

## THE PAPERS OF THE ROYAL COMMISSION ON POPULATION

By F. M. REDINGTON, M.A., F.I.A.  
*Actuary, Prudential Assurance Company, Ltd.*

AND

R. D. CLARKE, F.I.A.  
*of the Prudential Assurance Company, Ltd.*

THE main *Report of the Royal Commission on Population*, which was presented to Parliament in June 1949, was discussed at a meeting of the Institute on 5 December 1949 (*J.I.A.* LXXVI, 38). Since that discussion took place the various papers of the Commission have been published, and it seems suitable now to review the demographic aspects of the problems with which these papers are concerned. The following is a list of the volumes so far published:

Report of the Royal Commission on Population

[Pp. 259, Cmd. 7695, June 1949, 4s. 6d.]

Papers of the Royal Commission on Population

Volume I. *Family Limitation and its Influence on Human Fertility during the past Fifty Years.*

[Pp. 202, Dec. 1949, 4s.]

(An investigation carried out by the Council of the Royal College of Obstetricians and Gynaecologists.)

Volume II. *Reports and Selected Papers of the Statistics Committee.*

[Pp. 422, 1950, 8s.]

Volume III. *Report of the Economics Committee.*

[Pp. 64, 1950, 1s. 6d.]

Volume IV. *Reports of the Biological and Medical Committee.*

[Pp. 52, 1950, 1s. 6d.]

Volume V. *Memoranda presented to the Royal Commission.*

[Pp. 120, 1950, 3s.]

The full report on the family census has still to appear.

### GENERAL REMARKS ON DEMOGRAPHIC MEASUREMENT

The statistical analysis of fertility is a comparatively new subject. Ideas have not yet had time to ripen, and there has been such a mass of work done that it is, as yet, difficult to separate the wheat from the great quantity of chaff. The various volumes published by the Royal Commission add a further weighty contribution to the existing mass, and it is difficult to deal faithfully with this material without becoming engulfed in the confusion of detail. It is desirable, therefore, to attempt to establish a general background against which these volumes can be discussed.

The examination of population changes falls into two main lines, which

Hajnal with fair appositeness describes as the 'flow' and the 'stock' respectively. The first category—Hajnal's 'flow'—can broadly be described as the measurement at a moment of time of the rates of marriage and birth at that time. It is interesting for the actuary to notice that the traditional actuarial approach to mortality can be described as a 'flow' approach, since we customarily obtain rates of mortality over a short period of time, and from these rates we construct life tables. The reason for adopting the 'flow' approach to mortality is to have the most up-to-date information available, and this thought depends in its turn on an instinctive feeling that there is a definite trend in mortality which makes the experience of, say, 1950 a more reliable guide to the future than that of 1900. At the same time the actuary is well aware of certain dangers which he takes care to avoid when need arises. For example, he avoids using an experience based on years of war or exceptional epidemic. Further, the actuary is aware that no group of people will actually experience the mortality of 1950 throughout their lives, and when a forecast is specially desirable—as in the calculation of annuity rates—he abandons a table constructed from a short-term experience and examines the trend over a long period.

These difficulties of the 'flow' approach are of much greater importance in work on fertility than in work on mortality. Unlike death, marriage and birth are events in which conscious decision plays a considerable part and are consequently sensitive to fashion—to the general social and economic climate. In one sense every year is an exceptional year so far as birth and marriage are concerned, and it is for this reason that the various indices based on short-term 'flow'—for example, the various reproduction rates, gross, net, or effective—are falling out of favour. It is not that these indices are useless but that they are dangerous, since they crystallize the transient events of the moment into a permanent pattern, as though we were to attempt to estimate the time of a schoolboy's arrival at school from his velocity at any point irrespective of whether that point is opposite the police station or the sweet shop. Even if not misused for predictive purposes and restricted scrupulously to purposes of record, 'flow' indices suffer from the disadvantage that it is not easy to integrate and comprehend the significance of a long series of, say, net reproduction rates.

The temperate criticisms expressed by the *Report* on these 'flow' indices are surely justified.

The other main line of approach—Hajnal's 'stock'—can be described as the examination of the quantity of reproduction achieved by a generation up to a given moment of time. To pursue the analogy of the schoolboy, statistics of 'stock' measure the distance the boy has travelled. In a very general sense an index of 'stock' is the integral of a corresponding index of 'flow'. An example of a 'stock' index is the size of family, which is the main statistical feature to which the Royal Commission finally paid attention. The basic size-of-family table is shown on page 83.

The heading 'Calendar year of observation' is perhaps a misnomer, since the statistics are reconstructed from those of the family census taken in 1946 (brought forward by using the Registrar-General's statistics). The table shows the experience through the various calendar years of those included in the 1946 census. Within this limitation the last line of the table gives the history of fertility at the end of duration 20 for cohorts of couples who married before 1928. For practical purposes this is the complete fertility history of these cohorts. The last column gives the incomplete fertility up to 1948 of marriages

Total number of live births per married woman  
at various durations of marriage

Duration of marriage	Calendar year of observation			
	1930	1931		1948
1	·47	·46		Not available
2	·71	·71		Not available
3	·91	·90		Not available
4	1·10	1·08		1·01
...	...	...		...
20	3·03	2·93		2·12

Extracted from Table 18, p. 117, of the *Reports and Selected Papers of the Statistics Committee* and from Table XXIX, p. 54, of the main *Report of the Royal Commission*.

in successive years of the period 1928-47. Thus by comparison with previous columns it indicates recent trends.

