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ORIGINAL ARTICLES.

INFANTILE MORTALITY: ITS CAUSATION AND ITS RESTRICTION.

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That the death-rate during the first five years of life should be higher than for the same number of years at any subsequent period might be expected to be true. There are many factors contributing to this result. Some of these are easily recognized, and might be largely eliminated without any great effort. Others are evident, but can not be prevented without radical changes in social life, while still others are obscure. So long as the weak as well as the strong continue to procreate their kind, infantile mortality will be great. So long as tuberculosis, syphilis, and even idiocy are not regarded as bars to the reproduction of the species, weak, diseased and mentally incompetent children will be born; and looking at it from a philosophic standpoint, it is better for the future of the race that many of these should die, but it would be better still had they never been born. "Multiply and replenish the earth" is followed with more persistency than any command of the decalogue, and too often without any thought of the kind of material with which the earth is being replenished. However, as deplorable as this thoughtless and often sinful assumption of paternity and maternity is, it is not so bad as the criminal means often resorted to in order to prevent it. Great infantile mortality is not so disastrous to the progress of the race as is feticide.

It is the purpose of this paper to ascertain, 1, what the infantile death-rate is; 2, what are its most potent causes; and, 3, what measures might be resorted to in order to lessen it.

The number of births reported as having occurred in the United States during each of the census years ending June 1, 1860, 1870 and 1880,

were respectively 1,072,090, 1,287,670 and 1,577,133. [See mortality volumes of the census reports for these years.] According to the mortality rate of the census year 1870, found by adding 41 per cent. to the deaths reported, the number of those born in the United States which reached 5 years of age are for those born in 1860, 784,545; for 1870, 942,304; and for 1880, 1,153,144. In other words, of those born in 1860, 26.8 per cent. died under 5 years of age, and this figure practically holds good for the years 1870 and 1880. Thus, a little more than one-fourth of the children born in this country die before they reach 5 years of age. Of the deaths under 5 years of age in 1880, 57.8 per cent. occurred during the first year.

Having ascertained the death-rate among infants, the next inquiry will be in regard to the causation of this mortality, which must be regarded as high. In the first place, is there any difference in the death-rate among those born and reared in cities and those born to the rural population? The following table gives us the best information which I am able to secure on this point:

TABLE I.—Exhibiting the reported number of births and of deaths of those under one year of age in the United States during the census year 1880, classified in rural and city (49 large) populations, with distinction of sex. (Compiled from the Tenth Census of the United States, 1880, Vol. XXII, Mortality and Vital Statistics, Part 2, p. 634.)

UNDER ONE YEAR OF AGE.					
Population.	Sex.	Tot. births during the Census Year 1880.	Deaths per 1,000 during Census Year of those Born Within the Year.	Deaths	Deaths per 1,000 of living population.
Rural—Total.	M.	690,095	78.1	70,700	111.1
	F.	658,546	63.0	56,909	92.2
		1,348,661	141.1	127,609	203.3
Cities (49 large) Total	M.	116,851	162.4	26,149	267.2
	F.	111,761	132.8	21,426	221.1
		228,612	295.2	47,575	488.3

NOTE.—For the names of these 49 cities, see pages 80-82, and 634, of the volume mentioned in the heading of this table.

Table I shows that infantile mortality is much greater in urban than in rural populations. This is undoubtedly due to a number of causes, some of which we can better appreciate after we have ascertained the diseases to which the great mortality is due. However, there is one point to

which I desire to call attention here. It might be supposed that the children born in cities are weaker naturally than those born in the country. In only the largest cities is the death-rate among children due to debility higher than in the country, and this is caused, to a large extent, by crowding, by want of proper food, and by neglect. Dr. Würzburg says: "According to Dr. L. Pfeiffer the death-rate from debility is seemingly greater in the larger than in the smaller cities. This supposition seems to obtain in a certain sense in Prussia, for the deaths from debility during the years 1878-1880 in seven cities with more than 100,000 population were 35.7, 36.7, and 38.7 per 1,000; and in sixty-one cities with populations of from 20,000 to 100,000, only 28.5, 29.4, and 29.9. These figures indicate that the death-rate from debility is decidedly greatest in the larger cities, while the average death-rate from debility in all the cities is yet lower than that in the rural districts. The high death-rate of illegitimates is an important factor in the cities; thus, Köln, with a death-rate of all infants of 24.06 per cent., loses 27.48 per cent. of those illegitimately born."

