed.Soc.	Lack of family care	Lack of home care	Economic
Backwardness:	Intelligence	79			
	Reading	68	58		
	Arithmetic	84			18
Average Score:	Intelligence	-87			
	Reading	-78	-46		
	Arithmetic	-84			-20
Brightness:	Intelligence	-76		-48	
	Reading	-58	-59	-32	
	Arithmetic	-69		-34	-31
Probation <14		20	38		
Mental Deficiency		17	46		
Shoes and clothing: free			45		
Committals to care			44		
N.S.P.C.C. advice sought			45	42	
Birth-rate			69	49	
Immunisation: diptheria			-49	-73	
Immunisation: whooping cough		22	-55	-47	
Cruelty and neglect		28	47	45	
Probation 14-16		21		63	
Verminous conditions		27		58	
Cleansing notices		27		61	
Scabies				45	
Shoes and clothing: full cost				44	
J-index		-29			-65
Persons per acre					63

have arrived at. About two-thirds of this variance is accounted for by the general *ed-soc* factor I. Poor educational attainment, with low average scores, low percentages of bright children and high percentages of backward children, are found in association with a low economic level, with a high rate of prosecutions for cruelty to and neglect of children, with dirty living conditions, with many children

and young persons on probation, with many illegitimate children and with mental deficiency rates above average.

The second factor II differentiates ability in *reading* from the other tests. This is associated with a low birth-rate, high rates of immunization injections, little cruelty and neglect of children, and a low rate of mental deficiency. Factor III, differentiating the three measures of brightness from the other educational measures, is strongly associated with a high incidence of dirty children and dirty houses. It has obvious affinities with II—the immunization variables both have strong loadings in both factors, and so does the incidence of cruelty and neglect. Both factors seem to be associated with parental care (although it is obvious that, given the 20 social variables selected for the analysis, a complex justifying such a name is bound to appear somewhere among the factors) and the suggested basis of differentiation—the 'psychological' aspects of this covered by II and the 'physical' aspects by III—seems to be justified. Convenient labels might be *lack of family care* for II and *lack of home care* for III. A closer inspection and comparison of loadings on particular variables gives no reason to reject this interpretation, and in some cases gives added support. The common weighting in 'cruelty and neglect' can easily be accepted, since it can be envisaged that cases of cruelty will be associated with II and those of physical neglect with III. Mental deficiency contributes heavily to II and only marginally to III. Committals to care is stronger on II than III. But the most interesting loadings are those for the three measures concerned with the supply of shoes and clothing. For the 'total' measure, there is no difference, but 'free' and 'full cost' differentiate sharply between the two factors. As we have already explained, the 'full cost' represents the application by those on National Assistance, while those who are supplied free are ineligible for—or have not applied for—National Assistance. 'Full cost' has a strong loading on III, while 'free' is strongly associated with II. This points to a difference in economic level. J-index does not differentiate the factors, but this is a coarse measure, incapable of resolving differences of this kind, differences between families receiving National Assistance and those ineligible for this, and yet poor enough to qualify for free shoes and clothing. It might, however, be wrong to regard this demonstrated difference as being purely economic in origin. For an unskilled labourer with a large family, National Assistance may provide a weekly sum as great as—or even greater than—his wage-packet. Whether or not 'to go on the

labour' then becomes a matter of individual judgement, strongly mediated by social attitude. It is possible that differences in such attitudes contribute towards the differences between Factors II and III. In any case, no experienced social worker will be surprised at the connection between a heavy incidence of N.A.B. cases and a heavy incidence of dirty houses and children. The final interesting contrast between these two factors is in the juvenile delinquency measures, and the association of probation of children with II and of young persons (14–16) with III. This, too, is not an unexpected concomitant of our suggested nomenclature.

What of the educational connotations of our two factors? Why should a lack of love and affection inhibit ability in reading, however this is measured, and why should a lack of soap and water be associated with a low frequency of brightness, but not with a high frequency of backwardness? Answers to such questions are not to be supplied by an ecological survey, but need much more investigation of individual homes and families. We may speculate, however—and no doubt our speculations will be conditioned by our beliefs in the relative importance of heredity and environment, of psychological factors and physical factors, of individual development and family cohesion, of home atmosphere and peer cultures. Notice that, in the 1951 analysis, reading brightness was associated with the 'maternal care' factor, and the (un-named) fourth factor also contrasted reading with the other two tests. It is possible that this fourth factor, a bipolar, contains within it the differences we have now revealed in our 1957 II and III, but that the limited coverage of the 1951 social variables made a differentiation impossible. It must be remembered, too, that the measures of brightness in 1951 were highly circumscribed, with much less variance than they warranted. Bearing these limitations in mind, the two analyses have undoubted similarities and give each other a good deal of support.

The sixth factor, showing an affinity between ability in arithmetic and economic factors, is one with a very small proportion of the total variance—just 8%. Statistically, it is not significant, and its importance even for arithmetic is slight: the major part of the arithmetic variance is accounted for by Factors I, II and III, only 6·3% being contributed by this factor. Nevertheless, from the point of view of the social variables this factor should not be ignored: over half the total variance for *J-index* is centred here, and the greater part of the variance of *Persons per acre*. It is not unexpected to find a social

factor covering economic level/population density, and it is interesting to note the (slight) connection with our measures of attainment in arithmetic.

Finally, a comment is necessary on the results for the intelligence test, as compared with those from reading and arithmetic. There is no sharp contrast between intelligence and the two scholastic tests. Nor do the inter-correlations with the social variables show higher values for attainment than for intelligence, as might be expected. The picture obtained in 1951 is repeated again, with even greater regularity. This is in strong contrast to the results obtained by many other workers, particularly Burt and Fraser. The difference in the age of the tested children (14+ as against 10+ and 11+) is unlikely to have produced the whole of this difference. Our test is a verbal test, and thus far from being 'culture-free', but Fraser used Moray House tests, also verbal, and very similar in type to our own.

It is true that the intelligence factor pattern is slightly different from that of the other two tests: its variance is heavily concentrated in the first *ed-soc* factor. But the difference is much less than one would have expected. A repetition of this kind of survey, using a non-verbal test, might produce some interesting—and enlightening—results.

CHAPTER VIII

RETROSPECT AND PROSPECT

IN the preceding chapters four separate investigations have been described: the survey of educational attainment and ability in the Greater Manchester area; the 1951 enquiry into the relations between social factors and attainment in Manchester; the 1957 repetition of this on a wider basis; and the Salford investigation of school conditions. This final chapter attempts to discuss the significant findings of our enquiries within a wider context, and to consider in particular their implications for further research.

Looking back on the first stage of this research programme, the testing of over 13,000 14-year-olds in four different local authorities, and involving nearly 300 different schools, I am impressed first by the optimism with which we embarked on this task with such slender resources of man-power, and second—and much more so—by the vindication of our optimism. This was only possible because of the magnificent co-operation we received from the chief education officers and their staff, and most of all from the teachers. It will be remembered that the teachers not only organized the testing and administered the tests, but also marked them. When it is realized that this involved the marking, and checking, of over three million test items, the full extent of this co-operation begins to reveal itself. That the average marking error (Table 3.2) was only ·056 is quite an astonishing result, and can only have been achieved through the conscientiousness of willing volunteers, rather than the reluctant efforts of pressed men.

Limitation of test coverage

Although the survey was notable in the width of its coverage in terms of schools and children, it was by no means so when this was considered in terms of test content. Reading comprehension and mechanical arithmetic are, alone, far from adequate measures of educational attainment. At the primary stage of education they may reasonably be regarded as forming a basic core round which other

abilities, skills and knowledge grow. But at the secondary stage, and even more at the end of the secondary stage, their primacy (for the majority of pupils) has, or ought to have, vanished. The level of these basic skills for the average and above-average pupil is relatively unimportant: what matters is the use to which he has put them in wider contexts. For the dull and the backward school-leaver they are, of course, fundamental because of their immediate relevance to social competence. Schools and teachers are well aware of this: literacy and numeracy form the criterion of educational success for the lower tail of the distribution of ability. For the purposes of our analysis, we identified all those children who obtained standard scores of less than 85 on our tests. These, the bottom sixth in level of attainment, embrace the illiterate and the semi-literate, the innumerate and the semi-numerate, but this group also contains a larger number of children who cannot strictly be classified in these categories of severe incompetence but whose grasp, nevertheless, of these basic skills is so insecure that, a year or two after leaving school, they are likely to have regressed and become full members of these extreme groups. At 14+ they have the ability to read simple prose and to perform elementary calculations, but these are still difficult exercises, and they get little or no enjoyment from them. If, as is highly likely, their employment does not require continued exercise of these abilities, the probability is overwhelming that they will soon lose what exiguous skill they now possess. It has been shown (Table 3.9) that some individual schools in 1951 had a *majority* of pupils in this backward category. The 1957 sample showed a great deal of improvement, but the worst areas still showed heavy concentrations in some schools. For the teachers in such schools this forms a problem of great magnitude, calling for a concentration of effort of a kind and of a scope quite foreign to the staffs of those schools situated in more favoured areas of the conurbation.

For the average and the above-average pupil, however, reading and arithmetic are only parts of a much wider curriculum, the bread and butter on a table which holds a rich variety of more exciting and sophisticated fare. As measures of the educational attainment of boys and girls at the end of their secondary school course, tests of reading and mechanical arithmetic are far too limited in scope to give us a satisfactory picture. One of the characteristics of the development of the boy and the girl during the secondary stage of education is the gradual differentiation of interests and abilities, and the increasing

complexity of intellectual and manual skills. Our tests give us no indication of their response to the opportunities laid before them in geography, history and social studies, in literature, music and art, in mathematics and science, in craft and games and drama, and in the many extra-curricular activities to be found in most of our secondary schools. And yet it is difficult to see how we could have broadened our basis of measurement in a survey of this kind. The British educational system is designed to give freedom to schools and teachers and local authorities in the choice of syllabuses and curricula: as a result, it is also designed to frustrate the research worker who wishes to make area studies! In most European countries, and in the United States, the researcher can set tests of geography, history, mathematics and science to secondary school pupils, confident in the knowledge that all pupils will have been taught on the prescribed and agreed syllabuses in these subjects, and that he can thus obtain valid comparisons of attainment from one area to another. This is not so for British secondary schools. Even in the selective schools, where the G.C.E. imposes some degree of comparability in the upper age-range, area studies outside the range of the tool subjects are almost impossible, because of differences between one examining board and another (and between one year and another in the same board for subjects like English Literature).

