

A statistical survey of infant mortality's urgent call for action / by Edward Bunnell Phelps.

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Phelps, Edward Bunnell, 1863-1915.
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Publication/Creation

[Baltimore?] : [publisher not identified], [1911?]

Persistent URL

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INFANT MORTALITY'S
URGENT CALL FOR ACTION

BY
EDWARD BUNNELL PHELPS, M. A., F. S. S.
Editor, THE AMERICAN UNDERWRITER, of New York City.
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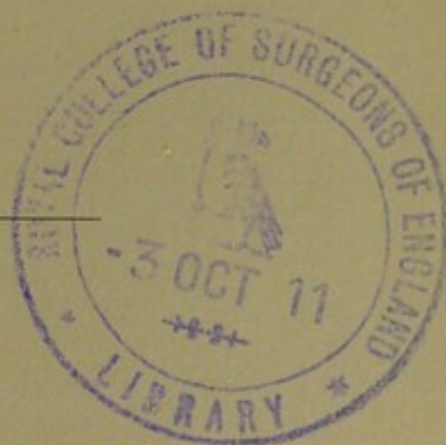


Address delivered at First Annual Meeting of the American Association for Study and
Prevention of Infant Mortality, at Baltimore, November 9-11, 1910, and
reprinted from the Transactions of the Association.

