

V.—MORTALITY.

INDEX TO PLATES.

DEATHS UNDER ONE AND UNDER FIVE YEARS.....Plate 40	WHOOPING COUGH. MEASLES.....Plate 45
Ratio of Total to Aggregate Deaths.	Ratio of Deaths to Aggregate Deaths.
RESPIRATORY SYSTEM. CONSUMPTION. Plate 41	EXPECTATION OF LIFE. DEATH RATE...Plate 46
Ratio of Deaths to Aggregate Deaths.	Among Native White Males, by Ages.
NERVOUS SYSTEM. DIARRHŒAL DISEASES.....Plate 42	LIFE INSURANCE EXPERIENCE (MALES). Plate 47
Ratio of Deaths to Aggregate Deaths.	Deaths from Selected Diseases, by States.
DIPHTHERIA. DIGESTIVE SYSTEM.....Plate 43	LIFE INSURANCE EXPERIENCE (BOTH SEXES).....Plates 48—49
Ratio of Deaths to Aggregate Deaths.	Principal Causes of Death, by Years of Insurance. American and English Experience.
ENTERIC FEVER. SCARLET FEVER.....Plate 44	
Ratio of Deaths to Aggregate Deaths.	

In General.—The total number of deaths reported by the Tenth Census, as occurring in the country during the year 1880, was 756,893, making the death rate 15.1 in 1,000. In 1870 the death rate shown by the reported number of deaths was 12.8, and in 1860 it was 12.5. This apparent increase in the death rate is due simply to the fact that more effective measures were taken for securing full returns than by preceding censuses. The returns for 1880 were, however, still far from complete. According to the estimate of Dr. J. S. Billings, under whose direction the reports were compiled, not over 70 per cent. of the total number of deaths were reported. The deficiencies are probably greatest in the more sparsely settled regions, and in the Southern states; they are doubtless greater among the colored race than among whites, among females than among males, among foreigners than natives, and among infants than adults.

The statistics of mortality reported by this census are, of course, inadequate for such purposes as forming life-tables, in which the total number of deaths is required. For comparative purposes, however, as illustrating the relative proportions of deaths by different diseases, the relative prevalence of certain diseases in different sections of the country, the relative mortality of the white and colored races, etc., they are of the greatest value, although the results are affected, to a minor extent, by the omissions above mentioned.

In the states of New Jersey and Massachusetts, in the District of Columbia, and in the cities of Baltimore, Bangor, Brooklyn, Chicago, Cincinnati, Charleston, Cleveland, Indianapolis, Louisville, Milwaukee, Mobile, Nashville, New Orleans, New York, Philadelphia, Pittsburgh, Providence, Richmond, St. Louis, San Francisco and Wilmington, registers of deaths are kept, which are presumably quite full and accurate. Comparing these returns with those of the enumerators, Dr. Billings has arrived at the conclusion that the actual average death rate in this country, in 1880, was certainly between 17 and 19 per thousand, and was probably nearly 18.2 per thousand. He contrasts this with the death rate of England, 20.5, and of Scotland, 21.3 per thousand. The reason for the smaller annual death rate in this country may be found in the abundance, cheapness and excellent quality of food everywhere obtainable, and in the fact that the population is not overcrowded.

Of the whites, the death rate per thousand was 14.74, according to the census returns. That of the colored race was decidedly greater, being not less than 17.28 per thousand. As the omissions were, doubtless, much greater in the case of the colored than the white element, the actual death rate would show a still greater disparity between the two classes. The higher proportion of deaths among the colored race is accounted for mainly by the great mortality

among colored infants, that of colored adults being only slightly in excess of the whites.

The death rate among males was slightly greater than among females. For every 1,000 female deaths there occurred 1,074 male deaths; showing a male death rate of 15.35 and a female death rate of 14.81 per thousand. This excess is probably due, however, to the greater number of unreported deaths of females.

Of the total number of deaths among males whose ages were reported, those at less than one year of age formed 24.80 per cent., while the deaths of females less than one year of age formed but 21.54 per cent. of the whole number of female deaths. Similarly, the deaths of males under five years of age were 41.95 per cent. of all male deaths, while the deaths of females under five years were but 38.19 per cent. of all female deaths.

Of the whole number of deaths concerning which the age at death was reported, 8.76 per cent. were between the ages of five and fifteen; 29.96 per cent. were between fifteen and sixty, and 17.24 per cent. over sixty.