This is a severe limitation, and one which must be borne in mind when considering the results of our enquiries. The severity of the limitations increases as we progress from the lower end of the range of ability, through the average, to the very bright and promising pupils. For some of the latter, measured ability in our test papers may be negatively correlated with attainment in the wider and more sophisticated subjects of their fourth- and fifth-form courses when such correlations are run between schools or areas rather than between individual pupils: in one sense, these two groups of subjects are in competition with each other. Consider two equally bright pupils, one of whom, A, is outstanding in a school in a poor area, a school with 60–70% of pupils below our limit of 85 standard score. The other, B, is an average pupil in a school in the outer suburbs, with only 5% or so backward pupils. Consider the differences in their time-table. The first is likely to have many periods devoted to reading, to basic English, to elementary arithmetic; his other lessons, necessarily curtailed in number, are likely to be elementary in content and fairly formal in approach. His opposite number B will have little or no time

devoted to reading (as remedial exercise) or elementary arithmetic. He will be *using* these skills in literature and in mathematics. His other fare—with much more time devoted to it—will have a great deal more variety, complexity and challenge. Measures of reading comprehension and mechanical arithmetic may well show pupil A to be rather superior to B: but any measure of education (as opposed to training) would surely reverse this result. Tests of response to literature, knowledge of science; ability to deal with new ideas and concepts; use of reference books; interpretations of charts, tables and graphs; width of general knowledge; the critical appraisal of conflicting points of view; tests of abilities such as these (and many others) are likely to reveal a clear superiority in B. The narrowness of our measures of educational attainment must be constantly borne in mind when considering the results of our investigations, and the fact that the use of the neighbourhood, or the school, as a unit of analysis is likely to exacerbate the difficulties rising from the inadequacies of our test coverage.

It is not to be thought, however, that the pattern of the secondary school curriculum necessarily makes it impossible to use wider measures of educational attainment. Educational research, and particularly research on 11+ selection and its validity, has developed methods of coping with inter-school differences. Ability in, say, history, may be measured by teachers' rankings or term examinations within any one school. Results may be combined with those from other schools, using different syllabuses, provided we have some common measure or test which can be used for *scaling* the results and thus ironing-out differences between schools in standard and range. Fraser (1959) used this method with effect in her Aberdeen enquiry.

Educational guidance

The study of individual schools in our two surveys brought out not only the large inter-school differences, but also the amount of overlap between selective and non-selective schools (Tables 3.6 and 3.8). The overlap revealed by a comparison of percentages of 'brightness' is the most interesting, and the most significant. Our results support those of Pidgeon (1960) who found 4% of pupils of 14+ in non-selective schools scoring above the grammar school mean. It must be remembered, however, that these results, and ours, are derived from scores from single tests, while selection for grammar and central schools is made on a broader basis. We select, at 11+, the 'all-rounder'; those

who are highest on aggregate marks in intelligence, English and arithmetic. Pupils who are outstanding in only one of these directions, and merely mediocre in the others, are less likely to be selected. Wolfle (1961, p. 60) points out that the inclusion of such pupils would approximately double the number selected. This makes such results as ours inevitable. Thus, using the arbitrary level of a standard score of 115 as the lower boundary of 'brightness', we find that about one-quarter of the brightest children—in each of our tests—are to be found in non-selective schools. The growth of G.C.E. and other advanced courses in secondary modern schools is seen to be a development based on sound logistics, and not merely a trend following educational fashion. The organization of such courses may not always be as efficient as it might be. The tendency in some large modern schools—and comprehensive schools—to identify whole forms for G.C.E. work is a mistaken one. With an adequate system of testing and guidance, pupils may be allocated to 'sets' in individual subjects: this will give opportunities to those whose interests and talents lie in one or two fields only, instead of restricting such opportunities to the all-rounders. Indeed, the whole picture of our research results underlines the need for an adequate system of educational guidance in the secondary school. By this is meant an organization, staffed by teachers trained in educational psychology, charged with the task of measuring and recording not only pupils' abilities and aptitudes, their scholastic strengths and weaknesses, but also their environmental assets and handicaps, their interests and ambitions, their outstanding traits of personality and temperament, and their general development through the early years of adolescence. I do not believe that the American system of 'counselling' is fully importable to our own culture, but much can be learned from their experience in this field. An appropriate British system would avoid their tendency to excessive emphasis on 'depth psychology' and the controversy over 'directive' and 'non-directive' counselling, and would give more weight to the identification of talent and aptitudes, and the tailoring of courses to particular patterns and profiles of abilities, leading up to a soundly-based system of vocational guidance at the end of the secondary school course.

The chances of such a development on any significant scale appear pretty small. It is far from being a new or novel idea: writers such as Burt, Hamley and Oliver in the 20's and 30's were making the same suggestion. Movement in this direction was slow, but nevertheless

fairly steady, up to the outbreak of the last war. Since then the climate appears to have changed for the worse. The social-political controversy over secondary school organization, tripartite versus comprehensive, with 11+ selection as the chief focus of attack, has led to a suspicion of educational psychology and educational measurement among many teachers and administrators. Many of the enthusiastic supporters of comprehensive schools—and some of the staffs of such schools—reject completely the objective tests of attainment and aptitude which, in my view, are essential tools in the efficient organization of these schools. There is a belief that the judgement of the teacher is always more reliable, more valid (and more humane!) than the result of any test. This belief is one which is partially correct, and so is all the more difficult to counter; yet the results of research after research demonstrate the fallibility of many such judgements, when made without the help and guidance of efficient and tested measuring instruments. No doubt some day the pendulum will begin its slow swing back. Meanwhile how many of our pupils will suffer from lack of a liberal and informed system of educational and vocational guidance? Local authorities need not shelter behind the plea that such systems cannot be organized without trained personnel, and that these do not exist. Since the end of the war there has been a great increase in the numbers of advanced diploma and degree courses for serving teachers, and some of these have trained, and are training, teachers for just this kind of work. We have run a course in Manchester University for some 12 years now, leading to a Diploma in Educational Guidance. Of those who have passed through the course, some are lecturers in training colleges, one or two have gone into the Youth Employment Service, a number are teaching handicapped children, others have gained promotion to headships—but none, as far as I know, is employed in secondary schools for educational guidance!

Temporal change and the pool of ability

One of the most significant results of our enquiries was the demonstration of a substantial improvement in standards of educational attainment in the tool subjects from 1951 to 1957. This parallels results from other surveys,[1] and it seems fairly clear that by now not only have we recovered the ground lost by the disorganiza-

[1] See, for example, Ministry of Education (1957) and, in the U.S.A., Bloom (1956).

tion of the war years but that standards have gone well beyond the 1939 level. This is as it should be, in view of the many improvements in the educational service: no country, in the second half of the twentieth century, could be satisfied with merely holding the level of education constant whether we measure 'level' by numbers or by standards. We are all familiar, nowadays, with the concept of the *pool of ability*, but in some ways this is a misleading metaphor. It may lead us to imagine that the main task of educational policy is to make sure that all the pool is used—that is, to ensure that educational opportunity is wide enough to give all able children the chance of higher education. But with an efficient, and increasingly efficient, education service the pool itself becomes wider and deeper, increasing the numbers of very able children. At the present time it is true that government action, in increasing the number of university places, in expanding the technical colleges and teacher-training colleges, is using more of the pool than ever before. But the efforts of the schools, allied to a radical change in the attitude of parents to higher education, have, at the same time, increased the size of the pool at a rate significantly higher than that achieved by the politicians in their siphoning-off process. The situation is rather like the old-fashioned arithmetic problem: the two taps of schools and parents are filling the bath at a more rapid rate than the open outlet of government action can draw off the water. It seems likely that the problems of '11+' of the 50's will pale into insignificance in comparison with those of '18+' in the 60's and 70's.

Educational standards, for the population as a whole, are not fixed and immutable. Test norms are purely temporary in nature; the more progressive and efficient an educational system is, the shorter their life. It is almost certainly true that no human being ever succeeds in achieving his full potentiality—in any direction—in this life. The function of education is to bring him as close as possible to that utopian ideal. This is true at all levels of ability and within all social classes. The gap between achievement and possibility is almost certainly greater, however, the further we proceed up the scale of ability. I believe that, at present, we have no conception of the levels of achievement possible for the highest intellects among our children: there is an enormous reservoir of ability waiting to be tapped. We are prevented from doing this by all sorts of factors. Inefficient teaching is inevitable to some extent, partly because our teacher-training methods are far from perfect, partly because most of the teachers of

such highly intelligent children are less able than their pupils, partly because class teaching tends to be geared to the average, and the highly superior pupil may spend more than half his class time in irrelevant and unproductive activity.[1] But factors inside the classroom are by no means the only ones which are educationally inhibiting, and those which can be broadly classed as 'environmental', arising from the family and the neighbourhood, have been shown in the preceding chapters of this book to be extremely powerful. That we know very little about them must by now be very clear to the reader. And yet they may, for many pupils, be much more powerful than any of the classroom factors. Who can doubt, in our homely example of the bath, that of the two open taps, that marked 'parents' has been flowing at a much more rapid rate than 'schools' over the last ten years or so?

Intelligence: nature or nurture?

In any discussion of the 'pool of ability' we cannot get very far before stumbling across the problem of the differentiation between tests of intelligence and tests of school attainment. To the educational psychologist, the intelligence test represents the best way—the only way—of estimating potentiality as opposed to achievement. That it does so imperfectly is abundantly clear: not only our own enquiries, but a large number of the researches reviewed in Chapter IV demonstrate that such tests are by no means free from the effects of environment. It has already been pointed out that attitude towards intelligence tests is mediated not only by educational and psychological considerations, but also by social and political attitudes. We are living in a period of egalitarianism, which carries with it hostility towards the concept of differences in innate ability. Valiant attempts have been made to show that intelligence tests are valueless as indicators of potentiality, and that they add nothing to the results obtainable from school examinations and teachers' judgements. A typical research, and one which came to my notice too late for inclusion in Chapter IV, is that of Baker, Schutz and Hinze (1961). Using 186 eighth-grade pupils divided into high scorers and low scorers on the Californian test of mental maturity, they compared results on various achievement tests and a teacher rating of overall academic achievement. They also graded each pupil in Warner's 'index of status

[1] See Parkyn, G. W. (1948), *Children of High Intelligence*, N.Z. Council for Educational Research, for a dramatic example of this process.

characteristics', based on father's occupation, sources of income and dwelling-area rating. They tested the hypothesis (using analysis of covariance) that if socio-economic status were controlled, the connection between intelligence and achievement would become insignificant. All differences, however, *remained* significant at the 1% level.