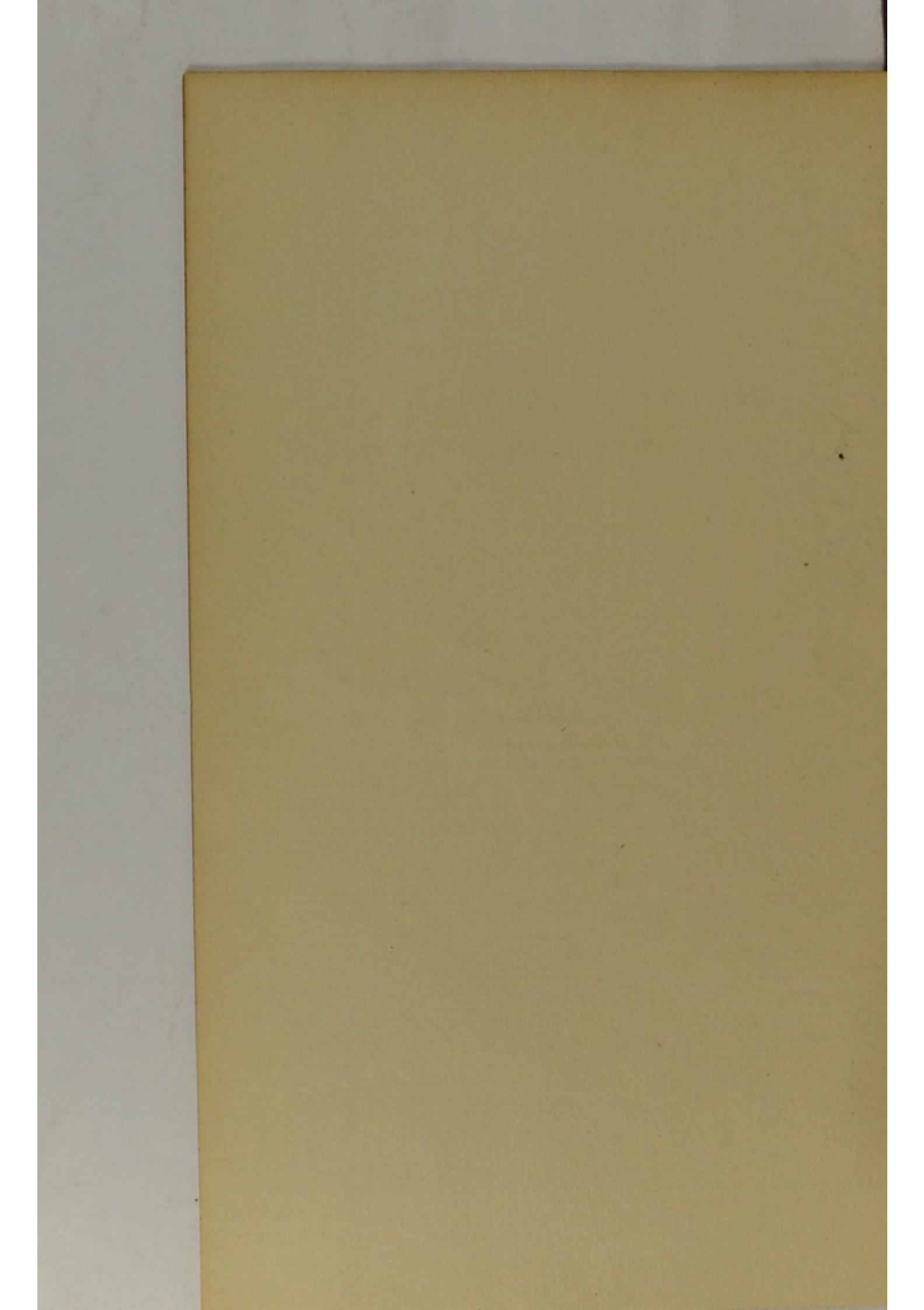


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A STATISTICAL SURVEY OF INFANT MORTALITY'S URGENT CALL FOR ACTION

The fundamental basis of all rational reform movements being the demonstration of the conditions which demand reform, it would seem to be incumbent on this first annual meeting of the American Association for Study and Prevention of Infant Mortality to establish the *raison d'être* for the organization of the Association by placing on record, and bringing before the American public in the simplest possible form, a convincing demonstration of the present appalling rate of Infant Mortality, or, in other words, of the utterly needless waste of infant life. Once the fact is proven, and burned into the public mind, investigation of the why—or reason for the fact—and the how—or means of remedying the fact—is an inevitable sequence. This logical order of procedure for this Association is succinctly stated in the provisional program for this meeting, in the first sentence of the outline for this session, which declares that: "Full and accurate information concerning the infant population and infant mortality is the indispensable basis of an intelligent effort to check the waste of infant life." Full and accurate information on these lines is not as yet obtainable, but at least a statistical approximation of the facts is attainable, and one which will convince any thinking man of the pressing importance of the movement which this Association is now inaugurating in this country. And, as indicated by its title, the purpose of this paper is to present "A Statistical Survey of Infant Mortality's Urgent Call for Action."

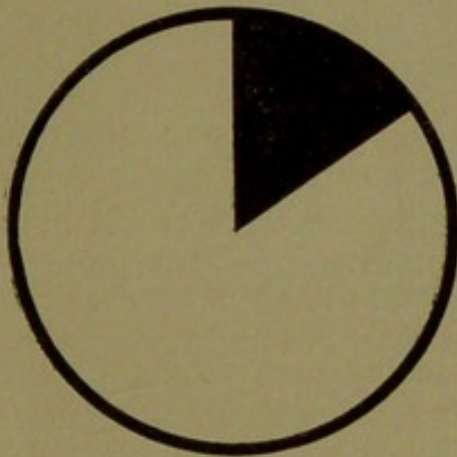
At the very outset, it should be clearly understood that all authorities on the subject, the world around, long since concurred in restricting the application of the term "infant mortality" to deaths under one year of age, thus indirectly relegating to the class of child mortality all deaths of children between one and, say, five years. Consequently, all figures and statements in this paper dealing with infant mortality apply only to deaths under 1 year of age. The world's specialists on vital statistics have also tacitly agreed, for good and sufficient reasons which need not here be discussed, that the rate of infant mortality shall be calculated by the division of the number

of deaths under 1 year by the number of births, per annum—still-births excluded—instead of by division of the number of deaths under 1 year by the living population under 1 year, as would be the case were the time-honored method of computing the death rates at all other ages applied to infant mortality. The infant mortality ratio being worked out on a basis positively unique, it is therefore obvious that it cannot properly be compared, or contrasted, with the commonly accepted death rates for any other ages. The basic facts—and especially the elimination of still-births from the figures for both births and infant deaths—being established, it is now in order to present in the briefest possible form the urgent call of infant mortality for remedial action.

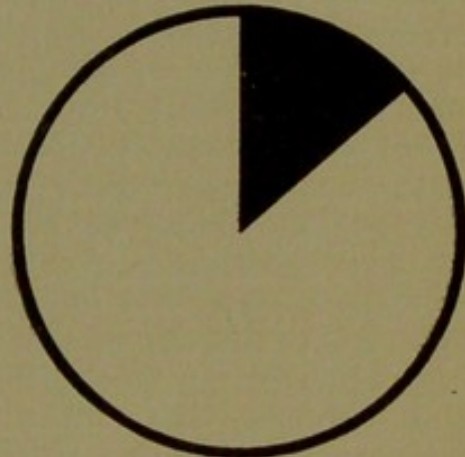
The foundation on which the call for action rests necessarily consists of statistical data on the subject, which, with references to their several authorities, are presented in the various tabular compilations appended to this paper. Fully appreciating the fact that the eye, rather than the ear, is the proper medium for conveying to the brain the force of statistical arguments, I shall not cloud this oral discussion of the subject with any confusing array of mere figures, but by a brief résumé of the final showing of the appended tabulations and certain graphic presentations of their significance shall endeavor to demonstrate that the moving cause for the organization of this Association is by no means one of the mere sociological fads of the current era of reforms practical, and so-called reforms utterly impracticable, but is one of the most essential, and most far-reaching, problems which now confront the human race.