The Plates.—The maps given on Plates 40 to 45, inclusive, have been constructed on a plan different from that elsewhere employed in the charts. The country has been divided into certain characteristic regions, differing from one another in topography, climate and other conditions affecting mortality. These regions are sub-divided by state lines, and the divisions

of the states, resulting therefrom, 111 in number, have been used as the units of the maps.

The states of Maine, New Hampshire, Massachusetts and Connecticut are each divided into two parts: that adjacent to the Atlantic coast and the hilly or mountainous interior. Vermont lies entirely in the hilly region, while Rhode Island is wholly in the region subjected to direct oceanic influences.

New York has five sub-divisions, as follows: A small area in the southeast corner, adjacent to the coast, the Catskill and the Adirondack regions, the more or less hilly interior, and the portion bordering Lakes Erie and Ontario. Pennsylvania has three sections: that of the Appalachians, in the middle of the state, with the plateau and hill country on either side, forming the eastern and western divisions. New Jersey and Maryland have each a coast and a mountainous section, while Delaware and the District of Columbia are entirely within the coast region.

The states of Virginia, North and South Carolina, Georgia and Alabama are each divided into three sections, comprising the low, and largely swampy coast, the hilly or mountainous portion, and the plain or plateau lying between them. Florida as a whole belongs to the coast region. Mississippi and Louisiana also are divided into three sections: the coast, the alluvial lands of the Mississippi, and the upland plains. Arkansas comprises the upland plains and the alluvial lands bordering the Mississippi.

In Tennessee there are five areas, comprising the mountain region in the east, the central basin-like area, the plateau in the western part of the state, and a narrow strip of alluvial land on the Mississippi. Kentucky has four sections: the mountain region in the east, the central region of rolling, hilly country, and the strips along the Ohio and Mississippi rivers. West Virginia comprises two sections: that of the mountains and that bordering the Ohio river.

Ohio and Indiana are sub-divided into three areas: that bordering on Lake Erie and Lake Michigan, that of the Ohio valley, and a middle region which is level or rolling, in the latter state approaching the character of prairie. Illinois is similarly divided into a lake region and a Mississippi river belt, with a larger central section of prairie.

Michigan contains two areas, one bordering on the lakes, and a heavily-timbered interior section. Wisconsin has, besides two areas corresponding to those of Michigan, a prairie region in the southern part, and a narrow belt along the Mississippi. Minnesota has four sections: the heavily-timbered northern portion,

most of which is yet unsettled, a Mississippi river belt, a small area lying between the two just mentioned, together with the prairie region in the southwestern part of the state. Iowa consists of narrow strips along the Mississippi and Missouri rivers, with a large interior of prairie. In Missouri there are, besides the strips bordering its two great rivers, a prairie region in the northern part and a timbered, broken country in the southern part of the state.

Dakota and Nebraska contain, together with the narrow strip along the Missouri, a prairie region on the east, and a portion of the Great Plains on the west, while Kansas is divided between the last two named regions. Texas comprises a coast section, an interior largely covered with forests, and the western portion of the state which corresponds to the western sections of Dakota, Nebraska and Kansas.

The areas of Montana, Wyoming, Colorado and New Mexico, are divided between the Great Plains and the Cordilleran mountain region. To the latter belong also the entire areas of Idaho, Utah, Nevada and Arizona, with the eastern parts of California, Oregon and Washington Territory. The Pacific coast region includes the western parts of the three last named.

These sections having been outlined without direct reference to the prevalence of particular diseases, may or may not coincide with areas of different shades of color.

The scale of color is the same throughout the series of maps on Plates 41 to 45 inclusive, which treat of the relative prevalence of principal diseases, as shown by the census returns; hence a given shade indicates on all these maps the same proportion of the total deaths. A deep shade, indicating a high proportion of deaths, does not, however, necessarily imply that a locality is especially favorable to the prevalence of the disease. It may indicate, on the contrary, that, on account of its real or fancied healthfulness, the region is one frequented by invalids beyond recovery, whose deaths unduly swell the proportion. This is noticeably the case with the California coast region, and parts of Minnesota, which have been much sought by consumptives.

Mortality of Infants.—The maps upon Plate 40, show the proportion which the deaths under the ages of one and of five years respectively bear to the total deaths. It appears that the proportion of deaths in the earlier years is very much smaller in the northern than in the southern part of the country, and is decidedly the smallest in the North Atlantic group of states. These are the most densely

settled, have the largest proportion of urban population, and in this section the comforts and refinements of civilization are most widely diffused. It is true that here the average size of families is less than elsewhere in the country, but this fact is sufficient to account for only a very small part of the difference in the rate of infantile mortality. All the facts at hand corroborate the general law, that the higher the degree of civilization the less the birth rate, and the smaller the mortality among the young.