A particularly persuasive argument, and one which has been seized on lergely by some British sociologists, has been advanced by McClelaand (1958): 'Let us admit that morons cannot do good school work. But what evidence is there that intelligence is not a threshold type of variable; that once a person has a certain minimal level of intelligence, his performance beyond that point is uncorrelated with ability?' (p. 13). It seems that McClelland has been misled by some researchers (such as Terman, for example, working with a highly-selected group of subjects—see his *Genetic Studies of Genius*) who have reported small and even insignificant correlations between I.Q. and attainment with very bright pupils. But they perhaps fail to realize the effect of restriction of range on such correlation coefficients —and the greater the restriction, the greater the shrinkage. McClelland's question is, in effect, one about regression: is the regression of I.Q. on attainment linear or not? Floud (1962, p. 532) suggests that '. . . the relation between the two has not yet been fully investigated by psychologists, although a linear relationship is frequently taken for granted'. This, to an educational psychologist, is an extraordinary statement. There are literally scores of researches which demonstrate this linearity unequivocally, and particularly those concerned with 11+ selection. Our own surveys of 1951 and 1957 show no departure from linearity when tested, nor is there in our results any support for the suggestion that I.Q. is a 'threshold variable'.

The evidence seems inescapable that the intelligence test, however imperfect it may be in comparison with the psychologist's concept of the ideal, is a good deal *less* affected by cultural and background influences than are tests of attainment. As such, it is an invaluable tool for research purposes, giving a nearer approximation to the level of innate ability than any other measure. The abolition of intelligence tests in educational selection, at any level, will result in a fuller and freer play of environmental factors and thus produce a less socially just result. This was clearly demonstrated by Floud and Halsey (1957) who investigated the differences produced between 1952 and 1954 in Hertfordshire, when the intelligence test was dropped from the selection

battery. The categorization of children by parental occupational class was 'less reliable' in 1954 than 1952, but in spite of allocating 'all doubtful and unclassifiable cases' to the working-class groups in 1954, the proportion of children of manual workers, skilled and unskilled, gaining grammar school places dropped from 14·9% in 1952 to 11·5% in 1954. At the same time the percentage of children of professional and managerial parents rose from 39·6 to 63·6. Undoubtedly the intelligence test *is* an instrument of social justice.

Intelligence and attainment

Nevertheless all our analyses have been consistent in throwing up an unexpected result inconsistent with theory and with most other researches: the finding that the intelligence test results are *more* affected by environmental factors than are the results from the two attainment tests. Our enquiries are not alone in producing this particular reversal: Chapter IV lists a number of others, and Dr Warburton in Chapter VI adds to the list. When we survey these discrepant researches, we find that in every case the unit of measurement and the basis of the correlations was not the individual child but the school, the neighbourhood or the town. This is the crucial fact that supplies the explanation for the apparent paradox. Robinson (1950) was undoubtedly right to warn us that correlations obtained from area studies and ecological surveys cannot be assumed to be equivalent to correlations obtained from individuals. He based his argument on such examples as the negative correlation between the proportion of coloured residents in an area and the mean educational level of the area, although the educational level of the coloured population might be above average. Here we have produced another and quite different example to support his view.

The mechanism behind our results has, in fact, already been outlined a few pages ago, when we were discussing the effect on a school of having a high proportion of backward children. This presents such an obvious and fundamental problem to the teachers that immediate therapy is given first priority. The amount of time and effort given to basic arithmetic and to the teaching of reading becomes very much greater than that allocated to such subjects in the more fortunate suburban schools. By such devotion to these basic skills, the level of ability in them is raised above that which we might expect, having regard to the distribution of ability among the pupils. But this can only be done at the expense of other and more liberal studies—studies

which were not tested in our researches. The effect of this on results in the intelligence tests is minimal, because of the essential nature of the test. In other words, the schools and the teachers are so aware of the strength of adverse environmental pressures and forces that they do all they can to counteract their influence on the basic subjects. Because the intelligence test is relatively free from the effects of schooling this has little effect on the distribution of I.Q., but raises the average scores on reading and arithmetic in schools in the worst areas. When we now make a survey of the area, we find an 'intelligence gradient' corresponding to the 'social gradient' as we move from the favoured outer fringe to the deprived centre area. The gradient for attainment, however, is *less* steep, because of the radical differences in time-table and curriculum between 'white' and 'black' schools. By the efforts of the teachers, not only has the environmental differential between intelligence and attainment levels been obliterated, but it has actually been reversed.

This effect can only occur when the school, or the area, is the unit of measurement: variance between schools, or between areas, is very much smaller than between individual children. As soon as individual scores are used for analysis, the correlation between environmental factors and attainment becomes clearly higher than that with intelligence—as demonstrated by Burt and Fraser and others, and as implied by the results of Floud and Halsey in Hertfordshire. Miss Allen's forthcoming report of the Wythenshawe area, using the same tests as we have done, but employing individual pupils as the units of measurement, ought to provide a convincing demonstration of the validity of our analysis of the causes of this paradox.

As far as I am aware, this essential and important difference between the results of area studies and individual studies of educational attainment has never previously been studied. The explanation of the conflicting results is, as I have suggested, very simple. Its very simplicity may lead some readers to suspect, or even reject, it. I am not so sanguine as to believe that it will prove immediately palatable to those convinced and committed egalitarians who, up to this point, have been rubbing their hands over the evidence we have (apparently) provided of the failure of the intelligence test to live up to its theoretical 'image'. But those of my readers who are teachers, and particularly those whose experience has been in a variety of secondary modern schools in urban areas, will find immediate support for this explanation from their own knowledge. Those with no first-hand

experience of the differences between time-tables and curricula in schools in favoured areas and in depressed areas may doubt the extent of such differences. Any teacher who has done 'supply teaching' in a large city for any length of time is more likely to find these differences under-emphasized here rather than exaggerated. I have found immediate agreement on the extent of these differences in discussions with inspectors and organizers within the conurbation, and for most of Her Majesty's Inspectors of schools such differences are so much a familiar part of the educational scene that to single them out for special comment seems to them almost a work of supererogation.

Strong support for this explanation of the mechanism behind our results comes from the study of individual schools reported in Chapter VI. We would expect a differentiation between backwardness and brightness on our hypothesis. Both will be affected—since the crux of the argument is not so much the increased effort given to the backward pupils as the effect of this on the whole school time-table—but the reduction of backwardness in schools in poor areas ought to be greater than the increase in brightness as measured by our basic tests of reading and arithmetic. Evidence of this is quite clear in Chapter VI, and nowhere more striking than in Table 6.10. Here we have reported the partial correlations with intelligence when the two attainment tests are, separately, held constant. Notice the differences between backwardness and brightness: the vital correlations with school neighbourhood are −·47 and +·24 respectively when reading is partialled out; −·49 and +·22 when arithmetic is so treated. The 2:1 ratio, and the similarity of the results, are just what we might expect.

Partial correlations of the opposite kind (with *intelligence* held constant) suggest that the efforts of the schools in the poorer neighbourhoods are more successful with backwardness in arithmetic than with poor reading. In Table 6.1, for example, the partial *r*'s are +·19 for backwardness in reading, and only +·09 for arithmetic. The partial correlations with brightness show a difference in the reverse direction (+·18 and +·28).

School factors: progressiveness

Some of the most interesting results to be found in Dr Warburton's chapter are those for *progressiveness*, showing that the schools adopting progressive methods have fewer backward children and more

bright children. This effect is more strongly marked with reading than with arithmetic. This is a useful piece of factual evidence in a field of educational controversy where opinion is more often mediated by attitude and prejudice than by the results of actual investigation. The factor analysis (Table 6.6) shows that this result is not caused by the association of progressiveness with other environmental variables: Factor II shows clear independence, and indicates a strong association of progressiveness with attainment—and a weaker, but significant, connection with school attendance.

'Progressiveness' in school organization and teaching methods is usually contrasted with 'formal' or traditional education. It made its full impact on the English educational scene in the years between the wars, through the efforts of such pioneers as Rachel McMillan and Susan Isaacs. It is more than a method: it is an educational philosophy. Its genesis makes a fascinating study, too complicated to be fully unravelled here. Two of its main strands were, however, the philosophy of Dewey and the psychology of Freud. From Freud came the belief that play in childhood had two functions of importance to the educator: a didactic function and a therapeutic one. Through play, the young child learned to come to grips not only with his physical environment but also with his emotional environment. Jealousy, anger, frustration could be 'played out' and so relieve his energies for intellectual and social development. From Dewey came an analysis of the learning process, with strong emphasis on the motivational element. The child, for Dewey, was not a receptacle for knowledge, but an active seeker after information and skill. The essence of education was the provision of an environment which would permit the active learner to develop at the optimum rate. The teacher's role was to provide material and to pose problems—to place the child in a 'forked-path situation'—and to be at hand to help with new material, or with advice and support, when this proved necessary. Both these strands, Freud and Dewey, led to a strong emphasis on the *activity* of the child, and hence progressive methods were often given the alternative name of *activity methods*.[1]

The application of this philosophy has led to a revolution in the infant schools of this country: greatly aided by the historical accident which gave us a compulsory school entry age of 5 years, as contrasted

[1] Susan Isaacs' two classic books, *Intellectual Growth in Young Children* (1930) and *Social Development in Young Children* (1933), still give, in my view, the best introduction to the theory and practice of activity methods.

with the 6 or 7 years of other European countries. By and large, 'progressive' methods of organization and teaching are now accepted as normal and desirable in the infant schools of England and Wales. Where the controversy arises is over the question whether such methods are 'right' for children in junior and secondary schools. Antagonists see activity methods as dangerous to standards (and values). 'Letting children do what they like' will inevitably lead to the avoidance of difficult tasks and difficult subjects: literacy and numeracy are bound to fall. But in those primary schools which adopted this approach no catastrophic decline in standards was observed, and the outstanding improvement in the energies and enthusiasms of the children, and their attitude towards school and learning, was clearly demonstrable. There are many teachers in junior schools, and a smaller number in secondary schools, who believe that progressive methods are generally superior—in every way—to more formal methods of education. The number of junior schools organized entirely on these lines is not large, but is growing slowly. Training colleges and university departments of education have great difficulty in finding examples of such schools for their students to visit as part of their introduction to different methods of education—although to read some of the intemperate attacks on this approach one might imagine that the country is over-run with 'activity' schools.

Methods which have proved successful in infant schools with children of 5 and 6 cannot be transferred unchanged to junior and secondary schools. Much harm has been done to sound progress by the uncritical and thoughtless adoption of 'progressive methods' by teachers with little grasp of the basic philosophy behind them, or of the essential aims of such methods, motivated merely by the desire to climb on the bandwagon of fashion. Techniques in the secondary school still remain somewhat tentative and experimental, but much can be done by those teachers whose educational philosophy leads them to value the 'child-centred' school, with an active approach to learning as the main ingredient.

The schools in Dr Warburton's survey were graded on a scale 'ranging from the extremely formal, rigid and orthodox to the most informed, free and progressive, with a curriculum organized through activities related to the interest of the children'. The fact that such a rating was shown, unequivocally, to be associated with the results of the attainment tests, and particularly with ability in reading comprehension, is one of the most significant findings of all those

reported in this book. It may give heart to the progressives in the teaching profession, and remove many of the doubts of those who see the advantage of such methods but fear some of the 'side effects'.