That this problem is world-wide in scope is conclusively proven by a tabulation of the infant mortality of 31 of the principal foreign countries for the quarter-century ending with 1905, which I compiled and published about two years ago and have appended to this paper as Table 1. Summarized in a single sentence, this table shows that on a broad average for 20 of the principal countries of Europe no less than 162 out of every 1,000 babies born alive died before completing the first twelve-month, in the 25 years ending with 1905, and that in that same period the average ratio of deaths under 1 year to living births in 31 of the leading countries of the world, even including the seven divisions of Australasia with their exceptionally low rates of infant deaths, was 154 (see Chart 1). For only about one-half of these countries are the infant mortality rates for the three years, 1906-8, now obtainable, and the 16 countries in question had an average infant death rate of 133 in 1906-8, as contrasted with one of 142 in 1901-5, and one of 150 for the 25-year period ending with 1905.

Even were these records to be taken as absolutely worthy of credence, the apparent decrease in the three years ending with 1908 would indicate a decrease of less than two infant deaths per hundred living births in recent years as compared with the average for the quarter-century immediately preceding. But



AVERAGE FOR 31 LEADING FOREIGN COUNTRIES
FOR TWENTY-FIVE YEARS, 1881-1905, INC.
15.4 DEATHS PER 1000 BIRTHS



AVERAGE FOR CONN., AND MASS. AND NEW YORK
FOR SIX YEARS, 1904-1909, INC.
13.9 DEATHS PER 1000 BIRTHS

CHART I.—Infant mortality per 1,000 living births. Each circle represents 1,000 births—black sections, percentages of deaths under one year.

the figures in question can scarcely be taken at their full face value, although cited from the official vital statistics of the several countries, for the reason that in practically all countries there has been a larger percentage of improvement of late years in the registration of births than in that of infant deaths. And, as the infant death rate is calculated by dividing the number of deaths under 1 by the number of registered births, the larger the registered percentage of births the larger will be the divisor, and the smaller will be the quotient—or apparent infant mortality rate—even though the actual numbers of births and infant deaths be identical for the two periods under comparison. It is evident, therefore, that *apparent* declines in the annual infant death rates of the various countries, States and cities cannot be taken as conclusive, and should not so be taken unless carefully investigated and supported by corroborative data. This defect in the commonly accepted statistics of infant mortality is especially prevalent in those for the registration States and cities of this country, as I shall later on endeavor to make clear in this paper.

For the time being, setting aside this element of probable error, and noting only the essential showing of the world-wide tabulation, it seems to be safe to assume that in the civilized world at large outside of the United States not less than 13 out

of every 100 babies born alive die within the first year. In some countries the infant death rate is nearly if not quite twice as high as that figure, but, dealing only with the broadest averages, the world's infant mortality now unquestionably amounts to 13 deaths for every 100 living births. As the tabulations for this country appended to this paper make clear, the infant mortality rate for the United States is certainly no better than that for the rest of the world at large (See Chart 1), and surely there could be no more convincing evidence of the ample justification for the present world-wide movement along the lines on which this Association was established than that one sombre fact, namely, that no less than 13 of every 100 newly-tenanted baby-carriages are vacated by death within the first twelve-month under present conditions, year in and year out. From my point of view, that fact is the basic fact of this crusade, is one which every worker in the crusade should keep clearly in mind, and one whose dire significance must be apparent to every thinking man and woman. No knowledge of either statistics or pediatrics is requisite for a full appreciation of it.

As human nature is constituted, however, it is not what is happening to the peoples of other lands, hundreds or thousands of miles distant, which most strongly appeals to us, but, rather, what is happening, or promises to happen, to us and to ours. The people of the United States have repeatedly proven in substantial form their broad humanitarian sympathy with the sufferers by the floods in China, the famine in India, and the destruction of Messina and other far-away cities, but it is not the infant mortality of the world at large, but that of Continental United States which looms up large before American mothers and fathers, and offers the problem which this Association is designed to solve, in part at least. Just what is that particular infant mortality, in so far as it can be approximately determined, why is it as appallingly heavy as it is, and how may it be materially and permanently reduced? These are the questions which now confront us, and which I shall briefly discuss in so far as such weighty questions can be even superficially considered in the few minutes which remain to me.