This kind of table is highly informative. Although it needs intelligent appreciation, and requires some qualification, it has a peculiar value. The decline in birth-rates which the last fifty years have experienced is, whatever else may be said about it, mainly a matter of personal decision. There is no appreciable increase in sterility; there may well have been a decrease. There is no increase in compulsion, political or economic, preventing marriage or birth. People are having fewer children because of individual decisions to do so. Whatever the motives for those decisions may be, and whatever the circumstances playing on those decisions—such as economic depression, full employment, war and peace—the total of this interplay of thought and event is summarized for each individual couple by the number of children they have. The table records these facts.

One disadvantage of size of family as an index of reproduction is that it does not directly answer the question which must be paramount in mind: How far has the population been replacing itself? Clearly, replacement requires that the average size of family must be greater than 2, since some of the children will die before reaching reproductive age and others will not marry. The Commission concludes that replacement requires an average family of about  $2\frac{1}{2}$ , but this conclusion, while obviously in the right neighbourhood, is not entirely acceptable for reasons given below.

There are other limitations to the size-of-family table, particularly in its application to the incomplete fertility of more recent marriages. The table is based on duration of marriage and ignores age at marriage. At present marriages are taking place at younger ages, and therefore the table may conceal a potential improvement in future fertility owing to the longer period of reproductive capacity of recently married couples.

Further, the table ignores the proportions married. In recent years there has been an appreciable increase in the proportions married at younger ages, and if this feature is maintained the average family required for replacement may be less than the  $2\frac{1}{2}$  mentioned.

Finally, there is the important point that the table deals only with the average and ignores variations from the average. This question is taken up again later. Nevertheless, it must be repeated that a table showing size of family is an invaluable instrument in the hands of the demographer.

A similar table, which might perhaps be of even more use, could be built up by tracing the births for each cohort of women born in successive calendar years, as follows:

Total number of live female births prior to age  $x$   
per woman born in year N

Age of mother $x$	Year of birth of mother N			
	1850	1851		1935
15				
16				
17				
⋮				

Such a table compounds within itself nearly all the factors ignored by the table of size of family, although it would still be desirable to examine the proportions married at each age and also the proportions of women at each age who have had 0, 1, 2, . . . , etc., children.

The main advantage of the table is that it restricts the difficulty of determining a replacement index; for it is almost a matter of definition that, if the final figure of column N equals or exceeds unity, then the generation of women born in year N has replaced itself. The approach may be elaborated by allowing for declining mortality, but it is to be hoped that some such table—which would of course include illegitimate births and be adjusted for migration—will be prepared as soon as the available data permit.

It is interesting to insurance men to observe how the gradual unfolding of the national population figures has many and close parallels with the gradual unfolding of marine insurance accounts. There can be no underwriter who would countenance the 'flow' approach or indeed any short-circuiting of the double-entry 'stock' table on the lines of those set out above, the principle of which was made statutory by the 1946 Act.

#### DEMOGRAPHIC ASPECTS OF THE MAIN REPORT

The Commission was to be sympathized with in its task. It was appointed in March 1944, and a more inopportune time could hardly have been chosen. The background of that time has to be appreciated before judgment can be passed on the *Report*.

The birth-rate began to fall about 1870 and declined steadily till 1914, but not at a rate to cause concern about replacement. The unfruitful years of the 1914-18 war and the immediate subsequent prolific years were a temporary disturbance which distracted attention from what was happening. The country woke up, as it were, in the 1930's to the fact that a serious decline in birth-rates had taken place and that the question of replacement was at stake. The atmosphere was not improved by statistical forecasts—mathematically accurate but of little other validity—that should current rates of decline continue various catastrophes would ensue. This was the tune whistled by demographers and echoed by the popular press until the 1939 war again distracted attention. When 1944 dawned with the belief that victory was likely and that it was time

to think about the problems of peace, it was natural to consider first one of the problems which had seemed gravest in 1939—the problem of population.

The period during which the Commission was sitting, 1944–49, could hardly have been more unstable from every point of view which the Commission had to consider. Marriages and births were exceptional; a major shift in social philosophy with far-reaching effects on the national economy was taking place. Moreover, the fertility experience of those years was inevitably affected by the wave of the 1914–22 distortions passing through the next generation.

In these circumstances the task before the Commission was unenviable, and in the outcome they deserve the thanks of the country for their exhaustive analysis of the problem and for their refusal to be sensational.

There is no need to elaborate their conclusions in detail here. Broadly the main demographic conclusions can be summarized as follows:

(a) that the size of the family is a significant and convenient measure of population changes;

(b) that the size of family has remained comparatively stable for some twenty years at about 2·2 children per married couple, which for the time being appears to represent the ‘family-building habits’ of the British people;

(c) that arguments can be adduced for the likelihood of both increases and decreases in the size of family, with no certainty either way;

(d) that this figure of 2·2 is some 6% deficient for replacing the population;

(e) that if 2·2 is maintained the population will increase till about 1977 and thereafter slowly decline;

(f) that, in any event, past changes in birth-rates will result in an ageing population.

