

# PRACTICAL SANITATION

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## CHAPTER I

### INTRODUCTORY—VITAL STATISTICS

SANITATION is a branch of knowledge which deals with the preservation of health. The subject has attracted attention from the earliest times, and many sanitary precepts were included amongst the first known teachings of mankind, but the sanitary requirements of the present day are much greater and more complex than those of primitive peoples.

During the nineteenth century a great change in the distribution of the population of England occurred, by the people leaving the country districts in large numbers to find work in those areas where industries were being established as a result of the introduction of steam power. The towns and new urban districts were generally unprepared for such a rapid increase of population, and the conditions of life in them became most inimical to health, resulting in an excessive prevalence of disease and death. The first steps in modern sanitation were taken by the towns themselves, several of which managed to secure from Parliament, by means of Improvement Acts, special powers for dealing with such things as paving, draining, cleansing, and other sanitary matters. This led to the passing of a general Act called the Towns Improvement Clauses Act, 1847, which consolidated the provisions in the local Acts, and made the powers available to any town which adopted them in a special Act. Up to this time, Parliament had regarded sanitation as a matter of local concern only, but in the following year the Public Health Act, 1848, was passed, setting up a General Board of Health with certain powers of supervision and control of the sanitary work of local authorities. This Act, which was a great triumph for the early sanitary reformers, of whom Edwin Chadwick was the chief, is a notable landmark in sanitary legislation. It was the forerunner of a series of Acts to improve the health conditions of the people, which were ultimately consolidated in the Public Health Act, 1875, which remained the

basis of sanitary legislation throughout England and Wales until the year 1936.

Before attempting to set out the effect of the increased sanitary effort of the past sixty years, it is necessary to make a brief reference to the manner in which the healthiness, or otherwise, of a community is estimated. This is done by the use of vital statistics, a branch of applied mathematics dealing with life and health. It is sometimes said that figures may be made to prove anything, but such a saying merely represents how easily error can arise in the use of figures. Statistics should never be resorted to unless the facts upon which they are based have been carefully compiled and arranged so that only exactly similar material is brought together, while the figures themselves and the results which they serve to convey, must be critically examined from different angles, so as to make sure that no avoidable sources of error have crept in.

In this country, the duty of drawing up and presenting the national vital statistics is placed upon the Registrar-General, whose office is linked up with the Ministry of Health. The initial facts upon which he compiles his figures are got from the Census, which is now taken under the Census Act of 1920. Except in 1941 a Census has been taken every ten years in England since 1801, usually in the month of April. A great deal of information is collected at each Census, but the facts of chief interest for health purposes are, the number of persons living in each area of the country, the ages and sexes of these persons, the numbers employed in each occupation according to age and sex, the number and sizes of the houses occupied, and the number of persons living in each class of house, with a statement of overcrowding. The results of the Census are only true for the particular night upon which the Census is taken, and estimates of population are made for each year succeeding, until the new Census is taken. These inter-censal figures can be regarded as intelligent and careful estimates only, and they lose in accuracy according to the length of the interval that has passed since the last Census. To reduce the margin of error, it is provided in the Census Act that a new Census may be taken once every five years, and intimation has been made of the intention to repeat the Census at five-yearly intervals. In making estimates of population for any year, there are many considerations to be taken into account. We may presume that the population in the years following the Census has increased or decreased at the same rate as in the inter-censal period immediately preceding, and by a calculation resembling the increase or decrease of capital at a compound interest rate, we can arrive at an estimated population for a post-Census year. We may correct this estimate by the presumption that the population of a district in a post-Census year should

bear fairly similar ratios to the number on the electoral roll and to the number of inhabited houses which it did in the Census year ; and lastly, we must make some correction for any gravely disturbing factors to such calculations, as, for example, the opening out or closing down of large works. During the war the issue of Ration books afforded a valuable indication of the population in each district. Taking all such points into consideration, the Registrar-General makes estimates of the mid-year population of the whole country and of each district in it, and these are generally accepted as the most reliable that can be made.

Under the Births and Deaths Registration Acts, all births and deaths must be registered with the Registrar of the district who, by arrangement, supplies the facts to the local authority. It is thereby possible to calculate the birth rate and death rate of each district. The death rate is calculated as an annual rate per thousand of the population living in the middle of the year under review. It is arrived at by multiplying the total number of deaths for the year by 1,000 and dividing by the mid-year population, thus  $\frac{D \times 1,000}{P}$ . It is necessary,

before making a calculation of the death rate for a particular locality, to revise the deaths occurring in the locality, excluding those that do not properly belong to the district, and including others that have occurred among residents of the district who have died elsewhere. Thus, in towns, deaths in large hospitals have to be assigned to the different districts from which patients came, and deaths of town residents at holiday resorts have to be included as if they occurred in the town. The death rate is only a very rough estimate of the healthiness of a population, because it may vary quite independently of healthiness according to the age and sex constitution of the population. Thus, old persons and infants under one year normally show a high death rate, while females generally give a lower death rate than males, so that a population might give a low death rate from a favourable age and sex distribution, quite independently of healthiness. For comparative purposes the Registrar-General now issues for each district what he calls a comparability factor (C.F.) for adjusting the local death rates of 1931 and subsequent years. He arrives at this factor by comparison of the age and sex constitution of each community with that of the whole country at the time of the Census, and when the crude death rate is multiplied by this factor, an adjusted death rate is obtained by which some comparison may be made between communities. The application of these factors is frequently most important, as, for example, in 1933 the crude death rates of Bournemouth and Dagenham were 14.0 and 6.5 per 1,000 respectively, but as the C.F.'s were 0.75 and 1.53 the adjusted death rates of

Bournemouth and Dagenham became for this year, 10·5 and 9·9 respectively, a comparatively insignificant difference.

