individual data that they conclude that the whole mass is unreliable; and the difficulties in the way of obtaining complete and reliable figures me seen to be so great that they incline to give up the whole matter in despair. Continued study of the subject, however, shows that many valuable conclusions or suggestions can be derived from imperfect data, and that in large masses of figures the errors either tend to neutralize each other, or to produce a constant effect in one direction which can be calculated and allowed for, so that those who have had the greatest experience are most convinced of their value. It is true that, in statistics, the inferences can not be more accurate than the data on which they are founded, but we do not look for scientific exactness from them so much as for an estimate of probabilities.

In the experimental method of advancing our knowledge of the laws of human life and disease, we seek to make a direct test of the variation of one particular condition, or set of conditions, upon the living organism, all other conditions being kept uniform as far as possible. Some such experiments can be made on man, but the greatest number of the problems which we may hope to solve by this method, and among these the most important, can only be approached Within the last by experiments on the lower animals. twenty years experimental physiology and pathology have made great advances, and these methods, so far as they are applicable, give more definite results, and are more immediately satisfactory, than those derived from comparison of observations in which no definite experimental variations have been made; but so far as regards causes of disease, or the action of supposed methods of prevention, or of remedies, it is unfortunately the case that we can not draw accurate conclusions as to what will happen in man from what is observed to happen in animals. In the first place, there are many forms of disease in man, and those among the most important, as regards the suffering and loss of productive power and of life which they produce, which can not, with our present knowledge, be experimentally produced in animals, and which rarely or never occur in them.

For example : Yellow fever is a disease which, from analogy, we have reason to believe may be due to the action of one or more specific micro-organisms, or, perhaps, I should say, to the products of such organisms. We find a dozen different kinds of bacteria in persons suffering from yellow fever, and by dint of much labor, these have been isolated and cultivated outside the human body. . The problem is to determine positively, and with scientific precision, which, if any, of these is the true, essential cause of the disease. The mode of doing this is by producing the disease in a perfectly healthy person or animal by the inoculation of the suspected organism. But, thus far, we have failed to find any animal in which a disease, which can be considered as specifically identical with yellow fever, can be produced by any method; and I need hardly tell you that inoculations of such a disease as this in a human subject, under conditions which would make the results of such inoculation scientifically trustworthy, are impracticable and unjustifiable.

Those forms of disease which are common to animals and man—such, for instance, as anthrax, tuberculosis, tetanus, hydrophobia, the ordinary forms of suppuration, and also typhoid fever—are being pretty thoroughly worked out by means of such experimental inoculations as I have just referred to; and we are able to say, with a great degree of precision, not only that these diseases are due to specific forms of bacteria, but to determine enough of the character-

istics of these forms to be able to identify them wherever they are found.

The method of observation may, for our purposes, be again divided into two categories. The first is that which is used in individual cases, being the form applied by the physician to each case which he has to treat. It also includes the sort of investigation which may be made in a single household, a small community, or a thinly populated district, to determine the course and cause of a particular form of endemic or epidemic disease, where the conditions affecting each family or dwelling can be studied in detail somewhat as the detective of modern fiction follows his By the combination and comparison of detailed clews. studies of this kind the greater part of our present system of diagnosis, prognosis, and therapeutics have been evolved ; but it has been and will be a slow process, for each man differs from every other man in structure and mode of function, and the conditions of the environment are so multiform, and so variable in space and time, that "experience is doubtful, and judgment difficult." We must therefore try to supplement the information thus obtained by that derived from the second kind of observation above referred tonamely, that of collecting a few data with regard to great numbers of people, especially where these are accumulated in thickly settled localities, forming what is called the statistical method as applied to different communities. By the first method we compare individual with individual, and do so with considerable minuteness of subdivision of the conditions studied ; by the second method we compare the vital phenomena of communities with those of other communities, but only on broad lines and in relation to circumstances easily noted.

The essential data of vital statistics are derived from enumerations of the living population and from records of births, marriages, and deaths. The numbering of the people is effected by a census, a term derived from the Roman Censors, a part of whose duty was to make such counts. Such enumerations were made by Moses (1490 B. c.), David (1017 B. c.); in Greece, 650 B. c.; and in Rome, beginning 566 B. C. They were probably made also in Assyria, but the Assad records have not yet been found. In modern times the first country to make a count was Sweden, in 1749. The first census in the United States was taken in 1790, as a necessary means of carrying out the constitutional provision that the basis of representation for the several States should be the number of the population in each. The first census in England was taken in 1801, and showed the number of persons, with distinction of sex, the number of houses, the number of families, and a rough statement of occupations under the general classification of agriculture, trade, manufactures or handicraft, and all others.

Dr. Billings next refers to the fields of study in vital statistics having for their object to determine the relation of race and color to birth-rate, to certain forms of disease, or to the liability of death at certain ages. These are important as answering such questions as : Is the negro population of the Southern States increasing faster than the white ?

The influence of race upon mortality is especially manifest in the death-rates of cancer. The number of deaths from cancer per 100,000 population in certain portions of the United States, with distinction of white and colored, was as follows : White, 27 96; colored, 12.67.

In the northern part of the United States the proportion

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