It is difficult to quarrel with these conclusions in so far as they are statements of what has happened in the past. It is fairly certain that the births to marriages in the years 1923–27 were insufficient for replacement (however we define that expression), although the deficiency was slight. It is also likely that the same conclusion will prove to be true of marriages up to, say, 1935. For more recent marriages the conclusion is much less certain. There has been a good deal of dispute about the Commission’s finding that the present size of family is *certainly* deficient to replace the population and that the deficiency might be roughly computed at about 6%. The assertion appears to be somewhat rash in view of the increasing proportions married and the earlier age at marriage. Furthermore, as will be noted in more detail in the next section, the recent rapid decline in infantile mortality has already removed a part of any deficiency there may have been.

The full context does much, however, to moderate the emphasis which is left by the bare repetition of this disputed passage. We have been witnessing a major change in the national family-building pattern, and it is too early to say where or whether a new equilibrium will be found. It is probably true that most violent changes overshoot the mark, and the drop in size of family may have threatened the replacement level. The *Report* says little more than that and it was surely its duty to say so much. Thus, it does not say that the deficiency will continue; indeed, it devotes many pages to the various factors operating for and against an increase in family size, and studiously avoids coming to a conclusion.

The reader emerges from this spate of words a little tired, a little confused and a little sceptical. Though the Commission cannot be blamed for refusing to predict the unpredictable, the reader could wish for more pith and less padding.

Monumental as the work of the Commission is, it has failed to strike the public imagination. Already it is acquiring the layer of dust which accumulates on those volumes that we respect too much to discard but love too little to read. Is this public apathy due to the quiet integrity of the Commission in avoiding dogma and sensation, or is it due to some lack of depth and perception in their appraisal of the situation?

History may answer: 'Both.' Though the reader will be grateful for the scholarly and restrained analysis of the problem and the intellectual humility of its presentation, he may feel that the *Report* has in some way failed to appreciate the drama of what has been happening to the birth-rate in western Europe.

Many aspects of this fascinating but formidable subject lie beyond the range of scientific inquiry. On this threshold, where the complexities of modern civilization impinge on fundamental urges of human nature, our attempts at analysis may well prove sadly inadequate. It is to be regretted, therefore, that the Commission did not stand back more deliberately from its problem and review it in a wider perspective.

The wider perspective which is so noticeably absent from the *Report* is the examination of the recent phenomenon of a decline in the birth-rate in the light of the almost universal story of the struggle between the over-fertile race and limited food resources. There have been few occasions—few in time or place—in the history of the human race when there was any great hope that the newborn infant would survive to live a full life. Death from disease was frequent, but merciful perhaps compared with the inevitable alternatives of death from starvation or fratricide.

Although there have been many local or temporary variations—such as, for example, were associated with the development or devastation of particular areas—there have perhaps been only two major phases of human history when large-scale expansions of population have been possible: the first in neolithic times when, as Prof. Gordon Childe has pointed out,\* the change from a food-gathering society to a food-producing society was followed by a very substantial increase in the human species; the second in the Western world during the eighteenth and nineteenth centuries, when the discovery of new methods of agriculture and other scientific advances greatly multiplied the food-producing possibilities.

By and large, however, human population has always been subject to the Malthusian checks. This fundamental fact of existence is to-day particularly manifest in India and China, where the pressure of increasing numbers in relation to inadequate food resources is the grimmest problem which now faces mankind.

Is it too much to say then that the news which came out of western Europe in the first half of the twentieth century, proclaiming that a free people could of its own voluntary action moderate its rate of growth and so hold out to its children the possibility of freedom from want, was an outstanding landmark in world history? A hundred years ago it would have seemed mere wish-thinking to expect that such a source of salvation would appear.

This view of the problem may not be the end of the story but it is the beginning. The Commission is not oblivious of the benefits of a restricted birth-rate, but it has not given them the prominence in its *Report* which they may be accorded by the verdict of history.

\* *What Happened in History* (London, 1942).

The background of the *Report* is basically: 'This is a grave problem although there are mitigating features.' The *Report* might have been very different if it had said: 'Fundamentally this is good news, but it raises some problems of readjustment.'

There is another general and human aspect of the problem which is not given proper emphasis in the *Report* but which might also have fired public imagination. This aspect is the difference between the average and the individual. In the first place, the variations from the average may affect the conclusions about the numerical growth of the population. For example, should the population contain sub-groups which are genetically separate, some of which have a reproductive rate of less than unity while others have a rate of more than unity, then as a mere matter of mathematics it would follow that, while the total population might very well decrease for a time, those sub-groups which were not reproducing themselves would die out, and in the long run the population would increase again as the proportion of the sub-groups with higher fertility increased. Put crudely,  $e^{\alpha t} + e^{\beta t}$  can decrease initially, but will ultimately rise if either  $\alpha$  or  $\beta$  is positive.

It is not suggested that the population of this country contains biologically distinct groups marrying only among themselves (although there may be cultural groups who do so); but in this connexion hereditary factors cannot be limited to the strictly biological. We must include in heredity those factors—strictly speaking environmental—which arise from the child's early nurture, i.e. that part of our environment which comes from our parents. If unselfish traits can in this sense be regarded as hereditary and if unselfishness is a major factor in decisions relating to size of family, a steady increase in the less selfish and more fertile sections of the community is a possible development. There is evidence that the present apparent stability in size of family is partly due to a compensating decline in both the childless family and the large family. If the childless family is often due to selfishness and the large family often due to ignorance, the rather barren demographic situation of recent decades may be no worse than that of the orchard after pruning.