What is, or has been, the infant mortality of the United States as a whole? Nobody knows, and there is no means of finding out. Even including the 18 States and 54 cities in other States whose registration systems in 1909 were acceptable to the Bureau of the Census, but 55.3 per cent. of the total estimated population of Continental United States was included in the Registration Area whose returns for last year are presented in the Census Office's recent advance bulletin of Mortality Statistics for 1909, and but a single one of all the Southern States,

namely, Maryland, figures in those statistics. Not only are mortality statistics for nearly one-half of the population of Continental United States therefore unavailable, but as our national statistics for the Registration Area as yet present no birth returns—except for Census-taking years—it is a physical impossibility to compute the ratio of deaths under 1 year to living births on the one universally recognized basis, even for our Registration Area. To be sure, the majority of the Registration States do issue annual compilations of their respective vital statistics, and most if not all of these compilations now include tabulations of living births, and deaths at the various ages. Even the oldest and most reliable of these State systems of registration of births and deaths, that of Massachusetts, has been unable to round out complete annual returns of births, and in the Sixty-Seventh Report of Births, Marriages and Deaths in Massachusetts, for the year 1908, a frank admission of and partial explanation for this fact are made in these words (p. 142):

“Although the law applies to the registration of births, as well as to that of marriages and deaths, it is probable that the statistics of the births are less accurate than those of either of the other two classes. From the nature of things, marriages and deaths must be registered, in order that the former may be solemnized, or that interment be possible in case of deaths; but in the case of the births, the inadequacy of penalty for neglect, ignorance of the law, as well as topographical conditions, tend to an incomplete registration. It is therefore likely that the number of births returned in Massachusetts in 1908 was less than the actual number which occurred; hence a lower birth rate, and comparisons between births and deaths inaccurate.”

In many, if not most, of the other States which purport to present annual birth statistics, the registration of births is far more defective than in Massachusetts, and as an inevitable result of the incomplete returns of births the infant mortality rates—or ratios of deaths under age 1 to living births—presented in the annual reports of these States can only be taken in a Pickwickian sense, so to speak. The divisor being too small in every case—in some cases materially under the proper figure—of course the resultant, and apparent infant mortality rate, is above the actual rate. As the years roll by, the birth registration is doubtless improving in most cases, the margin of error is therefore continuously changing, and hence attempted comparisons of the apparent infant mortality rates of recent years with those of earlier years are more or less misleading. But, as this most glaring defect in our American system of registration of vital statistics, and most serious obstacle in the way of securing correct figures of infant mortality in this country, has

been considered at length in the report of the special Committee on the Registration of Births, scheduled on the program for presentation at this session, further discussion of that phase of the subject in this paper would be entirely superfluous. Some reference to it, however, by way of acknowledgement of the unfortunate limitations of the best available data, seemed to me necessary before summarizing the statistical tabulations of infant mortality in this country attached to this paper.

Although no birth returns have been included in the Census Office's annual publications of Mortality Statistics for the last 10 years, in all of these reports there has been a classification of deaths by ages in the constantly changing Registration Area, and some idea of the movement of the infant mortality rate in so far as Registration States and cities have been concerned from time to time may be had by a comparison of the annual ratios of deaths under 1 year with the total number of deaths at all ages in each of those years. I had some time since worked out such a comparison for the nine years ending with 1908, and now note in the advance bulletin of Mortality Statistics for 1909 just received from the Census Office that Dr. Wilbur therein suggests such a basis of comparison, and furnishes several tabulations on those lines which are of real value in any study of the infant mortality of this country. As he puts it (p. 11, Bulletin 108):

"When the proper statement of infant mortality is lacking, recourse may be had to the ratio between the number of deaths of infants under 1 year of age and the population under 1 year, although this ratio is unsatisfactory for many reasons, and the population under 1 year is not available except by estimation for intercensal years. A very crude means of judging of the condition as regards the general extent of infant and child mortality is to compare the total number of deaths of infants under 1 year and of children under 5 years of age with the total number of deaths registered. Other things being equal—that is to say, with substantially similar populations with respect to age distribution and in the absence of epidemic diseases prevailing at higher age periods—the relative proportions of deaths of infants and children to the total number of deaths should show approximately the prevalence of infantile diseases and the importance of reducing the general mortality by efforts directed toward the prevention of infant mortality."