The death-rate from debility during the first year of life was, during the years 1875-77, for each 1,000 living children born in the whole of Prussia, 30.4; for those born in the cities, 28.9; for those born in the rural districts, 31.1. These figures show that the high mortality of children born in cities is not due to general debility or weakness of constitution, and show us that we must look for an explanation from some other source. In this search let us ascertain, from the following tables, to what diseases infantile mortality is most largely due.

TABLE 2.—Exhibiting the number of deaths reported from each of eleven diseases, in persons under five years of age and in each year of age under five years, together with the total number of deaths from each of these diseases in persons of all ages in the United States during the census year 1860. (Compiled from the Eighth Census of the United States, 1860, Mortality and Miscellaneous Statistics.)

DISEASE.	All Ages.	Under 1.	1 to 2.	2 to 3.	3 to 4.	4 to 5.	Under 5.
Cholera Infantum . . .	4,808	2,959	1,339	352	89	48	4,787
Convulsions	9,077	5,099	1,152	597	306	174	7,328
Croup	15,211	5,409	2,759	2,412	1,815	1,140	13,535
Diarrhœa	7,850	2,690	2,137	843	252	124	6,046
Dysentery	10,468	2,482	2,479	1,326	576	288	7,151
Inflam. of Brain . . .	10,349	2,989	1,786	994	521	307	6,657
Measles	3,899	760	884	646	332	188	2,810
Pneumonia	27,094	5,045	2,624	1,456	760	496	10,381
Scarlet Fever	26,402	2,601	3,443	3,886	3,457	2,757	16,144
Teething	4,909	1,951	2,348	501	42	18	4,860
Whooping-cough . . .	8,408	3,723	2,081	1,066	501	314	7,685

convulsions form a prominent symptom, no one can tell with certainty. In Dresden 281 deaths were reported from July 11 to September 25, 1886, as due to convulsions. Subsequent investigation into the histories of these cases by a competent medical officer showed that primary disease of the nervous system was responsible for only thirty-six of these, while cholera infantum and diarrhœa caused the death of seven-eighths of those reported as dying of convulsions. These figures will probably hold good for the United States, and we are justified, I think, in claiming that more than 90 per cent. of the deaths reported as due to convulsions are really due to digestive disturbances.

TABLE 3.—Exhibiting the number of deaths reported from each of eleven diseases in persons under five years of age, and in each year of age under five, together with the total number of deaths from each of these diseases in persons of all ages in the United States during the census year 1870. (Compiled from the Ninth Census of the United States, 1870, Vital Statistics.)

DISEASES.	All Ages.	Under 1.	1 to 2.	2 to 3.	3 to 4.	4 to 5.	Under 5.
Cholera Infantum . . .	20,255	13,375	4,924	1,188	329	161	19,977
Convulsions	12,751	8,563	1,614	642	329	173	11,321
Croup	10,692	4,855	2,102	1,390	943	560	9,859
Diarrhœa	14,195	4,554	2,833	1,310	485	274	9,456
Dysentery	7,912	1,984	1,698	783	320	219	5,004
Inflam. of Brain . . .	13,701	4,152	2,283	1,189	718	489	8,831
Measles	9,237	1,871	2,222	1,257	728	387	6,465
Pneumonia	40,012	7,252	3,686	1,929	1,046	653	14,566
Scarlet Fever	20,320	2,100	2,967	3,262	2,930	2,296	13,555
Teething	3,247	1,444	1,488	274	28	1	3,235
Whooping-cough . . .	9,008	4,424	2,086	1,063	529	294	8,396

TABLE 4.—Exhibiting, according to the reports (with distinction of sex), the number of deaths in each 1,000, deaths in all ages from each of eleven diseases, in persons under five years of age and in each year of age under five years; together with the total number of deaths from each of these diseases in persons of all ages in the United States during the census year 1880. (Compiled from the Tenth Census of the United States, 1880, Vol. XII, Mortality and Vital Statistics, Part 2.)