#### REPORTS AND SELECTED PAPERS OF THE STATISTICS COMMITTEE

When the principal *Report* of the Royal Commission appeared in June 1949, most actuaries felt handicapped in forming an appraisal of the Commission's work by the lack of information concerning the statistical material and methods on which the conclusions presented to the nation had been based. A year later this gap was largely filled by the publication of Volume II, *Reports and Selected Papers of the Statistics Committee*. Nevertheless, it must be regretted that, although a preliminary report on the family census is included in the present volume, the complete report on this vitally important mass of demographic data has still to appear. The delay between the taking of the census in February 1946 and the publication of the statistical analysis (still outstanding in December 1950) must give serious concern to all students of demography; and it is to be hoped that when future investigations of this kind are conducted the results may be made known within a much shorter period.

The most salutary feature of the papers of the Statistics Committee, as of the main *Report*, is a general absence of dogmatism. There is throughout a spirit

of restraint which shows itself in a recognition that, even if the investigator had all the data for which he could conceivably wish, it is still hardly possible to determine precisely the extent to which a given population is *currently* reproducing itself. When the dogmatic, and sometimes arrogant, pronouncements on population problems which were made in the 1930's are recalled, this new attitude is a welcome change for the better.

Differences of opinion certainly existed among members of the Statistics Committee, and these differences have necessarily been retained in the published documents. Thus while the majority opinion inclines to the modern view that reproduction rates are, like the expectation of life, interesting rather than informative and leans towards size of family or a similar index of 'stock' as the more convenient guide, the two senior statisticians of the General Register Office have, in an addendum to the Introductory Memorandum, entered a trenchant defence of the Effective Reproduction Rate (E.R.R.). They maintain that the E.R.R. has been criticized for failing to fulfil what its supporters have never claimed for it. It is, they declare, a useful control index for the demographer to have at his disposal, and its trend over a prolonged period of years undoubtedly gives a reliable guide to the level of reproductivity. While granting that major disturbances such as war play havoc with the E.R.R., they assert:

Shortcomings in the E.R.R. are neither more nor less than those pertaining to any other system of measurement and all that can be done in such circumstances is to reserve judgment until the emergency is sufficiently passed to enable the period as a whole to be seen in a reasonable perspective.

In so far as this defence of the E.R.R. consists of warnings against its misuse and of scepticism about indices in general, the reader may well sympathize. In so far, however, as it makes special claims for the E.R.R. the reader may feel that it is a question of personal preference and train of thought. No single index can give all the information required, and though the E.R.R. is one among a number of indices and probably the best of its particular class, many students of the subject will share the apprehensions of the majority report about reliance upon any form of reproduction rate.

Before we come to the main courses of the statistical banquet which the Committee has prepared, there is a succession of *hors d'œuvres*. Among these is a report by the Committee on the organization of official work on population statistics. This very fittingly ventilates the conflict of interest between the administrative and statistical sides of the General Register Office. The same conflict is sometimes to be found in other administrative bodies both within the Civil Service and outside it. As a consequence, the value of the statistical mind in administration and management has become increasingly recognized. The Committee's recommendation that 'the Registrar-General should normally be himself a person qualified to deal with statistical issues' seems so obviously right that any alternative opinion appears untenable.

Another of the Committee's reports deals with the nature of the statistics required for the analysis of fertility, and discusses the relative advantages of a central family index (which would eventually contain an 'in force' card for every family in the country) and of periodic family censuses. After receiving comments from the Registrar-General on the cost and on what is called the 'administrative workability' of a family index, they decided against this proposal and in favour of regular family censuses. As these will presumably be

carried out on a sampling basis, there exists a wide field of research for the adaptation of sampling theory to the statistics of reproductivity.

Three of the memoranda included in the present volume were compiled by the Government Actuary's Department. The first of these is a note on standardized reproduction rates and is an attempt to discount the effect of the abnormally high number of marriages in the early war years by applying the select issue rates actually experienced to a hypothetical standard population of married women. The effect is remarkable, and for the 1942 over the 1938 rate converts an increase of 4% into a decrease of  $8\frac{1}{2}\%$ . In other words, the increase in reproductivity (as measured by this particular index) during that period could have been due not to any rise in the select issue rates but to increases in the proportions married. This is an interesting commentary on 'flow' indices and is a salutary warning against their misuse.

The remaining two contributions from the Government Actuary's Department deal with mortality and consist of a hypothetical life table for 1942-44—now already out of date owing to the substantial fall in mortality since that period—and a memorandum entitled *The Course of Mortality in Great Britain*. The latter discusses various methods available for projecting mortality rates and reaches the conclusion that the most suitable procedure is to fit exponential curves to the death-rates in age groups. Data for the period 1900-45 have been used for the process of fitting, and a series of diagrams has been reproduced illustrating projected rates of mortality up to the year 1980. No ultimate or limiting value for  $q_x$  was assumed in this projection (such as was done, for example, in the construction of the  $a(f)$  and  $a(m)$  tables). But so long as the projection does not extend beyond a few decades—and actuaries seldom care to commit themselves too far ahead—the assumption of a limit beyond which no further improvement in  $q_x$  is to be expected has the effect of introducing an additional parameter in the projection formula and can be justified only if it should prove indispensable to achieving a satisfactory fit. In the present case there can be no question that, as may be observed from the charts printed at the end of the memorandum, an excellent fit with the data yielded by past experience was in fact achieved.