In view of the results of other environmental research, the result for progressiveness should occasion no surprise. The importance of the attitude of *parents* to education comes out strongly in research after research. Success in the secondary school depends more on the attitude and motivation of the *pupils* than on any other school factor, and this is the strength of progressive methods. By linking method and curriculum to the interests of the pupils, and by encouraging active exploration and participation rather than the passive acceptance of formalized instruction, the school becomes a more attractive place. If we can stimulate and feed interests, and provide activities and materials for the felt needs of the children, we are more likely to achieve co-operation and response, and produce an attitude towards school which may defeat the unfavourable attitude of many of the parents. A more formal and rigid approach, on the other hand, too often breeds apathy and lethargy among the captive pupils, progressing to active hostility in the upper school and an intensification of the dichotomy 'us' and 'them'. Notice the connection between progressiveness and attendance in the Salford enquiry. The very good teacher, the imaginative and inspiring teacher, can stir his pupils and achieve results whatever method he may adopt. For the less outstanding teacher, for the great majority of the average and the mediocre, lacking such rare talents, progressive methods offer the best chance of achieving positive and lasting results, particularly where environmental factors are heavily adverse. There is no doubt that progressive methods make more demands on teachers than do formal methods; demands not only of time and energy, but also of flexibility, adaptability and intelligence. For the very weak teachers such methods may be beyond their capacity, and they are perhaps safer with the formal methods which they understand and to which they themselves have been conditioned in their own education. It follows that they are better employed in the 'good' schools in the outer suburbs, where problems of attitude and motivation are less severe. This is also desirable in their own interests: the plight of a weak teacher in a 'tough' school is indeed unenviable—and an unruly and rebellious class may form a focus of unrest that infects the rest of the school.

Attitude to school: punishment

It will be clear that this question of progressiveness, linked with the attitude of pupils towards education, is only one facet of a larger problem. The attitude of pupils to a school is largely dependent upon the attitude of the teachers towards the pupils: the two are inseparable. The effectiveness of what are called 'progressive' methods is produced not so much by the methods themselves but by the philosophy underlying them. One of the clearest indications of the attitude of teachers towards pupils lies in the kind of sanctions and punishments employed in a school. Britain is one of the few remaining countries in Western Europe to retain corporal punishment in schools and, although its use has diminished very greatly over the last few decades, it still remains firmly entrenched as a 'right' and as a 'necessity'. The arguments in its favour most often stem from teachers in 'difficult' schools in bad areas. Its connection with environmental factors is so often underlined that we must consider them in this context. It is claimed that corporal punishment must be retained as a final and ultimate sanction, particularly in schools drawing their pupils from areas of poverty, crime and social disorganization. It is implied that without it control would become impossible, and that the behaviour of children, both in and out of school, would become worse. What evidence is there for the truth or falsity of such claims?

Our arguments in favour of progressive methods are also arguments against the use of corporal punishment, since this is completely contrary to the view of the teacher-pupil relationship which is central to the underlying philosophy of the 'progressives'. Our evidence so far, then, lies against caning, but it is not *direct* evidence, and can carry little weight for the convinced believer in this ultimate sanction. Direct evidence is difficult to come by, and most researchers in this field have contented themselves with surveying teacher opinion. A recent enquiry, however, by the West Riding Education Committee (1961) produces some interesting data of a more direct kind. An investigation among the secondary schools of the West Riding showed a positive association between corporal punishment and juvenile delinquency. Since this might well be caused by the concentration of 'caning' schools in the poorer areas—where, it is claimed, corporal punishment is necessary—data were also obtained on the average rateable value of the district, and on the percentage of homes having an occupancy rate of more than two per room. This

showed little connection with either delinquency or corporal punishment and gave no support to the theory that their correlation was a statistical artifact caused by an association with the third variable of quality of neighbourhood. This suggests that, far from caning *reducing* delinquency, it might well be increasing it. The psychologists and the sociologists would undoubtedly agree that such a result is not only possible, but even likely, the use of corporal punishment leading to an early establishment of the 'us' and 'them' attitude, and the development of an hostility to authority of all forms.

By the courtesy of the Chief Education Officer, the detailed results of the enquiry were obtained and a more searching analysis of the

TABLE 8.1

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Intercorrelations

	2	3	4	5
1. Corporal punishment	.383	.659[a]	.082	.196
2. Juvenile delinquency		.508	.297[b]	-.020[b]
3. School behaviour			.211	.004
4. Rateable value				-.220[b]
5. % 2 to a room				

a: rø b: product moment r Rest: biserial r

data carried out. The five variables were first inter-correlated (Table 8.1).

Notice the correlation of ·38 between corporal punishment and juvenile delinquency, and the very high correlation of ·66 between corporal punishment and (bad) school behaviour. To those who see this as only to be expected, since corporal punishment is only resorted to when behaviour is bad, the analogy of the chicken and the egg may be cited: which comes first? To try to make the interrelationships clearer, a factor analysis was carried out, followed by a varimax rotation to simple structure. The result is shown in Table 8.2. The varimax technique is seen to be almost too efficient in dealing with this small table: the five factors correspond exactly with the five variables. It will be seen that the two socio-economic variables are largely independent of the other three. There is no support here

TABLE 8.2

Factor analysis - varimax solution

	I	II	III	IV	V
1. Corporal punishment	.90	.07	.36	-.10	.22
2. Juvenile delinquency	.29	.93	.20	.14	.01
3. School behaviour	.36	.23	.90	.07	.01
4. Rateable value	.19	.11	.06	.96	-.11
5. % 2 to a room	-.04	-.01	.02	-.10	.99
Percentage variance	21.2	18.5	19.7	19.6	20.9

for the theory that schools in poor neighbourhoods are the ones driven to employ corporal punishment more frequently and more heavily. Indeed, the positive loading of ·19 of *rateable value* on Factor I would suggest that any association is in the opposite direction. The stronger loadings on *school behaviour* and *juvenile delinquency* are more important, and show an association of undoubted significance. Nevertheless, proof of association cannot be proof of causality, and we are still left with the chicken and the egg problem. The total pattern of this analysis, however, is one which offers no shred of opposition to the hypothesis that corporal punishment encourages bad behaviour and juvenile delinquency, but does offer evidence *against* the alleged association of caning and poor school neighbourhood. Taken in conjunction with other evidence, and with our results from the Salford analysis, the balance of judgement lies heavily *against* corporal punishment as a device for improving behaviour, raising moral standards and improving children's attitude to authority.

Attitude to school: attendance

One of the important variables when considering children's attitude to school is that of *attendance*. We have data here both for the total conurbation (Chapter III) and for the Salford enquiry (Chapter VI). In the first of these, the attendance of individual children was rated by the teachers in four broad categories (Table 3.10); Dr Warburton used percentage attendance as the measure in Salford, using the school as the unit. The method of comparison with attainment also differed in the two enquiries. For the 14,000 children in the conurbation—coming from all types of secondary school—average scores on the three tests were computed, for boys and girls separately

(Table 3.11). In Salford, using only non-selective schools, percentage of backwardness and brightness were compared (Table 6.4). This makes it difficult to compare the results—or at any rate, difficult to assign reasons for the differences found. These differences are clear. For the conurbation as a whole, there was a stronger association with mean score in *reading* than with the other two tests, and *arithmetic* was least affected by *frequent absences* and by *long absences*. Fig. 3 brings this out quite clearly. In the Salford analysis *arithmetic* was more closely associated with poor attendance than was *reading*, and this was true for both backwardness and brightness.

This is a curious result. Dr Warburton's hypothesis, 'That since arithmetic is a technical skill used very infrequently in everyday life compared with reading, and is dependent largely on instruction from a professional teacher, it will correlate more highly with teaching conditions than reading will; i.e. that arithmetic will correlate more highly than reading with . . . high percentage attendance' (p. 106), is one that most teachers would endorse, and one which his own results vindicated. But here we have two enquiries, one using the school as a unit, and one the individual child. In view of our earlier discussion, it comes as no surprise to find differences in results: but it *is* surprising to find the school-based research providing the expected answer, rather than the one employing the analysis of individual scores.

The explanation of this difference in results probably lies in one or both of two areas. The inclusion of the selective central and grammar schools in the conurbation analysis and not in the other is a fact of very considerable significance, and one which might well produce big differences in the 'differential' between reading and arithmetic. The test of mechanical arithmetic is one which is particularly ill-adapted for selective secondary schools, where 'arithmetic' as a subject receives little attention after the first year or two in the lower school, giving place to algebra, geometry and trigonometry of the 'mathematics' lesson. Results on such a test, therefore, are likely to be relatively unpredictable in such schools (notice the relatively low percentage of 'brightness' in arithmetic in grammar schools shown in Table A.4). Since attendance tends to be higher in selective schools than in non-selective, this may tend to reduce average scores in the higher attendance categories.

The other possible explanation—and the one which I feel is the stronger—depends again upon the 'chicken and egg' situation. Dr

Warburton's persuasive hypothesis is one which involves the view that attainment depends upon attendance. This is undoubtedly true in the primary school, but in the secondary school it is arguable that attendance depends upon attainment. Few would disagree with the hypothesis that children well motivated towards school will attend more regularly than those less well motivated. Fewer still would disagree if one goes on to suppose that successful pupils (i.e. achieving pupils) are more highly motivated towards school than less successful pupils. *Ergo* high achievers attend more regularly than low achievers. Now lack of achievement in reading is more pervasive, and involves a much broader band of the school curriculum than does lack of achievement in arithmetic. Poor reading ability is therefore likely to have a more profound effect on attitude to school—and therefore on attendance—than is poor arithmetic ability.

Recently some new evidence has come to hand which tends to support this general argument. The West Riding Education Committee (1962) has recently produced a report on attendance.[1] This shows that in 27 streamed secondary modern schools, attendance figures 'followed the pattern of streaming', with the A streams showing the highest attendance, and the differential tending to increase as the forms progress up the school. A significant finding was 'that where a particular form contradicted the pattern the headmaster often emphasized the exceptional qualities of the form teacher'. A second survey included grammar and comprehensive schools: 'in the mixed grammar schools the attendance percentage differed only slightly between the streams. In the comprehensive schools the higher streams on the whole attended better than the lower, though the difference was not marked.' Now these effects could well be ascribed to streaming. There are many opponents of this type of organization who would argue that such a result is not so much a concomitant of intelligence and ability, but of the rigid sociological groupings imposed and the behaviour 'expected' by the teachers. But the West Riding answered this argument by investigating an unstreamed secondary modern school. No significant pattern of attendance differences was found between forms—the expected result—but when the children were arranged in 'imaginary streams the "high

[1] In parenthesis, may one hope that more chief education officers of other local authorities might follow Mr Clegg's admirable example of conducting enquiries such as this—and the one on corporal punishment already discussed—and so add their quota to our small store of factual knowledge?

stream, high attendance" pattern clearly emerged. . . . Bright children attended better than dull children, whether streamed or not.' There seems little doubt that poor achievement produces poor attendance, which in turn produces poorer achievement and yet poorer attendance. The effect is cumulative.