This means, in other words, that, in default of national figures for either births or living population under age 1 in the Registration Area, at least one available means of attempting to measure the infant mortality for that area is a comparison of the annual ratios of deaths under age 1 with the total number

of deaths at all ages in that area. Such a comparison for the 10 years, 1900-1909, I have worked out and present in Table II attached to this paper (and also in Chart II), and, without taking up in detail the figures which may there be found, the general effect of that tabulation may be here shown by the citation of the average ratios on these lines for the two five-year periods, 1900-1904 and 1905-1909. In the former quinquennial period, the deaths under 1 in the Registration Area amounted to 19.2 per cent. of the total deaths at all ages in that area; in the latter quinquennial period, the ratio had risen to 19.5 per cent. thus showing an apparent increase rather than decrease. As was stated in the note from Dr. Wilbur's current report which I have just quoted, however, this method of comparison is "a very crude means of judging of the condition," and its credibility depends upon the assumption that age distribution and population conditions were substantially similar during the periods of comparison. But practically no other means of even attempting to measure the rise or fall of the infant mortality rate for the Registration Area as a whole is possible, and there are some reasons for believing that, in the main, the ratio of infant deaths to deaths at all ages affords a fairly reliable index of the infant mortality situation under normal general conditions. In the case of the comparison of the ratios of 1900-1904 and 1905-1909, the different conditions must be noted. From 1900 to 1905, inclusive, the Registration Area remained practically unchanged, no additions of area being made, whereas in 1906 the States of California, Colorado, Maryland, Pennsylvania and South Dakota were added to the Registration Area, thus increasing the population of that area by more than 7,000,000, or nearly 20 per cent. The addition of the five States in question materially increased the urban population of the Registration Area, and as the infant death rate in the cities is in general considerably larger than that of the rural districts this radical change in the make-up of the Registration Area might confidently be expected to send up the infant death rate of the area in question. But from 1900 to 1905, inclusive, the mortality statistics of the Registration Area dealt with precisely the same territory, hence are fairly comparable, and the registration returns for infant and child mortality for that period, as presented in Table II attached to this paper (and in Chart II), are worthy of careful study by all interested in the problem of infant mortality. In the last of the six years in question, 1905, the deaths under 1 year were fewer by more than 6,000 than those in the first year of the period, 1900, the deaths between 1 and 5 years showed an even larger decrease, one of more than 10,500, and of course the total of deaths under age 5

had dropped to the extent of more than 16,500, the sum of the decreases in the previously named age-groups.

Assuming that the birth-rate for the six years was substantially uniform (the birth rate in the Census year 1900 was 27.2 per 1,000 of mean population in the United States), the natural growth of the population in the Registration Area between 1900