It is perhaps uncharitable to compare the mortality rates projected by this method for the most recent year for which statistics are at present available—viz. 1948—with the rates that have actually been experienced. But it has to be recorded that at both the young and the old ages the projection has proved well above the observed rates, although it is close enough at the middle ages of life. It is only fair, however, to give the following quotation from the report (p. 62):

It must be emphasized that the experiment of fitting these four simple types of curve was not made under any delusion that it would be possible to derive from the experience of the last half-century a 'law of mortality' which could be automatically used to obtain projections extending for an indefinite period into the future.

The most important fall in mortality, which the projection did not and could not foretell, has occurred at the ages of infancy. Between 1941 and 1948 the death-rate in England and Wales for males under one year of age fell from 57 to 38 per thousand. It will be surprising if by 1978 the figure has not fallen considerably below the 29 per thousand forecast by the memorandum. The same is equally true for females, and there can be no question about the effect which the fall in infant mortality has upon any index employed to measure reproductivity. It is worth noting in passing that this fall already achieved

goes some way to moderate the main conclusion of the *Report* that the present size of family is insufficient for replacement.

The memorandum also discusses the generation theory of mortality and provides a further set of charts illustrating projections on this basis. As is to be expected, however, the generation method produces rates of mortality at the older ages which are too low and, although various modifications for overcoming this were proposed, the Statistics Committee decided against adopting the generation hypothesis in estimating the course of future mortality. With this decision it is difficult to quarrel, for although many improvements in mortality may be due to—or correlated with—generation influences, the recent developments in chemotherapy can hardly be included among them.

We now turn to the preliminary report on the family census, which is in many ways the most interesting document among these papers. The perplexities encountered in the study of fertility rates have led to increasing emphasis on the investigation of family size as a useful index of population growth. As Ogborn pointed out in the Institute discussion on the Royal Commission's *Report* (*J.I.A.* LXXVI, 57), statistics relating to family size were compiled in the nineteenth century both by Farr and by Charles Ansell junior; but, although the 1911 Census included questions on this subject, the use of the mean size of family as a replacement index is comparatively new.

As is well known the family census was conducted on a sample basis. Response was voluntary and amounted in the first instance to 84·7% of the total of the sample. The initial problem facing the investigators, therefore, was the possibility of bias resulting either from failure to contact individuals drawn in the sample or from refusal to respond. Both these possible sources of bias were obviously important. Childless women were more likely to be in employment than those with children and were accordingly less likely to be found at home by interviewers. Equally, motives of reticence might operate more powerfully with childless women and make them less willing to respond. Refusal might also be correlated with social class, women of one class proving more reticent than those of another; and since fertility varies with class this reticence might materially affect the validity of the results.

From the statistics collected by the Registrar-General for 1938 and subsequent years it was possible to derive 'true' percentages of women married in each of the years 1938-45 who were childless at the date of the census. These percentages were compared with corresponding percentages from the family census, and it was then established that the family census data materially understated the proportions of childless women. But by using both the 'true' proportion of childless women and the proportion among those who responded to the census inquiry, it was possible to calculate what the proportion among the women omitted from the census should be. This was accordingly done and the results were then compared with the proportions derived from a postal follow-up among refusals and 'no contacts', to which 17% of women originally omitted from the census responded. The agreement between the two sets of results was close, and it was concluded that the proportions of childless women yielded by the follow-up inquiry could safely be assumed to apply equally well to the women who were omitted altogether. Consequently in all subsequent calculations this assumption was employed to adjust the proportions of childless women emerging from the census data.

A comparison between the census and the follow-up inquiry in respect of the mean number of children born to fertile women at successive durations of

marriage revealed no significant difference. It was accordingly concluded that there was no bias in the census data regarding the size of family of the fertile. This conclusion was undoubtedly rather bold since the follow-up inquiry brought replies from only 17% of the original total of 'no contact' and 'no response' cases. There remained a hard core of 12.6% of the total sample for which no information was obtained; and it is not inconceivable that in this 12.6% there was a definite class bias.

However, it is difficult to see what other line the investigators could have adopted, and all that can be done is to bear this possibility of bias in mind when reviewing the final results. These are spectacular enough and show that as between marriages taking place during 1900-09 and those of 1925 there was a fall of 30% in the number of children per married woman. To include the experience of more recent marriages it is necessary to think in terms of 'incomplete fertility'; but for marriages of 10 years' duration there has been a fall in average family size from 2.51 for marriages in 1900-09 to 1.61 for marriages in 1935. The bulk of this fall occurred in the earlier part of the period, and among more recent marriages there has been a tendency for the family size to become stabilized.

The analysis of fertility by social class is of particular interest. In the present report on the family census the sample has been divided into two groups according to husband's occupation, viz. 'manual' and 'non-manual' workers. The result shows that the fall in family size has followed a closely parallel course in the two classes, the ratio of the family size of non-manual workers to that of manual workers having remained constant at about 70% over a considerable period.

There is, however, some indication that, for marriages taking place in recent years, the fertility of non-manual workers may be stabilizing while that of manual workers is still falling. Consequently the class differential may possibly diminish.