Teachers' attitudes

The statement that educational attainment depends upon school conditions seems to most people a statement of the obvious. And yet we know surprisingly little about *what* school conditions are the most important in this respect. It will be clear by this time that the argument being developed here is that factors of attitude and motivation are more important—in the secondary school particularly—than the more obvious physical factors such as quality of building, size of class, etc., and more important than even the quality of teaching, if this is used in the narrow sense of teaching technique and instructional method. The Salford investigation supports the few other researches dealing with class size in finding this factor of little significance. This is a curious result, and one at variance with the strongly-held beliefs of both parents and teachers. It seems that this factor is important only with respect to its interaction with school organization. If the school age-group lies between 30 and 40, or some multiple of this figure, attainment tends to be higher. With schools falling outside this range, the shifts and groupings of children made necessary by the awkwardness of its entry-size in relation to the capacity of its classrooms and the numbers of teachers permitted, seem to have an adverse effect on attainment not compensated for by the reduction in absolute size of some of its classes. For the teacher, a reduction in class size from 40 to 30 brings overwhelming relief in terms of physical effort and psychological pressure, but no research that I know of has been able to demonstrate a significant improvement in the children's attainment. It seems to me highly probable that researches in this field are strongly affected by the inherent difference between ecological and individual investigations. Although no relationship between class size and attainment is demonstrable using the *class* as the unit of analysis, yet such a relationship may be clearly present for individual pupils. For the parent, a small class seems to offer the possibility of more individual attention, but size must be reduced very drastically indeed to make this a certainty. For a formal teacher, a class of 20 may be taught in exactly the same way as a

class of 40. A skilful progressive teacher manages to deal with individuals for a significant proportion of school time no matter how large or small the class. Even with studies using the pupil as a unit, there may well be a significant interaction between size of class and method of teaching.

The motivation of pupils and the attitude of teachers are more important, and are likely always to be more important, than quality of accommodation or size of class. Technique is only important inasmuch as it is allied to motivation and attitude. But as well as attitude of pupil and attitude of teacher, we have a third factor: attitude of parent. Our own investigations bring no direct evidence of the importance of this factor, but it will be remembered that the literature reviewed in Chapter IV contained a great deal of evidence of this kind. The interactions of these attitudes, of child, parent and teacher, may be the greatest single force affecting the end-result of education for a particular child. It may even be agreed that all other environmental factors—school and neighbourhood—only affect educational attainment through their mediation of these attitudes. This is stating, in different terms, the theories of the social anthropologists in identifying cultures and sub-cultures within the urban environment. The sociologists, too, recognize the importance of these interactions. Floud (1962) writes:

> The child may come to school ill-equipped for, and hostile to, learning under any educational regime; but for the most part his educability depends *as much* on the assumptions, values and aims personified in the teacher and embodied in the school organization into which he is supposed to assimilate himself, *as on those* he brings with him from his home (p. 533).

The phrases which I have italicized indicate a judgement of degree of influence which may perhaps be valid for some children in some schools, but is unsupported by direct evidence. Nevertheless the stress on both sets of values, and the importance of the conflict—when there is a conflict—to the educability of the child, is not exaggerated. When we come to analyse more closely the conflicting attitudes, the possible underlying mechanisms, and the ways in which the attitudes might be expressed, differences of interpretation may be more radical. Floud's 'assumptions, value, and aims' may be interpreted in psychological and educational terms, as we have tended to do in the last few pages; or in terms of social class, as Jackson and Marsden (1962) have done. The thesis of the latter book is, simply,

that schools are run by, and organized by, teachers; that teachers are middle-class, with middle-class values; therefore schools and the system tend to discriminate against working-class children and working-class parents. There is no doubt that many teachers are ignorant of the accepted *mores* of the neighbourhoods from which many of their pupils come; that many teachers are, consciously or unconsciously, uncompromisingly hostile to these more alien 'cultures'; and that either attitude handicaps them in their work as educators (as distinct from instructors). But such attitudes are much less important in the educative process than those other attitudes we have already described: attitudes towards children as individuals, towards education as an active partnership between teacher and pupil, towards learning as progressive activity involving the child's interests, skills and aptitudes. The distinction being drawn is, of course, an artificial one in one sense: both sets of attitudes are closely connected and stem from a common social and educational philosophy, whether liberal or reactionary. But the distinction is a real one in terms of operational validity. The 'social class' view of attitude is on a more superficial level than the other, and is less fruitful in its suggestions for therapy and progress. Those of us with experience in teacher-training find little correlation between socio-political attitudes or social class on the one hand and progressive educational methods on the other. What seems to matter far more is the personality of the teacher, and his ability to initiate warm and friendly relations with other people. A 'liberal' philosophy, in the widest sense, is what matters most, together with a significant degree of 'tender-mindedness'. Eysenck's two dimensions of personality are far more applicable to this problem of teacher attitude than the middle-class: working-class dichotomy.[1] Wolfle (1961), in considering national resources of ability, indicates three types of factors that can be manipulated to increase such resources: 'the national policy and social climate under which a child is reared; the nature of the educational system; and the strength of individual or personal motivation'. Ministers of Education and chief education officers tend to stress the first two. The last might, in fact, be the way in which change can be brought about quickest and more permanently, and

[1] This does not absolve our training colleges and departments of education from doing much more in the way of introducing teachers-in-training to the relatively unfamiliar sub-cultures, both urban and rural, from which a substantial number of their pupils might come.

particularly so in the long-established industrial democracies such as our own.

Parental attitudes

Let us turn now to the attitudes of parents: more important, because of their primacy, than those of either children or teachers. If the parents believe in education, if they support the school in its efforts, if their aim is broadly similar to that of the teachers, then the child already has an enormous advantage over other pupils who come from less conforming homes. To use the expressive French phrase, *la famille éducogène* is one which every teacher would like to see multiplied. One of the sources of the unquenchable optimism of the teaching profession is the belief that, no matter how few there seem to be now, one of the major functions of the teacher is to produce more and more in succeeding generations. I would go so far as to claim that such a measure might well form a single criterion of progress and development for any national system of education.

At the other end of the spectrum from *la famille éducogène* is the family not only indifferent to education, but actively hostile to it. Although our own research has been on an area basis and has not concerned itself with individual families, who can doubt that, behind the statistics of the 'black' areas of the conurbation lie very many families of this kind. Many sociological enquiries and case studies have shown the existence of 'problem' families which, among all their other characteristics of crime and delinquency, of social rebellion and contempt for the law, show equal contempt for schools and all they stand for. These 'active' problem families may be distinguished from the (larger) groups of 'passive' nonconformists. Here the root of the problem is more often sheer inability to cope, often because of low intelligence and an almost complete lack of organizing ability. Education is not valued because nothing is valued, but active hostility is absent. Children from such families do not present such an intractable problem to the schools as do those in the 'actively hostile' category, but the large numbers of such children in the schools in the worst urban areas make this group perhaps the most difficult of all to cope with successfully.

These families do not exhaust the list of those whose attitudes to school prove serious handicaps to the educability of their children. There is another group whose effects, in some ways, may be more serious—viewed nationally—since their children are those above

average in intelligence and attainment. The problem may best be indicated, perhaps, by citing a research by J. A. Kahl (reported in Halsey, Floud and Anderson, 1961, pp. 348–66). He compared two groups of high school boys in the U.S.A., groups equated for I.Q., but differing in their attitude towards college. One group was composed of 'college aspirants'. The other group had rejected this ambition. Kahl found a significant connection between aspiration to college and the attitude of parents towards education. He called the non-aspirant boys the 'common man class', since their ambitions were 'common man occupations'. He comments:

> The interviews disclosed that although there was a general way of life which identified the common man class, some members were content with that way of life while others were not. Parents who were discontented tended to train their sons from the earliest years of grammar school to take school seriously and use education as the means to climb into the middle class. Only sons who internalized such values were sufficiently motivated to overcome the obstacles which faced the common man boys in school; only they saw a reason for good school performance and college aspirations (p. 364).

A similar comment from this side of the Atlantic comes from McMahon (1962):

> In the industrial north of England where I was brought up I know many able working-class people whose reaction to the suggestion that they should use their talent occupationally was 'It's not for the likes of us', stated explicitly or by implication. It seemed that the motivation to remain with the social group of one's kith and kin was stronger in the working class than in any other social class.

We are familiar with the 'Keeping up with the Joneses' in surburbia: here we have a contrary 'Keeping down with the Smiths', to use McMahon's graphic phrase. It may be that a major part of the variance found between particular occupational groups—skilled and semi-skilled workers, shopkeepers and clerks—reported by many investigators (e.g. Fraser and Furneaux) is caused by this mechanism.

Peer attitudes

For the adolescents of secondary school age a powerful force shaping their attitudes and value-systems is the prevalent climate of opinion and pattern of action among their friends and their contemporaries. Where this group pressure supports the attitudes found in the home it becomes very powerful indeed. Where the two are in

conflict, the peer-group value-system frequently becomes dominant. This may be only temporary, but it comes at a vital educational period in the adolescent's life, and by the time he grows through it some of his educational opportunities may be lost irretrievably. Our night-classes, in evening institutes and technical colleges, hold a sizeable proportion of young men (and women) who, with the acceptance of adult responsibilities coming with marriage, are trying to make good the losses of earlier years. Some of them make good, and eventually reach a level of employment commensurate with their innate abilities; others, with more basic educational deficiencies, perhaps, or with a less powerful drive, find the difficulties of part-time study too great for them, and go to swell the high proportion of 'drop-outs' found in these courses. Many people do not realize how much further education is concerned in trying to remedy deficiencies in the compulsory educational system. A comprehensive system of educational guidance in the secondary schools would reduce the load considerably; educational guidance in the lower echelons of further education would pay handsome dividends in the salvaging of much promising material.

What can be done for the adolescent during the time he is 'at risk' to this peer-group influence? A more rapid development of the youth service is an obvious line of attack, but youth clubs cannot be expected to solve the problem single-handed. Unless such out-of-school provision is linked closely to the schools themselves—a 'psychological' linking by pursuing common aims and methods, and employing enlightened methods based on a full analysis of the mechanisms underlying the 'teen-age revolt'—any success reported is likely to be limited to the less than fully committed. The hard core will remain untouched: and in the blackest of our urban areas this hard core may contain the majority of the age-groups.