DISEASES.	All Ages.	Under 1.	1 to 2.	2 to 3.	3 to 4.	4 to 5.	Under 5.
Cholera infantum . . .	M., 13,168 F., 11,815	673.99 669.41	251.25 254.49	58.48 57.12	10.57 14.24	5.70 5.75	1000.00 1000.00
Convulsions	M., 9,491 F., 8,353	690.57 635.68	122.25 120.00	57.95 61.62	25.38 33.87	16.18 15.98	912.33 867.15
Croup	M., 9,753 F., 8,215	380.68 354.40	173.90 171.28	140.70 153.71	103.60 106.26	75.95 77.98	874.82 863.61
Diarrhœa	M., 5,953 F., 4,872	397.97 420.52	189.36 199.83	60.98 66.06	21.45 21.88	10.14 8.26	679.90 716.56
Dysentery	M., 7,013 F., 6,414	266.21 240.89	228.40 202.85	166.03 103.71	43.56 35.51	23.64 21.59	661.84 604.57
Inflam. of Brain . . .	M., 5,869 F., 5,034	318.54 312.71	172.07 175.25	82.48 84.28	44.38 46.15	31.24 38.39	648.51 657.45
Measles	M., 3,980 F., 4,092	267.44 230.64	208.26 193.63	125.91 117.40	68.75 63.73	41.80 41.91	657.45 647.30
Pneumonia	M., 35,493 F., 27,560	137.50 146.54	73.90 81.83	40.36 44.24	20.49 23.38	13.42 15.55	295.75 311.33
Scarlet Fever	M., 8,181 F., 8,207	100.83 73.36	137.71 123.78	161.36 145.51	141.14 130.74	109.78 116.21	650.2 580.60
Teething	M., 2,171 F., 2,093	419.74 422.29	465.41 478.72	95.94 83.69	12.45 9.99	4.15 1.91	997.69 995.70
Whooping-cough . . .	M., 5,133 F., 5,931	530.57 498.56	230.51 224.26	102.36 118.43	47.27 57.10	26.76 32.44	937.49 930.90

In the study of tables 2, 3 and 4 we are confronted with certain difficulties which it is at present impossible to wholly overcome. More than 17,000 deaths are reported as due to convulsions, and more than 4,000 to teething. How the deaths reported as due to convulsions should be apportioned to the various diseases of which

In studying the diseases given in tables 2, 3 and 4, I shall divide them into three classes. The first class includes cholera infantum, convulsions, diarrhœa, dysentery and teething, diseases which cause more than 50 per cent. of the deaths which occur among children under 5 years of

A second class of diseases seriously affecting infantile mortality comprises diphtheria (reported in the United States census as croup), measles, scarlet fever and whooping-cough. These are universally regarded as contagious, and they are to be restricted by isolation and disinfection.

While I have no doubt that a microorganism is concerned in the production of pneumonia, I think that the weight of evidence at present is that exposure to marked changes in external temperature is an important, and probably a necessary factor in the causation of this disease. Deaths from pneumonia may be restricted by avoiding such exposure.

In concluding I may give the following answers to the questions asked in the beginning of this paper:

1. One-fourth of the children born in the United States die before they reach the end of the fifth year of life.

2. Derangements of digestion cause more than 50 per cent. of these deaths. This class of diseases may be restricted by proper attention to the food.

3. Infectious diseases are serious in their effects upon infantile mortality. They may be restricted by isolating the sick and disinfecting clothing and rooms.

4. About three-eighths of the total deaths from pneumonia occur among those under 5 years of age. Proper clothing and lessened exposure to extremes of temperature will do much to protect against this disease.

DEATHS FROM CHOLERA MORBUS, BY MONTHS, IN 31 REGISTRATION CITIES IN THE U. S.

From Vol. XII, Tenth Census United States, Part 2.

DEATHS FROM DIARRHOEA AND DYSENTERY, BY MONTHS, IN 31 REGISTRATION CITIES
IN THE UNITED STATES.

DEATHS FROM DENTITION, BY MONTHS, IN 31 REGISTRATION CITIES IN THE UNITED STATES.

From Vol. XII, Tenth Census United States, Part 2.