Final judgment on the methods employed in analysing the family census must await the now long overdue publication of the full report. It is to be hoped that this will contain an examination of the influence of age at marriage on family size. A double-entry table, showing the family size at duration 20 for specimen years of marriage and for each age of wife at marriage from 18 to 30, would be highly informative.

Perhaps another hope may be voiced. The sample has been criticized *ad nauseam* for being far too large. The delay in publishing the results goes a long way to justify the criticism. But when the statistical analysis is eventually laid before the public it is natural to expect that this great mass of data will have been classified and subclassified to yield as much information as possible. For example, it will be valuable to know something of regional and occupational variations in the age distribution at marriage and in size and structure of family. Indeed, there are many lines of investigation which researchers in demography have long wanted to pursue, and the family census should be able to provide the material of which at present they stand so much in need.

More than half of the volume under review is taken up by two lengthy and useful contributions to demographic analysis by J. Hajnal. The first of these is an analysis of the birth statistics for 1939-43. It was prepared in 1946, and a note by the author explains that since its completion further data have been published in the light of which he has modified some of his opinions. Nevertheless, the document has a historical interest and is notable for its analysis of

fertility rates both by duration and by birth order. The author stresses the importance not only of breaking down fertility rates into the contributions made by each birth order, but also of calculating 'true' birth-order rates where the births of order  $n$  are related to the appropriate denominator, i.e. the number of women who had already had  $(n - 1)$  children at the beginning of the year.

The second article by Hajnal is an examination of the births, deaths and reproductivity in England and Wales for the period 1938-47. The author endeavours to analyse the increase in fertility which occurred in the latter part of that period into three causes, viz.

- (1) the postponement of births from the early years of the war;
- (2) the increase in marriages leading to a substantial rise in the number of recently married women exposed to risk;
- (3) a genuine increase (if any) in family size.

Owing to lack of all the data that would be required to carry out this analysis as rigorously as he wished, Hajnal is unable to be very definite in his conclusions. But he is prepared to admit the possibility that the level of legitimate fertility in 1947 'may be more than 10% above the 1938 level'.

Hajnal then turns to the construction of reproduction rates. And here it may be opportune to remark that one of the basic difficulties in deciding on a satisfactory index of reproductivity is in essence identical with the problem which faced the General Register Office in the construction of comparative mortality indices. Reduced to its simplest terms it is the difficulty of selecting a suitable series of weights to apply to the rates of mortality or fertility emerging from the data.

With fertility we have to consider not only how many persons will survive to age  $x$  out of 1000 born, but also how many of these will be then married at durations 0, 1, 2, ..., etc. Quite different answers are found to this latter question if we use the existing proportions married at each age and duration from those given by constructing a population of single and married persons from current rates of marriage. As already indicated this distinction is characterized by Hajnal as the difference between the 'stock' and the 'flow', or between the population as it is and the population as it would become if current rates were stabilized for an indefinite period. Between these two concepts there is a fundamental dichotomy which constitutes the intractable core of the problem of measuring reproductivity.

Working on various alternative assumptions, Hajnal produces a series of reproduction rates varying from .81, which he admits to being certainly too low, to 1.00, which he regards as the upper limit. However, had he been able to allow fully for the reduction in infant mortality which we now know to have occurred, it seems probable that he would have increased his upper limit to about 1.02. Be that as it may, there can be nothing but commendation for the statement that 'the variety of reproduction rates is only a reflection of the limits of knowledge about the demographic prospects'.

It is to be questioned whether the tendency to neglect age and to concentrate on duration of marriage as the primary factor in fertility rates has not been carried too far. While Hajnal freely admits that, at a given duration of marriage the fertility of younger women is greater than that of older women, he prefers to base reproduction indices on fertility rates that vary with duration only. He affirms that, although the modern tendency is to marry young it does not follow that the family size will increase. But, since he is calculating

a range of indices with a view to giving upper and lower limits, one estimate could well be based on a combination of current select issue rates with a population of married women (analysed by age and duration) derived from current marriage rates. Instead, his upper limit is based on a 15 per cent increase over the number of births per marriage yielded by 1938 fertility rates and is too arbitrary to command confidence.

There remains one more item in Volume II which has yet to be noticed. This is a series of projections of the population of Great Britain over the period 1947-2047 based upon sixteen different sets of assumptions regarding the future trend of mortality, marriage and fertility. We are thus presented with sixteen different estimates of the population in 2047, and these range from 26,617,000 to 61,382,000.

The possible permutations of different assumptions for projections of this kind are, of course, numberless. Yet it may be felt that if only two different assumptions regarding the future trend of mortality were to be allowed, it would have been better to have 'declining slowly' and 'declining more rapidly' than the two categories 'constant' and 'declining' which were in fact employed. The assumption that mortality will remain constant is so out of touch with reality that it can hardly be expected to yield results of practical value.

The selection of marriage bases raised some difficult problems. Different results emerge according as current male or current female rates are assumed to persist in the future. In twelve of its forecasts the Commission used a basis intermediate between the male and female experiences during 1942-47. But the age-pattern that this assumes for future marriages is obscure and it must therefore be regarded with reserve.