Attitude towards school is closely linked to attitude towards authority in general. Backwardness and delinquency show high correlations in all researches. This is not surprising, since they are both products of a common value-system. Wilson (1962) uses the term 'delinquescence' to describe the delinquency-potential of the worst urban areas, and comments: 'It is feasible that a concentration of inadequate homes would set behaviour-patterns for the children of the neighbourhood, and that the delinquescence of an area consists of home-produced primary delinquency plus a secondary type of delinquency which, so to speak, has been caught by contagion' (p. 25).

It seems highly probable that this is a basic mechanism, linking family attitude and peer culture. It follows that the role of the school (like that of the youth club) in preventing delinquency and the rejection of authority, is to combat the influence of bad parental attitude. This cannot be done in the secondary school by the use of authoritarian methods and excessively rigid and formal organization. A more acceptable attitude to authority can only be fostered by making authority acceptable! This brings us back to the basic question of the educational philosophy of the teacher and his own attitude towards children and their education. A gradual spread of more liberal and progressive methods offers the best hope of reducing the number of teen-age rebels, and of ensuring that those who resist do so only temporarily. The multiplication of research demonstrating that repressive discipline is more likely to produce delinquency rather than reduce it (e.g. West Riding Education Committee, 1961), and that progressive methods do not, in fact, lower the level of attainment but are likely to improve it (e.g. Kemp, 1955, and our own research), may eventually wear down the resistance of the educational backwoodsmen who see in such methods the seeds of moral disintegration and national decrepitude.

Neighbourhood factors

Any ecological investigation such as ours tends to lead to an overall conclusion which is unhelpful and unenlightening: that there is an entity *educational attainment* which is apparently affected by *neighbourhood factors*, *school factors* and *home factors*. This vague concept of a plastic haggis-like entity being attacked by forces outside it, some pulling it out, and others pushing it in, is one very easily formed, and carries with it the illusion that it somehow explains what is happening. It leads to the asking of sterile questions (e.g. about the relative strength of these outside forces) or the formulation of useless therapeutic recipes (e.g. the strengthening of the skin of the haggis by intensifying 'discipline'). We can only protect ourselves from such a view of the problem by insisting that *educational attainment* is not a single entity, but a short-hand description of the reactions of *individual pupils* to various forms of educational measurement. And the whole of this chapter up to this point has been pressing the general view that the picture is not one of the pupil being surrounded by a multitude of forces, some favourable, some adverse —a picture that inevitably suggests that progress lies in the provision

of adequate insulation from these forces—but rather that the pupil himself produces some of the forces and interacts with others. He is, in fact, one active element in a complex *Weltschmerz*. Before any amelioration becomes possible (except accidentally) it is necessary to investigate this complex and begin to understand the main interactions. It is, essentially, a *multivariate* problem and one which must be attacked by appropriate multivariate methods. Accepting this approach, let us attempt to list some of the factors which might affect the level of educational attainment of a single adolescent. This can conveniently be done under six headings, three representing the

TABLE 8.3

Some factors affecting educational attainment

I PUPIL	II PARENT	III TEACHER	IV SCHOOL	V HOME	VI NEIGHBOURHOOD
1.Intelligence	5.Intelligence	9.Intelligence	15.Atmosphere	19.Atmosphere	23.Level of housing
2.Physical health	6.Temperament	10.Temperament	16.Status in the neighbourhood	20.Cleanliness and order	24.Age of building
3.Temperament	7.Educational experience	11.Educational experience	17.Contacts with local industry	21.Type and severity of discipline	25.Economic level
4.Attitude towards school	8.Occupational experience	12.Training	18.Relations with youth clubs	22.Possession of books and papers	26.Occupational level
		13.Attitude towards children			27.Crime rate
		14.Attitude towards education and authority			28.Cultural provisions
					29.Moral climate

persons most closely concerned (*pupil*, *parent* and *teacher*), and three covering the major environmental agencies (*school*, *home* and *neighbourhood*). Table 8.3 lists 29 possible factors under these six heads. The table is largely speculative—as any such formulation must be at the present stage of knowledge—and no attempt has been made to suggest degrees of importance. But it will serve to indicate the extent of the field, and, perhaps, to suggest lines of enquiry. What matters, as has been suggested, is the extent of the interactions or covariances between the various factors. Research has already indicated many of these—for example, among the factors listed under I —but many others still remain to be explored. It is an interesting and instructive exercise to make a 29 × 29 matrix, and to mark

known or suspected covariances by placing a cross in the cell at the intersection of a particular row and column. For example, for 4 (*attitude towards school*) we might suggest major interactions with 1, 7, 8, 10, 13, 14, 15, 19, 21 and 27, and smaller, but possibly significant covariance with 2, 3, 5, 9, 12, 17, 26, 28 and 29. Many of these associations have already been demonstrated by research; others are more speculative. Such a matrix, when completed, is likely to show a heavy concentration of crosses along the diagonal, since, for example, the column III variables tend to show associations with each other, as do those in II and those in VI. The value of such a speculative exercise lies in the demonstrations which it affords of the gaps in our knowledge of the areas where research is still needed. Much of our ignorance has been caused by the specialization of research workers, and their inevitable classification into pigeon-holes marked 'pure psychology', 'educational psychology', 'social psychology', 'occupational psychology', 'sociology', 'social anthropology', etc. etc. We know little or nothing about the associations between variables in II with those in IV, for example; or III with VI; or IV with V; or IV with VI. Not only is this a multivariate problem, but it also calls for a multidisciplinary attack.

Regional differences

One of the problems raised by researches such as ours is the question of the degree of generalization which is possible from the results. It is clear to all that an investigation into the social concomitants of educational attainment in a highly urbanized setting cannot be generalized to the rural scene. We know little about educational sociology in any environment other than the modern industrial town. Practically all investigations have confined themselves to cities and towns, and the worst areas of these. One can understand the reasons for this, and yet deplore our lack of knowledge of the special problems of the countryside. What little has been done demonstrates the radical differences that exist between urban and rural problems in this field. Ferrez (1961) shows, for example, that in France geographical factors 'are even more important than the social ones; and that the effects of these two kinds of factors are particularly decisive when combined, i.e. in rural areas . . . the distance between a child's home and the nearest secondary school is still the most important factor' (p. 77).

It is stating the obvious to point out that our results are not applicable to rural areas. Are they, however, true for all industrial towns? Does Manchester, in 1957, give a picture which is true for all British cities? This is by no means certain. Recently we have witnessed a growing interest in the geographical variations of social conditions in these islands. Taylor (1962) started a discussion in the *Guardian* which provided a rich harvest of opinion and prejudice, and a rather smaller supply of factual data. His own figures on educational provision and opportunity, however, showed clearly the differentiations between north and south. Later correspondence widened the basis of comparison, and the general impression left on the reader was one of deprivation in the north and privilege in the south. A more comprehensive study, employing census data, by Moser and Scott (1961) brought out very clearly the great variation among British towns when social and economic variables are studied, and their factor analysis gave some support to the north *v.* south dichotomy. This use of factor analysis by sociologists is to be welcomed, although it is perhaps a pity that the whole of the nettle was not grasped and rotation of the factors performed to produce a more meaningful and richer interpretation. Nevertheless, their work threw up two major factors, one of *social class*, and one of population growth or *development 1931–51*. Only two educational variables were included in the 57 used by Moser and Scott, so that they were quite swamped in the factor analysis by the social and economic variables. Mr G. M. Forrest has carried out for me a factor analysis of 12 of Moser and Scott's variables, using a varimax rotation, the results of which are given in Table A.11. It will be seen that the first two factors have substantial loadings on the two educational variables. The first factor, correlating ·82 with *social class* and —·77 with *persons per room*, has other substantial loadings on *J-index* (+·48), *households with 5 amenities* (+·40) and *percentage employed in professional services* (+·32). This is a fairly clear factor of 'social class', with correlations of —·85 and +·87 respectively with the educational variables *percentage with terminal education age under 15* and *percentage aged 15–24 in full-time education*. The second factor correlates ·32 and —·28 with the educational variables, and has the following loadings on the social variables: *infantile mortality*, ·84; % *households with 5 amenities*, —·69; *J-index*, —·60; *birth-rate*, ·50; *social class index*, —·45. This is a factor with elements both of economic level and parental care. This factor pattern is one which

gives general support to our own Manchester results, and suggests that although there are many regional differences among towns, some of the associations of social and educational variables found in the Manchester survey may possess a fairly broad degree of generalization. To claim more than this would be hazardous in the extreme.

Economic factors

Our stress on attitudinal and motivational factors should not lead us to ignore the possible effect of economic factors. It has not been uncommon for writers in the last decade to assume that the welfare state has abolished poverty, and so to imply that the economic factors which loomed so large in the social surveys of the inter-war years are no longer important. Such a view is of doubtful validity. It is undoubtedly true that the total volume of economic hardship has been dramatically reduced, but poverty has not been entirely eliminated by any means. Lady Wootton (1959) has described the Army of the New Poor, 'those working-class families in which the bread-winner does not earn exceptionally high wages, and in which there are several young children and no supplementary earners. Children's allowances notwithstanding, families in this position have a very hard struggle.' It will be remembered that our two variables of *shoes and clothing, free*, and *shoes and clothing, full-cost*, had interesting connections with the economic level of the family, and that they showed markedly different loadings on Factors II and III (Table 7.10). The differentiation between these variables suggested in Chapter VII receives indirect support from Wilson (1962) when she writes: 'For a large family an unskilled labourer's wage plus family allowances is not sufficient to raise the family above subsistence level, and . . . such a position may easily lead to voluntary periods of unemployment.'

The elimination of poverty is not yet complete, but the incidence is now only a fraction of what it was in the hungry 30's. And yet this great social amelioration has not produced any sensible levelling-out in other indices of social differentiation. In the medical field, for example, Susser (1962) comments: 'The planners of the Welfare State intended to eliminate poverty, and with this the different incidence of disease between rich and poor. Taking stock now, in 1961, we can say that this has not yet come about. The infantile mortality rate, for instance, has fallen in almost parallel fashion in each social

class, and among the new-born in the first month of life the disparity is perhaps greater than before.'

Methodology

There may be many readers who feel that the sum total of our research efforts, two ward surveys in Manchester, a school survey in Salford, has produced remarkably little in the way of hard fact on which action might be based. Such a view is understandable, but is demonstrably over-pessimistic and unrealistic. We are still quite a distance from that stage of systematic knowledge at which confident recommendations can be made about desirable social and administrative action. And the methodology of our investigations has been of a kind that is not designed to lead to such recommendations. The use of factor analysis indicates a pre-judgement: that our present state of knowledge is so elementary and fragmentary that the immediate research task is to attempt to *structure* the field, in the hope that we may achieve further insights (even if these be partial) into the complex of inter-relationships of variables and factors. Only in this way can new and more promising hypotheses be formulated, to serve as spring-boards for further research. Whatever results we may achieve from ecological surveys of this kind must be buttressed by investigations of individual children and individual families before an assessment can be made with any confidence of the true significance of our findings.