The greater mortality among the young in the Southern states, is doubtless due in part to the preponderance of the colored element in the population. Owing to the difficulty of getting complete returns from this class, the number of deaths is probably understated.

The high ratio of infantile mortality in Utah is worthy of note, in connection with the practice of polygamy. In most of the other territories and Western states the proportion is low, manifestly because of the small proportion which children bear to the total population.

Deaths from Different Classes of Diseases.—Of the total number of deaths reported by the Census, the cause of death was given in 733,840 cases. The following table gives the number of deaths due to ten principal diseases, or groups of diseases, with the proportion which each bears to the total number of deaths, of which the causes were reported:

CAUSES.	NUMBER OF DEATHS.	PERCENTAGE OF ALL DEATHS.
Diseases of the respiratory system	107,904	14.70
Consumption	91,551	12.48
Diseases of the nervous system	83,670	11.40
Diarrheal diseases	65,565	8.94
Diphtheria	38,398	5.23
Diseases of the digestive system	34,094	4.64
Enteric fever	22,905	3.12
Scarlet fever	16,416	2.24
Whooping cough	11,202	1.53
Measles	8,772	1.18

Deaths from diseases of the respiratory organs were much less prevalent along the coast than in the interior of the country, showing that the uniform climatical conditions, induced by the presence of large bodies of water, are favorable to immunity from this class of diseases, while the extremes of a continental climate are correspondingly unfavorable. These affections were very prevalent in the central and western parts of the Mississippi valley. In the higher parts of the Cordilleran region, in the Pacific states, and especially in the coast region of California,

the large proportion of deaths from lung troubles is doubtless due to the number of invalids, suffering from such diseases, who have resorted to these sections in the vain hope of recovery.

The region primarily most affected by consumption was New England. The disease was also very prevalent in New York, southern Ohio, Kentucky and Tennessee. The Southern states, with the exception of the two above mentioned, were comparatively exempt from this scourge.

Diseases of the nervous system were most prevalent in the North Atlantic states and in Ohio, where they accompany the large urban population, the close settlement, and the preponderance of professional employments and of manufactures. Under these conditions the struggle for a livelihood is more intense than in agricultural sections, and the result of the greater wear of the nervous system is plainly shown. These diseases are prevalent in a secondary degree in the central part of the Mississippi valley, from the Gulf coast to the great lakes, and along the South Atlantic coast, as well as throughout California and western Oregon. The proportion is small in eastern Kentucky and Tennessee, in Alabama, and in the inland portions of North and South Carolina and Georgia. It is still smaller in most of the Cordilleran region and upon the Great Plains.

Diarrheal diseases appear to be relatively most prevalent in the prairie region and upon the South Atlantic plain, with a marked tendency also toward the Southern Central section. The proportion is smallest in the West and in northern New England. The southern coast region, with the exception of that of Louisiana, does not appear to be especially subject to diarrheal disease; indeed, the reverse is the case.

Diphtheria is vastly more prevalent in the North, and particularly so in the Northwest, than in the South. This is mainly the result of the severity of the climate, together with the facilities for spreading this contagious disease offered by the denser population of the former region. In Utah nearly one-third of all deaths, in Dakota nearly one-fourth, and in Nebraska, Minnesota and Idaho, one-sixth, were caused by diphtheria. Passing to the other extreme, the deaths from this cause were less than one-half of one per cent. in the District of Columbia and in New Mexico, while in but one of the Southern states (West Virginia) did the proportion reach five per cent.

Deaths from diseases of the digestive system, as would naturally be expected, were

distributed over the country with great uniformity. The ratio of deaths from this cause to the total deaths reported, which was, in the country at large, 4.64 per cent., ranged among the different states only from 2.8 per cent. in Vermont, to 6.27 per cent. in South Carolina. With scarcely an exception, it was greatest in the Southern states, owing to some extent to the climate, and largely to disregard of proper diet and the prevalence of rude cookery.

Typhoid fevers appear to have been least prevalent in the North Atlantic states, showing that the attention given to drainage, sewerage, etc., offsets the ill-effects which follow the condensation of population. In the South Atlantic region, and in the Mississippi valley, the disease was more prominent. Generally speaking, it was less prevalent in the northern than in the southern parts of the country, a warm climate appearing to be more favorable for its development than a cold one.

