PUBLIC HEALTH STATISTICS.

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From time to time certain Government Departments and Medical Officers of County Councils, Borough Councils and other local authorities publish reports relating to the public health which contain considerable information concerning the work of the various sections of the Health Service, and in addition to indicating the progress in sanitation, hygiene, etc., that has been achieved, and stressing the need for further endeavour in special directions, these reports contain statistical tables which often do not receive the careful study which they deserve. Figures are often voted "dull" and "uninteresting," and are passed over, whereas to those who take the trouble to study them they are as illuminating as paragraphs of written matter. Care is needed, of course, properly to appreciate their value since unless they are considered in relation to all the known facts they may, unintentionally, be misleading; but the various "rates" and "percentages" to be found, for example, in the annual report of a borough medical officer of health, are worthy of consideration by all citizens. A slight knowledge of what these figures stand for will make them as interesting to the "man in the street" as they are already to the statistician. No abstruse mathematical calculations are usually employed, nor will the reader's memory of unhappy wrestlings with knotty problems in school days be aroused by the remembrance of logarithms and discussions on the degrees of error and accuracy.

There are in such reports, which are usually framed according to definite instructions issued by the Ministry of Health, certain relatively elementary statistics which shed some degree of light upon the state of the public health, and are therefore worthy of consideration. A knowledge of the methods of compilation will serve to make them of even greater interest. In the succeeding paragraphs the cardinal matters in such reports are briefly dealt with, and it will be realized that the study of these statistics when they extend over a considerable number of years is well worth while.

In passing, a brief word may be said concerning statistics. Statistics may be described as the science of counting, or the science of numbers. Statistics are of most value when employed in connexion with large numbers that are not easy of comprehension, and they are necessary for comparative purposes. They involve the collection of certain material, its tabulation, summary and calculation. In some matters, in addition to the statistical report, illustrations by means of the graphic method are useful. These may be based on the natural scale, or, better still, on a logarithmic
scale which indicates ratios rather than quantities and proportional variations.

Population.—This is ascertained correctly at each census, but at subsequent or intercensal years is estimated by various methods. These include the following: (1) The natural increase of births over deaths. (2) Ascertaining the average number of inhabitants per house at the last census, and making a calculation based on the number of inhabited houses. (3) Assuming that the birth-rate remains constant. The number of registered births being known, the population can be calculated on the basis of the birth-rate known to have held good in the last census. (4) The employment of logarithms, this being perhaps the most reliable of all methods. It is the Registrar-General's method, and assumes that the same rate of increase will hold good as in the previous intercensal period, that is that the population increases in geometrical progression. The problem is therefore one of compound interest. The importance of obtaining as correct an estimate of the population as possible is very great, since nearly all rates are based upon it; an under-estimated population gives, for example, an unduly high death-rate and birth-rate, or vice versa. Rapidly growing districts to which young married couples move obviously affect the calculation of the population of the whole area concerned.

Marriage-rate.—This is usually expressed as the number of persons married per 1,000 of the population (not the number of marriages). In this figure re-marriages of widows and widowers are included; it would be more accurate if the calculation of the marriage-rate were based on the number of bachelors, spinsters, widowers, widows and divorced persons living at marriageable ages.

Death-rate.—The crude death-rate or general death-rate is calculated upon the basis of the population and all the deaths that occur in the district. Obviously this is not fair to the district if it contains many institutions and hospitals, and, therefore, it is usual to exclude the deaths of non-residents in the area and to add the deaths of residents that occur outside the district. The rate then ascertained is the recorded death-rate. A more accurate rate is the standard death-rate. The standard death-rate of a country is the average death-rate at all ages experienced during the previous intercensal decade. It is, therefore, based upon the data of a decennium, and not, like the preceding rates, on annual or monthly information. The standard death-rate of any part of a country is the death-rate at all ages which would have occurred in it if each of the twelve age-groups of its population had experienced the same death-rate as occurred in the corresponding twelve age-groups in England and Wales during the previous intercensal decade. Therefore, the standard death-rate of a portion of the country or a town will be the same as that of England and Wales if its population is distributed as to age and sex in the same proportion as that of England and Wales and if the mortality corresponds.
This naturally brings one to the corrected death-rate, which is the death-rate corrected as regards age- and sex-distribution of the population. Obviously this is the fairest calculation on which death-rates of various localities can be compared. The corrected death-rate, therefore, is the recorded death-rate multiplied by the "factor for correction" for sex and age distribution, and this is obtained by dividing the standard death-rate for the whole country by the standard death-rate of the locality concerned, the quotient or result being the factor for correction. Unless such a factor be employed it is necessary to remember when considering the death-rates of a district that an increase does not necessarily mean a less healthy standard of life. A decrease in the birth-rate over a long period has the effect of raising the age-status of the whole population. During the early years the decrease in infants and children at susceptible ages of life helps to keep down the death-rate, but later the result of a continued low birth-rate is to produce a greater proportion of older people in the community when the liability of such to death begins adversely to operate.

Comparative Mortality.—A useful method by which death-rates of different towns may be compared is by means of the comparative mortality figure. The recorded death-rate at all ages for England and Wales is taken as 1,000, and the corrected death-rate of each town is then compared with that figure. The alternative method of comparison is complicated, and involves the expenditure of much time; it consists of comparing the number of deaths in age- and sex-groups in proportion to the population at each age- and sex-group.