The need for investigations with the pupil and his family as the unit is brought into clear relief when we consider what is perhaps the most promising result of our efforts: the indication that attainment is mediated by factors of *parental care*. The contrast between the psychological aspects of this (what we have called *family care*) and the more physical aspects (*home care*) is an unexpected and suggestive finding. But such an interpretation of our results can hardly be more than tentative, based as it is on analysis of wards, and until corroboration is found from the study of individual families it must remain so. Bound up with this is the differentiation between different aspects of educational attainment, both by area of study (in our work, reading *versus* arithmetic) and by method of measurement (backwardness and brightness *versus* mean score). These results have very important implications for further research and are a very strong counter-indication against using only average scores, and global measures of attainment. To the research worker in his pursuit of truth

and knowledge—and particularly to one exploring such a complex field—these are the results which give him satisfaction; the signposts, some large, others small, some clear, others almost indecipherable, which he has uncovered for the guidance of future workers.

APPENDIX

TABLE A.1

SAMPLE BY AUTHORITY AND TYPE OF SCHOOL

Type of School	Manchester			Salford			Stockport			Lancashire		
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
Grammar	484	403	887	89	161	250	154	190	344	276	370	646
Technical	235	66	301	108	16	124	89	36	125	80	64	144
Central:												
Roman Catholic	69	112	181									
C. of E.	67	65	132									
County	245	189	434									
Total			747									
Modern	962	1055	2017	312	264	576	344	334	678	773	847	1620
All-age:												
Roman Catholic	664	657	1321	172	172	344	80	65	145	87	125	212
C. of E.	302	336	638	190	192	382	22	34	56	61	62	123
County	739	659	1398	245	216	461	64	59	123	52	37	89
Total			3357			1187			324			424
Grand Total	3767	3542	7309	1116	1021	2137	753	718	1471	1329	1505	2834

APPENDIX

TABLE A. 2

MEAN RAW SCORES BY AUTHORITY, SEX AND TYPE OF SCHOOL

School Type	Sex	Intelligence				Reading				Arithmetic			
		March	Salf.	Stock.	Lancs.	March	Salf.	Stock.	Lancs.	March	Salf.	Stock.	Lancs
Grammar	B	63.61	65.48	63.16	69.71	47.79	48.13	46.08	49.23	46.68	49.60	42.25	47.91
	G	61.17	55.80	61.08	65.63	45.82	43.19	43.99	46.55	41.57	37.74	44.23	44.95
Technical	B	43.67	53.63	53.44	48.08	40.74	42.25	44.18	42.08	41.45	45.06	47.02	43.43
	G	44.92	44.50	53.14	45.06	38.59	38.13	41.67	39.23	38.17	30.94	45.53	43.94
Central:													
Roman Catholic	B	47.13				45.09				36.25			
	G	47.91				42.63				36.63			
C. of E.	B	45.28				43.37				35.30			
	G	45.22				39.29				37.34			
County	B	50.18				43.42				39.84			
	G	45.72				38.95				37.53			
Modern	B	22.09	25.93	27.63	24.99	27.68	30.76	31.56	29.48	23.09	25.70	25.17	24.18
	G	22.28	22.71	32.85	26.51	26.76	27.33	31.39	29.03	21.65	21.96	28.75	24.04
All-age:													
Roman Catholic	B	20.87	20.60	28.14	22.60	28.29	29.12	31.39	29.34	21.21	22.98	26.51	21.41
	G	19.82	22.78	24.95	24.13	26.19	27.53	28.00	28.58	19.04	21.42	21.91	24.43
C. of E.	B	22.61	20.24	18.77	22.93	28.93	27.60	24.77	27.95	24.82	21.52	21.27	25.56
	G	21.64	19.11	19.12	21.13	25.36	25.43	23.44	25.39	21.73	22.01	17.21	23.82
County	B	24.34	24.76	20.69	39.90	29.43	29.06	22.27	29.71	25.90	27.42	22.54	27.62
	G	22.32	21.31	24.49	36.11	27.15	25.99	24.11	25.78	23.02	23.42	25.93	23.70
Modern plus all-age	B	22.47	23.44	26.64	25.45	28.46	29.35	30.33	29.38	23.60	24.78	24.96	24.20
	G	21.61	21.55	30.27	26.25	26.55	26.60	29.83	28.65	21.36	22.23	26.92	24.06

TABLE A. 3

MEAN STANDARD SCORES BY AUTHORITY, SEX AND TYPE OF SCHOOL

School Type	Sex	Intelligence				Reading				Arithmetic			
		M	Sa	St	L	M	Sa	St	L	M	Sa	St	L
Grammar	B	119.5	120.5	119.0	122.5	116.0	116.5	113.0	118.5	114.5	119.0	113.0	116.0
	G	118.0	116.0	118.0	120.5	117.0	113.5	115.0	118.0	112.5	109.0	116.0	117.0
Technical	B	109.0	114.0	114.0	111.0	107.0	108.5	111.0	108.0	108.5	113.0	115.0	110.5
	G	110.0	109.5	114.0	110.0	108.5	108.0	111.5	109.0	109.0	103.0	117.5	116.0
Central	B	112.0				111.0				106.5			
	G	110.5				110.0				109.0			
Modern	B	97.0	99.0	100.0	99.0	93.5	97.0	97.0	95.5	95.0	96.5	96.0	95.0
	G	97.5	97.5	103.0	99.5	96.0	96.5	100.5	98.0	96.0	96.0	102.0	98.0
All-age	B	97.5	97.0	98.5	100.0	95.0	94.5	93.5	95.0	95.0	95.5	95.5	95.5
	G	97.0	97.0	98.0	99.0	95.5	95.5	94.0	96.0	96.0	96.5	96.0	98.0

TABLE A. 4

PERCENTAGES OF 'BRIGHTNESS' BY AUTHORITY AND TYPE OF SCHOOL

Type of School	Intelligence				Reading				Arithmetic			
	M	Sa	St	L	M	Sa	St	L	M	Sa	St	L
Grammar	70.6	65.6	81.4	82.5	62.5	51.6	67.2	68.7	52.3	42.8	71.8	63.8
Technical	21.3	41.1	41.6	30.6	21.9	21.8	40.8	27.1	35.2	38.7	64.8	47.9
Central:												
Roman Catholic	27.1				39.8				16.0			
C. of E.	23.5				28.0				18.9			
County	31.8				28.6				25.8			
Total	29.2				31.2				22.2			
Modern	1.9	4.5	5.9	4.4	3.4	7.3	6.0	6.1	3.7	6.3	7.8	6.8
All-age:												
Roman Catholic	2.3	1.5	7.6	3.3	4.7	5.2	8.3	3.3	3.6	5.2	9.7	5.2
C. of E.	2.2	1.3	0.0	3.2	3.3	5.5	0.0	3.2	8.6	4.5	1.8	8.0
County	3.6	3.7	2.4	18.0	4.2	4.1	1.6	6.7	6.3	9.8	6.5	6.7
Total	2.8	2.3	4.3	6.3	4.2	4.9	4.3	4.0	5.7	6.7	7.1	6.3

For the base numbers for these percentages, see Table A. 1

TABLE A.5

PERCENTAGES OF 'BACKWARDNESS' BY AUTHORITY AND TYPE OF SCHOOL

Type of School	Intelligence				Reading				Arithmetic			
	M	Sa	St	L	M	Sa	St	L	M	Sa	St	L
Grammar	0.0	0.0	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Technical	0.7	0.0	0.0	0.0	0.3	0.0	0.0	0.7	1.0	0.0	0.0	0.0
Central:												
Roman Catholic	0.0				0.0				0.6			
C. of E.	0.0				0.0				0.0			
County	0.0				0.0				0.0			
Total	0.0				0.0				0.1			
Modern	22.1	21.5	13.9	17.2	21.4	19.8	13.0	16.9	19.3	20.7	14.5	18.9
All-age:												
Roman Catholic	28.8	24.1	17.2	18.9	23.8	20.1	17.2	17.0	26.8	22.1	16.6	21.2
C. of E.	23.7	27.5	26.8	27.2	23.2	26.4	23.2	28.8	21.8	23.8	28.6	23.2
County	18.5	24.5	18.7	5.6	18.1	23.0	34.1	20.2	17.5	19.7	24.4	13.5
Total	23.5	25.4	19.4	18.5	21.3	23.3	24.7	21.1	22.0	21.7	21.6	20.2

For the base numbers for these percentages, see Table A.1

APPENDIX

TABLE A.6

INTERCORRELATIONS - 1951 SURVEY

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
1 MD rate																1
2 Birthrate	635															2
3 Illegitimate birthrate	678	441														3
4 TB rate	706	763	461													4
5 Neglected children	569	612	611	572												5
6 J-index	669	553	275	558	313											6
7 Deathrate	442	435	210	434	399	364										7
8 Persons per acre	515	493	406	542	505	500	567									8
9 Infantile mortality	082	345	106	021	354	-010	184	028								9
10 Infectious diseases	070	492	-031	377	246	206	-051	029	039							10
11 Backwardness: Intelligence	836	687	664	632	504	366	360	326	254	029						11
12 " :Reading	636	368	484	318	234	349	154	368	162	-207	754					12
13 " :Arithmetic	599	534	720	510	572	124	-006	511	139	083	664	432				13
14 Brightness: Intelligence	550	303	431	159	234	249	081	192	202	-002	573	646	4 99			14
15 " : Reading	063	-021	-072	-161	252	162	-142	-138	173	178	-009	-069	0 63	302		15
16 " : Arithmetic	224	279	154	223	213	179	199	220	092	000	253	301	3 90	392	043	16
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	

Decimal points omitted. Signs reversed on variables 6, 14, 15, 16.

TABLE A.7.