Scarlet fever, so common and so fatal among children, was confined in its range almost entirely to the Northern states, where, as in the case of diphtheria, the facilities for spreading, consequent upon dense settlement and more general intercommunication, are very great.

In the South the proportion of deaths from this disease was trifling, amounting in nearly every state south of Mason and Dixon's line and the Ohio river, to less than one per cent. The highest proportion in the country was in Wyoming, where, owing to an epidemic during the census year, it was 19.57 per cent. of all deaths. Next to Wyoming was the crowded little state of Rhode Island, in which 11.48 per cent. of the deaths were due to this disease.

Deaths from whooping cough were relatively more abundant in the South than in the North, and least abundant in the North Atlantic states, although doubtless the disease was quite as prevalent there as elsewhere. While few children escape it, the proportion of deaths is very small. During the census year it caused only 1.53 per cent. of all deaths, the ratio ranging in the different states from 0.26 per cent. in New Hampshire, to the unusually large proportion of 7.30 per cent. in New Mexico.

The distribution of deaths by measles was very similar to that of whooping cough. The Southern states suffered the greatest mortality, and the North Atlantic states the least. The lines were not as closely drawn, however, as in the case of whooping cough. The greatest mortality was in New Mexico, Kansas, Colorado and Nebraska, while following them, in almost unbroken line, come the Southern states. The

least mortality was in Rhode Island, where only 0.02 per cent. of all deaths were chargeable to this disease.

One very important practical point has been brought out forcibly by Dr. Billings' discussion of these statistics. In the case of all diseases due to blood poisoning, such as diphtheria and enteric and malarial fevers, the mortality is decidedly less in the large, well-sewered cities, which have general systems of water supply, than in the rural districts and small towns where water is obtained from wells, and where excreta are stored in cess-pools and vaults. Thus, in the lake region, in the cities, 7.82 per cent. of all deaths were from diphtheria, while in the rural districts and small towns 8.41 per cent. were due to this disease. In the case of enteric fever, in the same region, the corresponding proportions were 1.72 and 2.73; in the North Atlantic region, 1.63 and 2.00, and in the Gulf coast region 0.77 and 3.00 per cent. The results in the case of malarial fevers are quite as striking. In the lake region, the proportions were 0.83 and 1.12; in the North Atlantic region, 0.30 and 0.54, and on the Gulf coast 4.48 and 7.76 per cent.

The exhibits on Plate 46 of the "expectation of life" among native white males, at different ages from birth up to one hundred years, and of the death rate in successive years of each 100,000 of the same class, are based on tables prepared by Levi W. Meech, actuary, from the mortality statistics of the census of 1860 and that of 1880.

The chart shows that the expectation of life increases up to the age of four years, the boy who has reached this age having an expectation greater by over ten years than at birth. Between the ages of four and twenty this advantage is gradually lost, and the youth of twenty has only about the same chances of life as the new-born infant. At no age between four and one hundred does the expectation diminish in an equal ratio with the number of years elapsed. Between the ages of twenty and forty, for example, the expectation diminishes by about thirteen years, and a like amount between forty and sixty, while between sixty and eighty it decreases but 9.52, and between eighty and one hundred only 4.06 years, showing a much smaller rate of decrease for the latter periods.

Out of 100,000 native white males, no less than 16.2 per cent. die before reaching the age of one year; of those who survive, 6.41 per cent. die before reaching the age of two years, and of the remainder, 3.59 per cent. die before the age of three. The smallest death-rate occurs between the ages of thirteen and fourteen.

Not until the age of seventy-two does the death-rate equal that between the ages of one and two, and not until eighty-four does it exceed that of infants under one year of age.

Life Insurance Experience.—The Plates numbered from 47 to 49, inclusive, are based upon the experience of thirty American life insurance companies, comprising not far from 1,000,000 lives, as published in "Systems and Tables of Life Insurance," 1881, by Levi W. Meech. The statistics which they present are those, not of the mass of the population, but of selected lives, and are, therefore, much more favorable to longevity than the statistics of the census would be, were they complete.