There are other forms of general death rates known as weekly, fortnightly, monthly or quarterly death rates. These are always recorded as if they were annual death rates. Thus, as there are 52·17 weeks in a year, the weekly death rate for any one week is arrived at by multiplying the total number of deaths in that week first by 52·17, then by 1,000, and dividing by the mid-year population,

*i.e.*  $\frac{D \times 52 \cdot 17 \times 1,000}{P}$ . Similarly, death rates may be calculated

for any part of the year. Death rates for disease are calculated as annual rates per 1,000 of mid-year population of persons dying from the particular disease, in the same manner as the general death rate. The Registrar-General, however, in dealing with disease death rates, in order to obviate the use of decimal points, usually states disease death rates as per million of the mid-year population, his rate per million therefore being arrived at by multiplying total deaths from any particular disease by one million and dividing by the mid-year population. The most important disease death rates are those from the principal epidemic diseases, those from tuberculosis and those from certain general and local diseases such as cancer, diabetes, lung disease (excluding tuberculosis), heart and circulatory diseases and rheumatism. Generally, age death rates are calculated as annual death rates per 1,000 of population living at the specified age, but there is one most important exception. The rate of death in the first year of life is calculated on the number of births which has taken place in the year under review. This is known, not as the infant death rate, but as the infantile mortality rate, and it is arrived at by multiplying the total number of deaths of infants under one year by 1,000 and dividing by the number of births registered during the year, that is,  $\frac{D \times 1,000}{B}$ . As the number of births registered is known

with accuracy, and the number of deaths is also accurately known, there are few fallacies to which an infantile mortality rate is liable. It will be obvious that as the infantile mortality rate is based upon deaths of infants and births in a specified time, weekly, fortnightly or monthly infantile mortality rates do not require the application of numbers corresponding to the number of weeks, fortnights or months in a year, as do the corresponding death rates.

Occupational mortality is recorded by what are known as the comparative mortality figures. The general occupational mortality in England is taken as 1,000, and the actual mortality in any specified occupation is stated as a comparable figure greater or less than this. The comparative mortality figure is arrived at after a somewhat

complicated calculation in which allowance is made for the age of the individuals occupied.

Maternal mortality is calculated from the number of deaths of mothers in childbirth per 1,000 births which have occurred in the period under review.

The birth rate is the rate of birth per 1,000 of population and is calculated similarly to the death rate: the number of births multiplied by 1,000 divided by the population, thus  $\frac{B \times 1,000}{P}$ .

Weekly, fortnightly or monthly birth rates are calculated in the same way as the corresponding death rates. The birth rate may be divided into the legitimate birth rate calculated on married women at the child-bearing ages, and the illegitimate birth rates calculated upon single and widowed women at child-bearing ages. The birth rate, however it is stated and analysed, is little indication of the reproductive capacity of a community, just as an illegitimate birth rate is little indication of sex morality.

The following table, compiled from the Registrar-General's reports, shows the progressive improvement that has taken place in the general death rate, the infantile mortality rate, and the death rates from enteric fever and tuberculosis in England and Wales since 1871:—

## ENGLAND AND WALES

AVERAGE ANNUAL RATES IN FIVE-YEARLY PERIODS  
FROM 1871

Years.	Death Rate.	Infantile Mortality.	Death Rate per 1,000 from	
			Enteric Fever.	Tuberculosis.
1871-75 . . .	22.0	153	.37	2.9
1876-80 . . .	20.8	145	.27	2.8
1881-85 . . .	19.4	139	.22	2.5
1886-90 . . .	18.9	145	.18	2.3
1891-95 . . .	18.7	151	.17	2.1
1896-1900 . . .	17.7	156	.17	1.9
1901-05 . . .	16.0	138	.11	1.7
1906-10 . . .	14.7	117	.07	1.5
1911-15 . . .	14.3	110	.05	1.4
1916-20 . . .	14.4	90	.02	1.3
1921-25 . . .	12.2	76	.01	1.0
1926-30 . . .	12.1	68	.01	.9

It will be seen from this table that a vast improvement has occurred in all the rates shown, and it is correct to say that in each case sanitary

effort has contributed materially to the result, and in no case would such result have been possible without increased sanitary activity. It is not always possible to prove beyond dispute the good results of sanitary improvement, but so frequently and so consistently have good results been found to follow well carried out sanitary work, that the relationship of cause and effect has come to be universally accepted. It should not be forgotten, however, that there are many other agencies, all working for the betterment of the people, which have materially helped the sanitarian in his task of combating disease. It is important, therefore, that inspectors should take a comprehensive view of their duties and remember that they are working in a wide field in which the harmonious co-operation with other officers, and the understanding and support of the people themselves, are necessary for ultimate success.