FACTOR ANALYSIS - PRINCIPAL COMPONENTS

	I	II	III	IV	h^2
Mental Deficiency	.901	.047	.104	.029	.826
Birth-rate	.816	-.347	-.187	.021	.822
Illegitimate Children	.737	.230	.103	.301	.697
T.B. rate	.779	-.427	.093	.221	.847
Neglected children	.726	-.188	-.284	-.030	.644
J-index	-.603	.322	-.035	.197	.507
Death-rate	.488	-.394	.337	-.569	.831
Persons per acre	.660	-.270	.322	-.119	.626
Infantile mortality	.255	.096	-.414	-.507	.503
Infectious Diseases	.181	-.559	-.583	.324	.790
BACKWARDNESS:					
Intelligence	.864	.243	.048	.062	.812
Reading	.660	.505	.229	-.088	.751
Arithmetic	.740	.282	-.111	.396	.796
BRIGHTNESS:					
Intelligence	-.577	-.587	.219	.108	.737
Reading	-.045	-.156	.762	.240	.665
Arithmetic	-.394	-.217	.049	.214	.251
Percentage variance	40.7	11.6	9.8	7.3	69.4

TABLE A.8

INTERCORRELATIONS - 1957 SURVEY

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
1 Backwardness: Intelligence																													1
2 " : Reading	799																												2
3 " : Arithmetic	828	776																											3
4 Brightness: Intelligence	787	727	731																										4
5 " : Reading	664	756	639	778																									5
6 " : Arithmetic	773	733	779	806	667																								6
7 Mean score: Intelligence	905	828	869	858	785	858																							7
8 " " : Reading	806	828	806	781	790	722	894																						8
9 " " : Arithmetic	852	805	875	876	740	910	941	824																					9
10 Persons per acre	203	233	297	266	100	335	206	141	265																				10
11 Birthrate	400	450	250	535	570	491	460	418	418	370																			11
12 Illegitimate birthrate	271	232	255	424	278	339	351	293	316	445	677																		12
13 Deaths under 1 year	052	093	000	006	-022	131	-012	053	065	024	233	263																	13
14 Deathrate	-173	-081	-124	-035	-022	051	-105	006	-076	262	065	313	367																14
15 Cruelty & neglect	446	525	400	556	590	506	506	529	476	265	788	550	371	105															15
16 NSPCC advice sought	241	338	160	412	469	330	364	313	284	097	786	593	176	118	847														16
17 MD rate	354	397	372	314	429	500	428	400	418	565	681	456	312	280	688	535													17
18 Probation: young persons	361	415	358	565	487	361	444	348	445	032	640	353	180	-255	695	686	419												18
19 " : children	353	349	297	343	455	307	434	324	312	087	599	442	324	-069	769	704	561	666											19
20 J-index	314	310	355	291	112	519	354	301	407	655	372	463	254	491	313	211	726	039	110										20
21 Verminous conditions	277	335	301	531	434	399	361	384	430	269	588	416	189	074	705	565	539	559	456	385									21
22 Scabies	152	129	144	242	170	269	155	173	179	414	471	424	328	276	519	376	544	372	401	496	542								22
23 Immunisation: diptheria	-238	-233	-177	-373	-551	-324	-324	-265	-312	065	-681	-281	029	391	-576	-609	-359	-650	-567	100	-453	-315							23
24 " : whooping cough	-093	-222	-046	-213	-356	-290	-171	-147	-206	-206	-555	-152	012	280	-294	-216	-282	-335	-237	047	-166	-235	682						24
25 Shoes & clothing, total	198	175	130	270	417	118	269	208	201	140	496	297	128	-140	629	548	494	509	761	042	547	205	-537	-140					25
26 " " " , free	303	299	138	125	302	240	302	231	219	260	499	271	189	-164	574	441	592	279	617	178	375	274	-396	-243	731				26
27 " " " , full cost	143	063	122	312	306	122	190	095	202	095	430	295	171	-126	582	513	323	534	653	032	598	259	-550	-108	827	426			27
28 Cleansing notices	336	245	320	533	428	472	401	371	441	276	573	439	106	006	665	483	553	470	451	407	866	544	-541	-282	598	456	639		28
29 Committals to care	315	388	248	411	425	280	320	332	320	337	769	589	213	094	770	682	651	576	600	327	674	386	-479	-284	566	542	491	556	29
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	

Decimal points omitted. Signs reversed on variables 4, 5, 6, 7, 8, 9, 20

APPENDIX

TABLE A.9

ANALYSES OF VARIANCE WITH SIGNIFICANT RESULTS

Progressiveness Grades	A	B	C	D
% Brightness (Arithmetic)	12.4	6.3	6.9	5.6

Analysis of Variance

	S.S	d.f	M.S	F	Sig.
Between progressiveness grades	311.9	3	104.0	3.08	.05
Within progressiveness grades	1489.1	44	33.8		
Total	1801.0				

Size of Class	25.4-31.0	31.1-34.3	34.4-35.6	35.7-37.4	37.5-38.9	39.0-44.0
% Backwardness (Arithmetic)	31.9	15.9	27.3	17.3	18.4	21.0

Analysis of Variance

	S.S.	d.f	M.S	F	Sig.
Between sizes of class	1594.3	5	318.9	2.92	<.05
Within sizes of class	4582.7	42	109.1		
Total	6177.0				

% Attendance	87.2-88.6	88.7-89.5	89.8-90.7	90.8-91.2	91.3-92.0	92.1-95.1
% Brightness (Intelligence)	0.7	0.8	1.0	2.3	3.1	5.9

Analysis of Variance

	S.S	d.f	M.S	F	P
Between attendance groups	157.4	5	31.5	3.06	<.05
Within attendance groups	433.6	42	10.3		
Total	591.0				

% Attendance	87.2-88.6	88.7-89.5	89.6-90.7	90.8-91.2	91.3-92.0	92.1-95.1
% Backwardness (Reading)	35.8	22.3	23.1	13.1	23.0	15.9

Analysis of Variance

	S.S.	d.f	M.S	F	P
Between attendance groups	1874.4	5	374.9	2.58	<.05
Within attendance groups	6101.6	42	145.3		
Total	7976.0				

% Attendance	87.2-88.6	88.7-89.5	89.6-90.7	90.8-91.2	91.3-92.0	92.1-95.1
% Brightness (Arithmetic)	5.6	3.3	5.8	1.9	8.1	14.8

TABLE A.9 (Cont'd.)

Analysis of Variance

	S.S	d.f	M.S	F	P
Between attendance groups	798.8	5	159.8	6.69	<.01
Within attendance groups	1002.2	42	23.9		
Total	1801.0				

% Attendance	87.2-92.0	92.1-95.1
% Backwardness (Arithmetic)	31.5	20.1

Analysis of Variance

	S.S.	d.f	M.S	F	P
Between attendance groups	878.0	1	878.0	7.62	<.01
Within attendance groups	5299.0	46	115.2		
Total	6177.0				

Ratings of School Neighbourhood	A	B-F
% Brightness (Intelligence)	4.7	1.6

Analysis of Variance

	S.S	d.f	M.S	F	Sig.
Between ratings of School Neighbourhood	.4	2	193.7	11.39	<.01
Within ratings of School Neighbourhood	58.6	35	1.7		
Total	446.0				

Ratings of School Neighbourhood	A	B	C	D	E	F
% Backwardness (Intelligence)	14.3	21.9	23.7	27.6	25.0	39.2

Analysis of Variance

	S.S	d.f	M.S	F	P
Between ratings of School Neighbourhood	1955.5	5	391.1	2.62	<.01
Within ratings of School Neighbourhood	4780.5	32	149.4		
Total	6736.0				

Ratings of School Neighbourhood	A-E	F
% Backwardness (Reading)	21.1	38.7

Analysis of Variance

	S.S	d.f	M.S	F	Sig.
Between ratings of school neighbourhood	1560.0	1	1560.0	9.43	<.01
Within ratings of school neighbourhood	5956.0	36	165.4		
Total	7516.0				

TABLE A.9 (Cont'd.)

Ratings of School Buildings	A	B-F
% Backwardness (Intelligence)	14.3	27.6

Analysis of Variance

	S.S	d.f.	M.S	F	P
Between ratings of school buildings	889.0	1	889.0	5.47	<.05.
Within ratings of school buildings	5847.0	36	162.4		
Total	6736.0				

TABLE A.10

FACTOR LOADINGS : VARIMAX ORTHOGONAL ROTATION

(Decimal points and plus signs omitted)

Variable	I	II	III	IV	V	VI	h^2
1 Backwardness: Intelligence	883	177	111	021	-032	-008	826
2 " Reading	855	140	104	162	092	-127	812
3 " Arithmetic	881	081	160	-069	080	121	834
4 Brightness: Intelligence	-843	-073	-050	-165	-141	-353	890
5 " Reading	-777	-255	068	-321	-137	-028	796
6 " Arithmetic	-836	-001	-291	-202	-071	-178	861
7 Average: Intelligence	-962	-197	-076	-051	-017	-052	975
8 " Reading	-888	-125	-044	-044	-170	009	838
9 " Arithmetic	-931	-077	-170	-085	021	-208	953
10 Persons per acre	156	041	722	166	089	054	563
11 Birth-rate	294	421	279	621	427	079	926
12 Illegitimate Birth-rate	214	242	329	144	527	177	542
13 Deaths under 1 year	-024	165	100	-026	457	056	250
14 Death-rate	-100	-192	281	-263	673	-035	648
15 Cruelty and neglect	378	614	109	311	490	225	919
16 N.S.P.C.C. Advice sought	212	538	-025	364	526	165	771
17 M.D. rate	273	454	643	217	290	020	826
18. Probation - young persons	323	456	-152	412	191	399	702
19 Probation - children	252	771	-070	201	287	134	803
20 J-index	-254	003	-792	117	-307	-114	813
21 Verminous conditions	230	436	301	146	254	580	756
22 Scabies	047	168	415	213	374	380	533
23 Immunisation : Diphtheria	-183	-429	138	-789	067	-299	953
24 " Whooping Cough	-100	-087	-145	-753	084	-020	612
25 Shoes and clothing (total)	104	904	045	059	-002	183	867
26 Free shoes and clothing	121	747	292	175	-005	-157	713
27 Shoes and clothing, full cost	051	717	-024	054	041	482	754
28 Cleansing notices	243	456	346	190	091	607	800
29 Committals to care	190	584	292	296	368	108	697
Variance	7.765	5.012	2.650	2.622	2.393	1.790	22.232
Percent Variance	34.9	22.5	11.9	11.8	10.8	8.1	100.0

TABLE A.11

Factor-analysis of 12 variables from Moser and Scott (1961).

Varimax rotation

	I	II	III	IV	V	VI
1. Birth rate ratio 1955-57	-.23	.50	-.67	-.02	-.28	-.09
2. % illegitimate births, 1955-57	-.03	.08	.05	.95	-.05	-.02
3. Persons per room	-.77	.07	.05	-.38	-.30	-.05
4. % households with 5 amenities	.40	-.69	-.13	-.27	-.05	.15
5. New housing rate 1945-58	-.02	-.06	-.95	-.03	.08	.01
6. % in professional services	.32	-.14	.02	-.04	.02	.92
7. Social class index	.82	-.45	.10	-.10	.04	.15
8. J-index	.48	-.60	-.09	-.15	.03	.31
9. Infant mortality rate, 1955-57	-.26	.84	-.20	-.09	-.04	.01
10. T.B. notification rate	-.05	.04	-.03	.02	-.97	-.03
11. % with terminal educ. under 15	-.85	.32	-.14	.05	.08	-.17
12. % aged 15-24 in full time education	.87	-.28	.12	-.10	-.01	.27
% variance	28.1	18.6	12.3	9.9	9.4	9.2

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