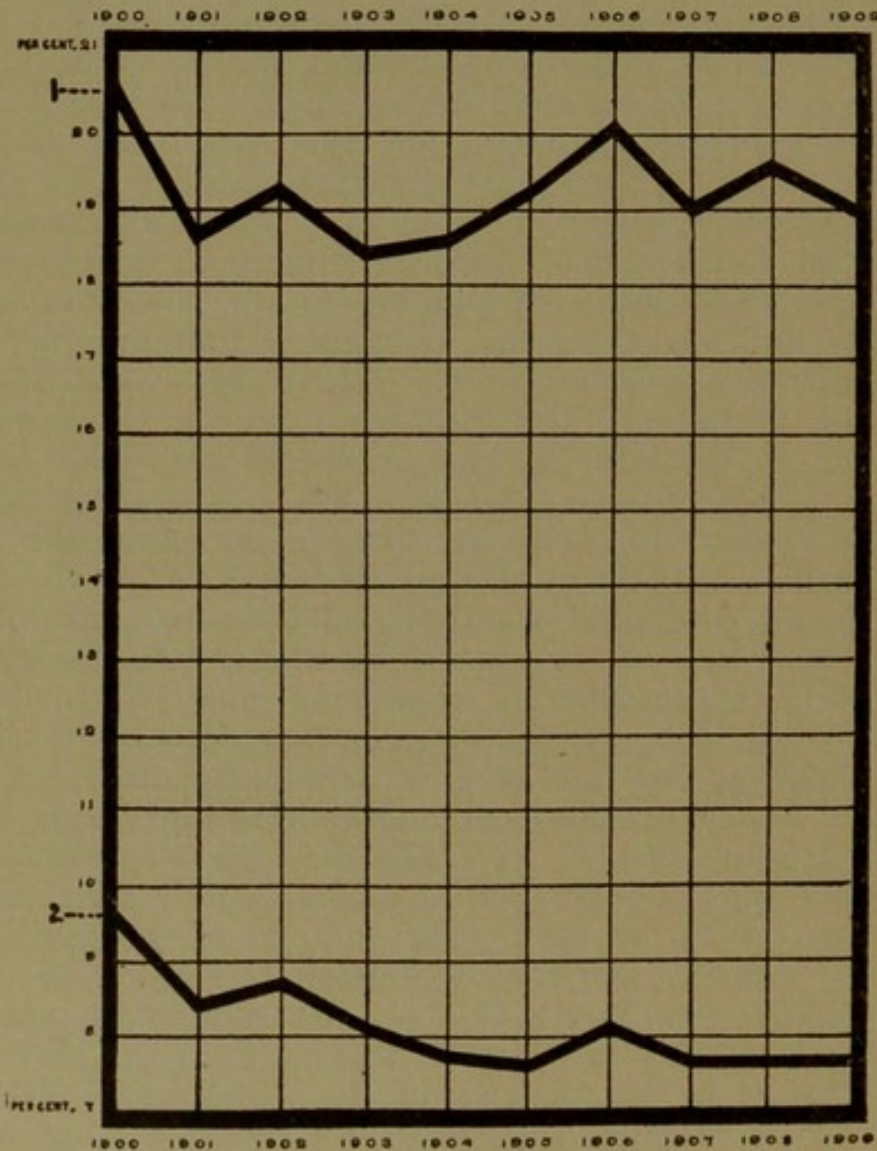


CHART II.—Annual ratios of (1) deaths under 1 year and (2) deaths between 1 and 5 years to total deaths in registration area of U. S. for 10 years, 1900-9.

and 1905 (amounting to nearly 3,000,000) would indicate an increase of about 81,000 in the probable number of births in 1905 as compared with 1900, and at the ratio of deaths under age 1 to living births in the Registration Area in the Census year 1900 (149.4 per 1,000) this increase in births would have involved an increase of more than 12,000 in the number of infant deaths in 1905 as contrasted with the number in 1900.

As a matter of fact, there was a decrease of more than 6,000 in the number of infant deaths, instead of the presumable increase of more than 12,000, and that figure would seem to signify an actual decline of nearly 23 per cent. in the infant death rate of 1905 for the Registration Area as compared with that for the Census year, 1900, as shown by the Twelfth Census. Of course comparisons of single years' mortality are open to many serious objections, but as the number of infant deaths in the Registration Area in 1905 was higher by several thousands than that of any of the years intervening between 1900 and 1905, the decrease in the actual number of deaths under age 1, in the face of a steadily increasing population and corresponding increase in the number of births, would seem conclusively to indicate at least a slight decrease in the infant death rate. The unquestionable decrease in the general death rate, from 1,755.0 per 100,000 in 1900 to 1,501.8 in 1909 in the Registration Area, the similar decrease in the general death rates of foreign countries, the comparatively slight but almost invariable decline in the infant death rate in recent years in those States and foreign countries having reasonably complete registration systems, and all collateral evidence combine to suggest a small decrease in infant mortality throughout the United States in the last decade. But positive evidence of that presumable decrease will not be forthcoming until the infant mortality statistics of the Thirteenth Census are available. In any event, it is extremely improbable that the infant death rate for the Registration Area, which was 149.4 per 1,000 living births in the Census year 1900, will prove to have dropped below 130 per 1,000 in 1910.

A study of the figures presented in Table II will reveal many incidental evidences of a decrease in the infant mortality rate, even though the ratio of deaths under 1 to total deaths at all ages was slightly larger for the Registration Area as a whole in the last five years than in the previous quinquennial period. For instance, in 1900-1905, while the Registration Area remained unchanged, the fluctuating changes in the ratio in question tended toward a decrease, the ratio in 1905 being only 19.3 as compared with 20.7 in 1900. In 1906 came the addition of five States to the Registration Area, and as these States included many large cities with comparatively high infant mortality rates the immediate increase in 1906 of the ratio of infant deaths to total deaths, from 19.3 to 20.2, might naturally have been expected, and by no means necessarily indicated any actual increase in the infant death rate. Since 1906 the Registration Area's ratio of infant deaths to total deaths has shown a downward tendency, and although in none of the last three years has it reached quite as low a figure as it had in 1901, 1903 and 1904,

before the five new States were added to the Registration list, the ratio of deaths under 1 to total deaths in 1909 was lower than that of 1900 by 1.6, and of course its complement, the ratio of deaths *over* age 1 to total deaths, necessarily increased to that extent. In short, this method of approximately measuring infant mortality by no means conflicts in its general showings with the indications of a decrease of infant mortality in the Registration Area of the United States which the decrease in the actual number of infant deaths so long as the area remained unchanged would seem conclusively to suggest.

Much more convincing evidence of the hoped-for decrease in the actual waste of infant life in this country is afforded by the ten-year study of the registered living births, deaths under age 1, and deaths at all ages, and their respective ratios, in certain States having well established registration systems, which I present in Table III attached to this paper (and also in Charts III and IV). Through the co-operation of the registration officials of Massachusetts, Connecticut and New York, I have been enabled to obtain the figures for 1909 in advance of the publication of their several reports, and in the case of Massachusetts and Connecticut have thus been able to tabulate comparisons for the last 10 years; in the case of New York State, the comparison was restricted to six years, as the New York State Department of Health did not separately classify deaths under 1 year prior to 1904.