The fertility assumptions themselves were more varied. Those most in accordance with contemporary trends are probably '5% above 1935-38' and 'exact replacement'. These, when taken in conjunction with 'declining mortality' and '1942-47 nuptiality', yielded populations in 2047 of 45,472,000 and 52,681,000. The estimated population in 1947, which was the base year of the projection, was 48,188,000, and the two projections quoted give a range within which a reasonable man in 1948 might, on the information then available, have expected the population to lie a hundred years later. Since 1948 we have had reason to suppose that the decline in mortality may be somewhat more rapid than was assumed in these projections, and they may thus prove to be understatements.

It is, perhaps, significant that with only two more years' information than was available to the Committee it is possible to entertain misgivings about this series of projections and to feel that the range of the basic assumptions did not compass all the developments which are likely in the future. It would be of more value to those who have faith in such processes if some projections could be prepared, based on (i) a new forecast of future mortality in which full account is taken of the sharp fall in infant mortality over the years 1942-48, (ii) current nuptiality experience, i.e. assuming that the lower average age at marriage will become a permanent feature, and (iii) various fertility assumptions, one of which might be that the select issue rates experienced in 1947-49 will become stabilized. It is true that, in the course of the articles discussed earlier, Hajnal has argued with some cogency that the reduction in the mean age at marriage will in due course bring about a fall in select issue rates, and for this reason other projections might be prepared on a more conservative basis. But at the moment, the sixteen projections constructed by the Statistics

Committee leave the feeling that none is strictly in touch with the contemporary situation.

It will, of course, be argued that two years from now any new projections will be equally out of date. That is no doubt true enough, but scepticism should not be allowed to stifle all curiosity, and it is proper to go on making investigations at regular intervals. Only experience can show whether the variations in successive investigations will be so great as to render them useless for any practical purpose. It may be, however, that some stability will emerge which will enable demography to play a part in public enlightenment.

To sum up, this volume of reports by the Statistics Committee, while it reaches no finality, is a milestone in the development of demographic science in this country. It is to be hoped that all actuaries and others interested in population research will study it as a most important record both of theory and of technique.

#### PAPERS ON BIOLOGICAL AND ECONOMIC SUBJECTS

Though it is inevitable that, out of the five volumes of *Papers* that have so far been issued by the Royal Commission, Volume II should be the main focus of actuarial attention, it would betray a parochial outlook were we to ignore the extensive collection of information to be found in the other four.

Volume I, *Family Limitation and its Influence on Human Fertility during the past Fifty Years*, contains a report by E. Lewis-Fanning on an investigation carried out by the Council of the Royal College of Obstetricians and Gynaecologists into the past growth and present extent of the practice of birth control. The investigation was based upon the replies given to an elaborate medical questionnaire by 3281 married women who were non-maternity patients in the general wards of hospitals at some time during the period August 1946-June 1947. The presence of bias in a sample of this kind is very fully discussed, and no attempt is made to disguise the inevitable departures from randomness. Thus, to begin with, there was a marked regional bias, a high proportion of the sample coming from hospitals in the London and Glasgow areas. There was an excessive representation both of women who had married young and of women of the less well-to-do classes. There was also a bias towards the mothers of large families. A large family reduces the margin of income available to purchase privileges, and consequently women who have several children are more likely to seek treatment in the general wards of hospitals than are childless women or those with only one or two children.

To eliminate some of these sources of bias the investigators decided that all statistical analysis must be based on subdivision of the data both by date of marriage and by social class. Even so they found it necessary to warn the reader that a relatively high fertility is characteristic of all the various sub-groups in the sample.

From a statistical point of view the report fulfils two useful functions. In the first place it gives a quantitative evaluation of trends whose general character was already known. Secondly, it provides information on which a judgment can be made of the effects to be expected from any continuation of these trends. Thus it is clear that the gradual spread of birth control through all strata of society is the major factor in the decline in fertility. But is it possible to conclude that the practice of birth control has by now reached a maximum level and that no further decline from this cause is likely to be registered?

The investigators in the present report incline to give an affirmative answer to this question. It is well known that birth control began among the well-to-do classes and has spread gradually through the other strata of the population. It has sometimes been assumed that there is still a substantial proportion of the poorest section of the community which has not yet acquired knowledge of birth-control methods and that therefore family limitation is not yet at a maximum. However, the report does not support this viewpoint. Indeed, Dr Lewis-Fanning has discovered that since 1930 there has been a decline in the extent to which birth control is practised among the lower social classes. It thus seems likely that the dissemination of knowledge of the means of family limitation through successive strata of the community has now run its full course and that there is no particular justification for expecting further reductions in fertility from this cause.

Volume IV, *Reports of the Biological and Medical Committee*, covers reproductive wastage (abortion, stillbirth and infant mortality), reproductive capacity and involuntary childlessness. It is not surprising that the only form of reproductive wastage on which the Committee felt able to speak with any confidence was infant mortality, where they felt that a reduction in the rate to a level of 20 per 1000 births was a practicable aim. We have already seen, in the course of reviewing Volume II above, that such a reduction is well within the bounds of statistical probability.

The short report on reproductive capacity is a sensible, level-headed document which justly gives short shrift to obscurantist theories about 'racial degeneration'. Such legends as the supposed infecundity of third-generation town dwellers are more often the product of befuddled or fanatical minds than of sober evidence. But since such ideas had gained some currency it was necessary for the Committee to examine the question with scientific objectivity. Naturally, with a subject of this kind precise information is impossible, and no conclusions can be proved with certainty. At the same time, the Committee could find no evidence whatever to support the suggestion that there had been any real decline in the reproductive capacity of the population.