The following table exhibits the expectation of life, as given by seven different authorities. The first six columns, abstracted from the article on life insurance in the Encyclopædia Britannica, ninth edition, are from English experience, while the seventh is taken from Meech's tabulation of the returns of the United States census, mentioned on the preceding page:

AGE.	CARLISLE. 1815.	EQUITABLE. (DAVIES.) 1825.	EQUITABLE. (MORGAN.) 1834.	SEVENTEEN OFFICES EX- PERIENCE. 1843.	INSTITUTE OF ACTUARIES. 1869.	ENGLISH No. 3. MALES. 1864.	AMERICAN MALES. (MEECH.)
10.....	48.82	48.83	48.32	48.36	50.29	47.05	48.44
20.....	41.46	41.06	41.37	41.49	42.06	39.48	40.87
30.....	34.34	33.98	34.53	34.43	34.68	32.76	34.51
40.....	27.61	27.40	27.40	27.28	27.40	26.06	27.88
50.....	21.11	20.83	20.36	20.18	20.31	19.54	21.22
60.....	14.34	15.06	13.91	13.77	13.83	13.53	14.93
70.....	9.18	9.84	8.70	8.54	8.50	8.45	9.51
80.....	5.51	5.38	4.75	4.78	4.72	4.93	5.41
90.....	3.28	2.65	2.56	2.11	2.36	2.84	2.76

It will be seen that the American expectation of male life is greater at all ages, the excess in several cases being more than a year, although the American expectation is computed for all lives, while the English experience covers only selected lives, as above stated. The comparison of selected lives in the two countries, given in the diagram at the foot of Plate 49, shows a still greater difference in favor of American longevity.

These facts appear to disprove the oft-repeated statement and popular belief that Americans, especially those of mature years, and those engaged in occupations which tax the brain and nervous system, live too fast and wear out the vital energies early. It should be remembered that this is the very class which indulges in the luxury of life insurance, and this comparison seems to indicate that, granting that Americans live at high pressure, then that condition is more favorable to longevity than the slower life of the mother-country.

Another popular belief is dispelled by the above-mentioned concluding diagram upon Plate 49. For a generation American women have been derided for their alleged physical inferiority to their English sisters, who have been held up as models of health and strength. In consequence reformers have urged upon American women the adoption of English modes of life as a means of attaining, in a larger proportion, to the health and long life popularly ascribed to the English women. Whether the fact be reassuring or not, life tables appear to indicate that, of the two, American women are the longer lived.

A comparison of the diagrams on Plates 48 and 49, develops the fact that deaths from zymotic diseases, as well as from accidents and injuries, present a striking exception to the rule that, during the early years of insurance, medical examination serves as a material protection to the companies.

Thus the death-rate from the class of constitutional diseases is .63 for the first year of insurance, 1.53 for the second, and 2.25 for the third year, per thousand males insured, as against an average of 2.35 for the entire period of insurance, showing that for these diseases medical examination is an effective protection until after the third year. On the other hand, deaths from zymotic diseases average 2.37 for the first, 1.9 for the second, and 1.88 for the third year, all being in excess of the average of 1.83 for the entire period of insurance. There is a similar contrast between zymotic diseases and all other causes of death, except accidents

and injuries. For all diseases, the average duration of the protective effect of examinations is about two and one-half years, in the case of selected lives; while, if the rejected lives were included in the average death-rate for the whole insurance period, it would be seen to be much greater.

The average mortality per year among insured persons was, by the American tables, for males, $10\frac{20}{100}$ per thousand. For females it was somewhat greater, being $11\frac{20}{100}$ per thousand. Among the causes of mortality, consumption holds the first place among specific diseases, causing $1\frac{86}{100}$ deaths per thousand among males, and $2\frac{15}{100}$ among females. The following table shows the number of deaths per thousand persons insured, caused by each of the principal diseases:

CAUSES.	DEATHS.	
	FEMALE.	MALE.
Consumption.....	2.15	1.86
Pneumonia.....	.93	.78
Accidents.....	.17	.77
Typhoid and typhus fever.....	.63	.66
Paralysis and softening of the brain.....	.45	.64
Diseases of the heart.....	.52	.53
Apoplexy.....	.33	.49
Diseases of the liver.....	.28	.30
Malarial fever.....	.26	.24
Diseases of the bowels.....	.36	.21
Abscess and hemorrhage of the lungs.....	.22	.20
Congestion of the brain.....	.09	.19
Cancer.....	.27	.18
Diseases of the stomach.....	.27	.18
Dropsy.....	.26	.18
Dysentery.....	.19	.17
Bronchitis and pleurisy.....	.16	.17
Congestion of the lungs.....	.15	.16
Cholera.....	.08	.12
Debility, prostration, etc.....	.16	.11
Erysipelas.....	.05	.11
Diarrhea.....	.12	.10
Childbirth.....	1.04
Diseases of the breast and uterus.....	.58

Aside from those causes of death peculiar to women, it appears that females are more liable to diseases of the lungs and of the digestive organs, while males are more subject to accident, and more frequently victims to diseases of the brain and the nervous system.