The general significance of this table may be summarized in the statement that in both Connecticut and Massachusetts the number of deaths under 1 year was smaller in 1909 than in 1900, despite the decided increase in population and living births in each case, and the ratio of infant deaths to living births of course shows a marked decrease. In Connecticut there has been an apparent decrease of no less than 40 infant deaths per 1,000 living births in the last 10 years, and in Massachusetts there has been an apparent decrease of 29.5 in the same period. In the last six years the nominal ratio of infant deaths to living births, in New York State has decreased 21.4, and in the face of the continuous increase in the population of the Empire State the number of infant deaths recorded for the entire State has increased only about 1,100 in 1909 as compared with 1904. Lest these large apparent declines in the infant death rates of these three representative States may be taken more literally than the facts warrant, I must again at this point call attention to the unquestioned increase of late years in the percentage of registered births, thanks to the vigorous efforts of the Division of Vital Statistics of the Bureau of the Census, and various other helpful agencies, and again remind you that the actual

decrease in infant mortality is therefore considerably smaller than the figures would seem to indicate if taken at their face value.

For instance, that excellent authority of almost life-long experience with vital statistics, Dr. William H. Guilfooy, Registrar of Records of the Department of Health of the City of New York, tells me that although from 92 to 95 per cent. of

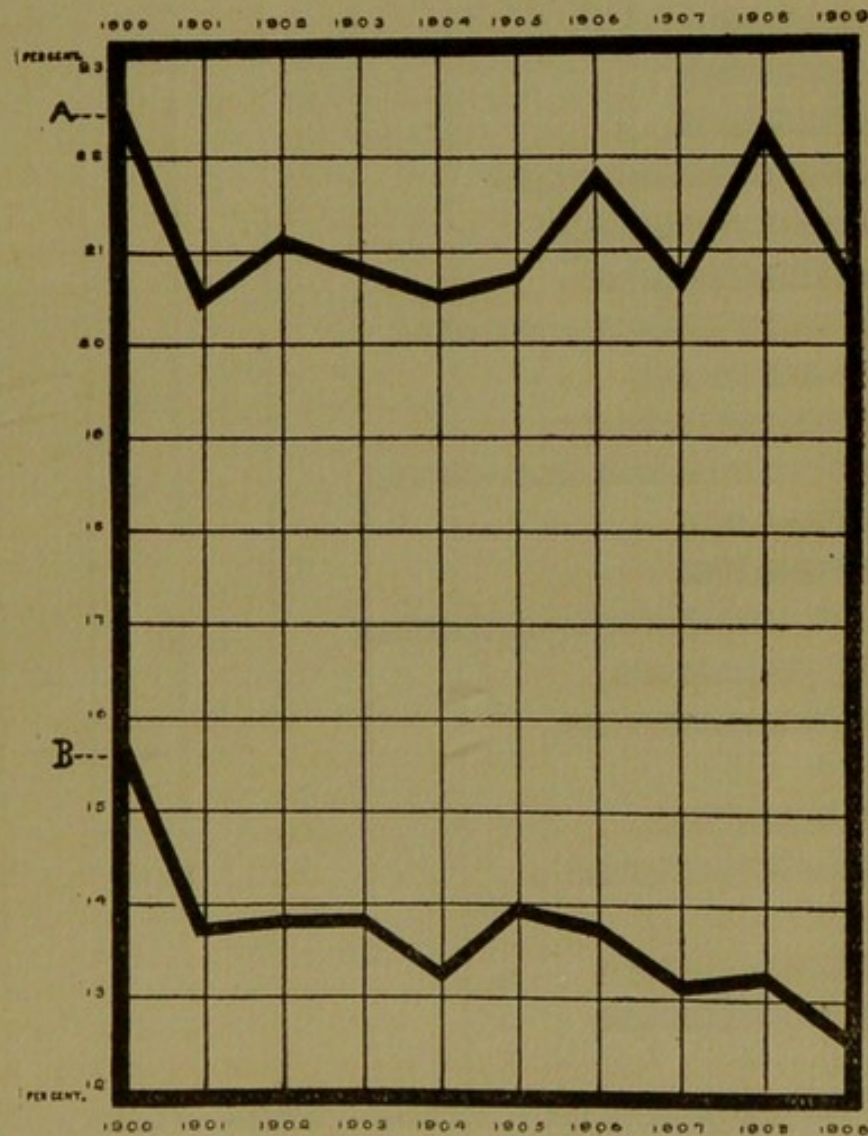


CHART III.—Annual ratios of deaths under 1 year to (A) total deaths and (B) to living births in Massachusetts in 10 years, 1900-9.

