

REVIEWS

The Registrar General's Decennial Supplement, England and Wales, 1951. Life Tables.
[Pp. 37. H.M. Stationery Office. 1957. 3s.]

THIS Supplement presents new tables of mortality to be known as the *English Life Tables No. 11*, prepared by Sir George Maddex, the Government Actuary. They are based on the deaths in England and Wales in the three years 1950-52, although in one of those years (1951) there was a severe influenza epidemic, affecting appreciably the number of deaths at the older ages. Careful consideration was given to alternative methods of producing the table, but it was found that the use of the deaths for the 5-year period 1949-53 would have resulted in rates of mortality heavier than those for the years 1950-52 at the younger ages, but lighter at the older ages. Eventually it was decided to follow the practice of using deaths for the 3 years around the census date as employed in constructing the three previous *English Life Tables*, Nos. 8, 9 and 10.

The 1951 Census took place on 8 April 1951, and it was thought unnecessary to adjust the figures at the younger ages to bring them up to the numbers living at the midpoint of the years 1950-52; but at ages over 45 the enumerated populations were adjusted to bring them forward to 30 June 1951. At the most advanced ages the percentage additions reached some 3%. The crude central death rates thus calculated showed irregular progression from age to age, owing to a number of causes. Some of those irregularities, due to errors and the tendency shown to return ages ending in certain digits, ought to be removed. King's method of pivotal values and osculatory interpolation did not go far enough in this direction, because the method produces over each 5-year group a very close agreement between actual and expected deaths. It was therefore decided to experiment with a method similar to that used for graduation of experiences relating to assured lives and annuitants. Eventually it was found that from age 21 for males, and from age 27 for females, the national mortality rates for 1950-52 could be represented closely by a mathematical formula of similar form for each sex.

It was hoped that a curve of the form $m_x = a + \frac{b}{1 + e^{-\alpha(x-x_1)}}$ could be used, but to cope with a second peak in the series of ratios of $\frac{m_{x+5}}{m_x}$ it was found necessary to use a subsidiary curve of a different nature, the complete expression being

$$m_x = a + \frac{b}{1 + e^{-\alpha(x-x_1)}} + ce^{-\beta(x-x_2)}$$

where the constants had the following values:

	Men	Women
a	·00129	·00099
b	·734	·578
α	·136	·136
x_1	91·3	90·8
c	·0186	·00323
β	·003	·003
x_2	71·6	62·5

The contribution made by the subsidiary curve was much greater for men than for women, as is evidenced by the percentages of men's to women's rates between ages 45 and 75 in Table F.

To obtain q_x for males at ages 6–20, and for females at ages 6–26, the averages of the crude values of q_x for ages $x-1$, x and $x+1$, were calculated and, since they formed a reasonably smooth progression, were adopted. Rates for ages 0–5 were found by the method which has become customary from the records of births and deaths, though not without examining the effect of using census populations instead of births. On the whole, the evidence is in favour of continuing the customary methods.

A comparison of the results by King's method and the mathematical curve method showed that as graduations both were equally satisfactory, but for the reasons elaborated in the Report the latter method was preferred to King's method. King's method had a long run, but it is doubtful whether officials of local authorities have, in fact, made much use of it, and the reasons given for abandoning its use in the construction of national tables are convincing.

Comparisons between the graduated rates of mortality (q_x) by the No. 11 and by earlier tables are made, and the features of considerable improvement at younger ages, smaller improvement at older ages, and worsening at the very old ages for males, are in accord with general impressions formed in recent years. For the 40-year period 1911–51 the trend followed much the same course for both sexes, but at ages over 40 improvement in mortality has been much greater for females than for males. The improvement in infant mortality is demonstrated by the increase in the expectation of life at birth for a boy to $66\frac{1}{2}$ years and for a girl to $71\frac{1}{2}$ years.

It is pointed out that in an era of persistently declining death rates the whole conception of the life tables as normally computed is somewhat artificial, and that the tables now produced cannot be regarded as suitable for predicting the size and age structure of the future population. The No. 11 Mortality Tables may, however, be suitable for calculations in connexion with industrial assurance contracts, sickness benefits, and for other purposes, and it may be of interest to mention that actuaries of industrial assurance offices have already undertaken the calculation of monetary functions for the English Life No. 11 (Males) Table for rates of interest from 2% to 4% at intervals of $\frac{1}{4}$ % and such tables are now available to the profession generally.

The supplement gives specimen rates of mortality for men and women according to marital status, and as would be expected lighter mortality is found among married women than among single or widowed women at nearly all ages. The statistics relating to males are, however, not so complete as those for females, but with this reservation the rates for married men were lighter at all ages than for single men.

In the Report on the 1931 tables, analysis was made of mortality rates in thirty-four geographical areas, but this Report analyses only the rates in the ten 'standard regions' used in recent years by the Registrar General; these ten regions have been divided to separate the figures for six conurbations, and the results are certainly of interest. Although there are exceptions, of which Greater London is one, mortality rates are generally heaviest where populations are densest. Another exception is the rate in the first year of life where some rural areas show little advantage over urban areas.

Comparisons are also made between rates of mortality in 1950–52 for England,

Scotland and Wales, respectively, both for men and women. Mortality is seen to be much heavier in the smaller countries than in England.

Abridged Life Tables are furnished for males and females separately for Wales and for Greater London. National Life Tables for Scotland covering the same period have recently been published.

The appreciation expressed by the Registrar General of the work done by the Government Actuary in preparing the new Life Tables and the valuable accompanying commentary is well deserved.

K.J.B.

Statistical Methods in Research and Production (with special reference to the chemical industry). Edited by O. L. DAVIES, M.Sc., Ph.D.

[3rd Ed. Pp. x+396. London and Edinburgh: Oliver and Boyd. 1957. 45s.]

THE first edition of this book was reviewed in *J.I.A.*, 74, 163. The present edition contains substantial revisions and additions, but retains the essential features of presentation of its predecessors. The principal additions are (to quote from the dust-cover)—the economics of testing and experimentation; sequential sampling; the estimation of variance components and their confidence limits; and the analysis of covariance. The treatment of curvilinear regression has been expanded and a more detailed consideration of relationships between variables is presented.

The chapter (Statistical Tests; Choosing the Number of Observations) on the economics of testing is perhaps the most interesting in that it reflects recent trends towards relating application of statistical techniques directly to financial considerations (or *vice versa*) as compared with the more traditional scientific approach.

An important change is a shift of emphasis to confidence limits as opposed to tests of significance, 'experience having shown the greater practical utility of the former'. If this be interpreted as implying a preference for estimation as opposed to tests of significance, there is a good deal to be said for this point of view. However, many statisticians find confidence limits of rather restricted usefulness in a number of practical situations.

The revision as a whole has been skilfully carried out and the resulting book should prove of value to anyone concerned with day-to-day application of statistical methods in industry.

N.L.J.

The Population of Jamaica. By GEORGE W. ROBERTS.

[Pp. xxii+356. The University Press, Cambridge. 1957. 40s.]

RECENT researches into problems of population and resources have shown that these problems tend to be most acute in tropical islands. It is timely, therefore, that plans should be in hand for economic and demographic studies of an important British Dependency, which it is hoped will shortly become a major part of a new Dominion and which is also a tropical island. Of three volumes in preparation, which are to deal respectively with population, with resources and with social and psychological factors affecting fertility, the first has now appeared and has given the project an auspicious start.

It comes as a shock to find that the organization sponsoring this research project is not British but American. If, as is believed, this organization—The