Death-rates for Diseases, Occupations, Etc.—Special death-rates are often usefully calculated for particular diseases, occupations, and for each sex. When death-rates are calculated for certain periods, such as for quarterly or monthly returns, it must be remembered that a quarter or one-twelfth of the total annual population forms the basis of the calculation. The Registrar-General obtains the quarterly population by multiplying by thirteen the population of one week, which is obtained by dividing the estimated population of a town by 52·17747.

Infantile Mortality.—Whereas marriage-, birth- and death-rates are based on populations which, in intercensal years, are ascertained by careful estimations and are, therefore, dependant for their correctness on the accuracy of that estimate, the infantile mortality rate is expressed as a certain number of deaths of children under one year of age per 1,000 births in the same year. This rate is not, of course, a strictly accurate statement but it is near enough for all practical purposes. It is a sensitive index to the health and general sanitary condition of a district, but if any area is to be judged effectively by this standard, a series of such statistics extending over a few consecutive years should be studied. Infantile mortality is most heavy in the first three months of life and especially during the first four weeks—the dangerous neo-natal period. It is highest among male children and thus equalizes the higher proportion of male children that are born.
If ever the law relating to the registration of births is revised so that the ages of the parents are recorded when the births are registered and if it is then ascertained whether the child is a first or later infant, further valuable information will be made available for the statistician. Illegitimate children are less likely to survive than legitimate children, and separate infantile mortality rates should be calculated, the deaths of legitimate infants per 1,000 births of legitimate children, and the deaths of illegitimate infants per 1,000 births of illegitimate children. Male children have a greater mortality in the earlier months of life, hence a reduction in infant mortality raises the male proportion of children. After the first year of life the excess of female resistance to death over that of males, is small, gradually disappearing as age advances until at 10-15 years a higher death-rate for females is the rule. If infant deaths are considered in two groups, (1) those which are inevitable owing to the children being born without capacity for survival even under ideal conditions, and (2) those which are avoidable, death resulting from the effect of unfavourable environment, it is clear that as infant mortality falls generally the share of class (1) of what remains must increase. There will always be a point, not yet ascertained, beyond which it is impossible to reduce infantile mortality. The fact that recent improvements in environment have been accompanied by less fall in the mortality of males than of females, suggests that a larger proportion of the deaths of males belongs to class (1). If this be so then further improvement may be expected to result in further increase of the difference between the sexes. The greater excess of deaths of males over females in the earlier months of infancy points in the same direction, for the proportion of inevitable deaths must fall off rapidly as life advances. The value of statistics as an aid to scientific work for the health of the community is clearly demonstrated in such a subject as the study of infantile mortality, in which they point out those aspects of the question in which progress is made or where the need for further efforts is most obvious.

When preparing statistics relating to infantile mortality it is necessary to remember the injurious effects of overcrowding which implies some measure of poverty; since bad housing, insufficient clothing and food, strike most effectively the weakest members of the community. It is useful to prepare rates for the density of the population per acre and for special areas where the infantile mortality is under review. Overcrowding may also be demonstrated with definite accuracy by means of a special census, taken by the health visitor or sanitary inspector, of certain streets in which the number of inhabited rooms per house is recorded. The number of persons per room and any overcrowding may then be ascertained: it being usually accepted that where more than two persons are found per room overcrowding exists, or at all events undesirable crowding involving the improper mixing of the sexes. Another good index of the state of the housing of the people and its influence on infantile mortality may be ascertained from information supplied by the
health visitors who visit newly-born infants where the birth occurred at home. The following will be found to be a useful statistical table by which to demonstrate the conditions existing:

<table>
<thead>
<tr>
<th>Number of persons in family</th>
<th>Number of families occupying the following number of rooms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 room</td>
</tr>
<tr>
<td>2</td>
<td>2 rooms</td>
</tr>
<tr>
<td>3</td>
<td>3 rooms</td>
</tr>
<tr>
<td>4</td>
<td>4 rooms and so on</td>
</tr>
</tbody>
</table>

It should be definitely stated in a footnote to such a table that the newly-born baby has not been included in the figures, nor day occupants (such as the midwife) in the room, but only the actual number of residents who sleep there. It is usual to include kitchens, but not sculleries, bath rooms, etc.

**Infectious Disease.**—The incidence of infectious disease is subject to the laws of periodicity, and it is useful to employ the method of graphic charts upon which each disease is recorded in weeks. For the study of certain diseases it is desirable also to record the temperature and other climatic conditions. The fact that some diseases, such as measles, move in cyclical waves and "salt" the susceptible population must also be remembered.

**Ward Statistics.**—It is a good thing in all large urban districts for statistics to be prepared for each ward on a uniform basis in order that they may be compared. Tables afford a good index of the condition of the wards if they include statistics relating to births and birth-rates, deaths and death-rates, infantile mortality, deaths from pulmonary tuberculosis, and from all forms of tuberculosis, attack-rates and death-rates from all the principal epidemic diseases; density of persons per acre, percentage of open spaces to total ward area, and total population.

**Life Tables.**—No reference to vital statistics is complete without a reference to Life Tables. These indicate the probability of life at any age; they may be prepared nationally, locally, or for occupations, etc. A good deal of labour is involved in the construction of a life table, and where none is available it may be found useful to remember a simple formula to find the expectation of life at any age between 25 and 75. It is as follows: Take 80 years as basis, deduct present age, and two-thirds of the remainder represents the expectation of life. This only operates up to 75 years with any measure of accuracy; and in view of the increasing probability of length of life, the result of the application of this formula is not an over-estimate but rather an under-estimate of the expectation of life.