The report on involuntary childlessness is mainly medical in its content. The prevalence of involuntary childlessness is uncertain, as there are no statistics by which it can be properly measured. The only source of information is the clinic, and it is impossible to estimate an exposed-to-risk from which persons attending a clinic are drawn. The whole subject is, in fact, in its infancy, and it is not feasible at present to form any assessment of the effect on national fertility of successful treatment of involuntary childlessness.

Volume III, which contains the report of the Economics Committee, suffers from the handicap that it is already outdated. It was completed in 1945, when the extent of the fall in fertility was thought to be much worse than it now seems. Since the Committee decided that the report could not be amended merely by making minor changes, it has been reproduced in its original form. As the Committee fully recognize, however, its value has been impaired by the altered perspective which the demographic analysis has revealed.

Similar considerations vitiate the memoranda submitted by R. F. Harrod and included in Volume V. Harrod begins with the premise that 'the present situation is critical and gives ground for alarm'. Fortunately, the sky is brighter than when those words were written.

Volume V also contains two contributions which no one interested in demographic studies can afford to neglect. One is a careful analysis of the

economic position of the family and of the effect of children on the parents' standard of life. This reveals not only—as would be expected—that the marginal income available for luxuries is lower in a family where there are children than in a childless family, but also that the amount spent in rent by childless families is greater than among families with children. In other words, the larger the family the poorer the quality of living accommodation, and both here and in other ways the large family is at a serious economic disadvantage.

However, the inquiry was based on a survey carried out in 1937–38, and the investigators admit that since then certain changes have occurred which have improved the relative position of the larger family. These are food rationing coupled with subsidies, resulting in a more equal distribution of foodstuffs per head of population, the provision of cheap school meals and the payment of family allowances.

Of course these changes, while benefiting the mass of the population, are of little value to the professional and upper middle class. The cost of a public school education nowadays makes a large gap in the net income of even a well-to-do parent, and whereas the relative position of the family may have improved since 1938 in the working and lower middle classes, in the upper middle class the trend has been definitely in the reverse direction.

Finally, we come to a discussion on *The Relations between Intelligence and Fertility*. Four psychologists and two geneticists have here set down their views on what is one of the most vital problems of demography, namely, the question whether we may be breeding from the less intelligent sections of society and so gradually lowering with each generation the average level of national intelligence. The views presented vary, but this is of smaller importance than it might be because each authority qualifies his conclusions with a rider that their validity is weakened by inadequacies in the data. One thing is certain: according to recent experience, the level of intelligence tends on the average to diminish with increasing family size. But whether this is so because, on the average, the parents of large families are less intelligent than the parents of small families, or whether it is because the existence of a large family reduces the advantages from which the children might profit in the course of their growth and development, or whether some other unknown factor may be responsible, cannot yet be definitely decided. We may hope, therefore, that further data will be forthcoming in the near future from which a more satisfactory conclusion can be derived.

Even if the first, and more pessimistic, conclusion is true it may nevertheless be that the feature is transitional. The decline in the birth-rate has not taken place uniformly throughout all groups of the community. If, as seems to be the case, it has spread downwards affecting first the more intelligent, and later the less intelligent groups, then during the period of transition a lower birth-rate would automatically be thrown up by the more intelligent classes.

It is interesting also to note that in recent years there has been evidence of an increase in the general level of intelligence which, although it may be partly due to growing familiarity with intelligence tests, should at least moderate any tendency towards undue pessimism.

## CONCLUSION

The Royal Commission's *Report*, with its ancillary papers, considers the population question from a statistical, a biological and an economic aspect. On the statistical and biological sides the Commission appears to have been well served by its advisers in the quality and amount of information which was laid before it. It is true that, on the statistical side at least, it is impossible to feel entirely happy that the Commission took the best advantage of the information that was presented to it. It is likely that the two measures of 2.2 for family size and 6% for replacement deficiency will all too readily become fixed in the popular mind, and that the reservations with which the Commission hedged these figures around will be forgotten. In fact, the reservations are all-important.

On the economic side there may be some sense of disappointment. As indicated already, the original work of the advisory committee was partially invalidated by the demographic results and, as a consequence, the Commission has had to fall back on generalities. There will nevertheless be widespread agreement with the main recommendations for improvement in family allowances and tax reliefs. The Commission makes the valid point that public economic policy cannot be neutral in its effect on the birth rate and there can be little doubt that current policies are still adverse to families with children.

But fundamentally the population problem is neither statistical, nor biological, nor economic. The primary questions at stake are sociological, political and moral. It may be argued that these questions lay outside the Commission's terms of reference, which were: to examine facts—to investigate causes—to consider consequences—to consider what measures, if any, should be taken in the national interest—and to make recommendations.

It was open to the Commission to take a wide or a narrow view of these terms of reference. The Commission preferred the narrow view. Consequently, the specifically human issues, the imponderables, the historic and spiritual forces which shape the destiny of a nation were ignored. By and large, the *Report* possesses the qualities of sincerity, objectivity and conscientiousness. If it lacks the larger vision, this may be a fault not necessarily of the *Report* itself, but more of the period in which it was written.