the actual births in the City of New York were probably registered in 1909, some authorities estimate that not more than 65 per cent. of the births in the same city were registered as late as 1900. Dr. Guilfooy believes that the percentage of registered births in 1900 was something like 80 per cent., but, even on that basis, there would have been a net increase of at least 15 per cent. in the registered births of the city of New York

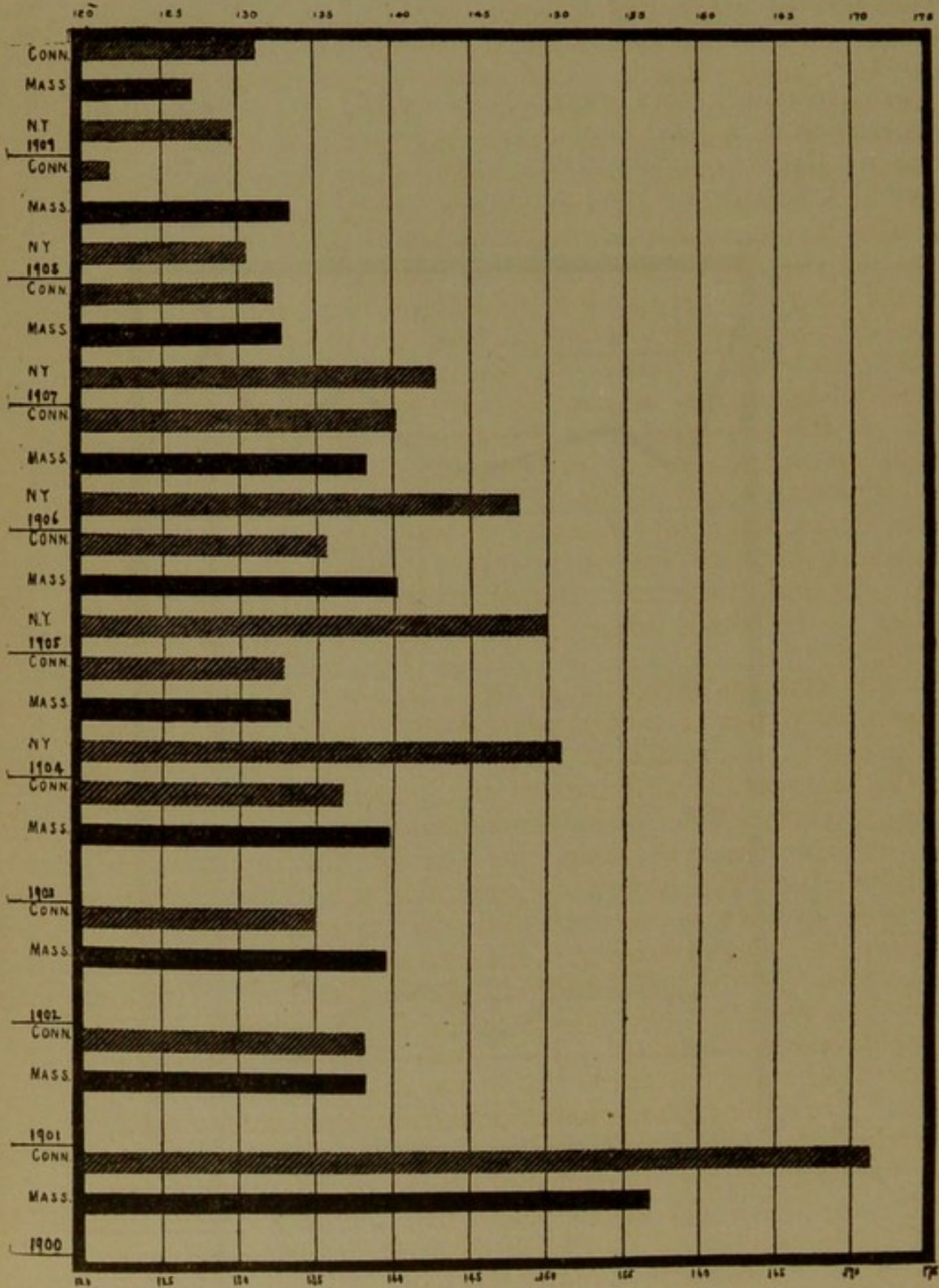


CHART IV.—Fluctuations of annual death-rates for last decade in Connecticut, Massachusetts and New York.

*Deaths under 1 year per 1000 births.

in the last 10 years, and in many other cities and districts the increase in the percentage of registered births has doubtless been very much larger. Consequently, the actual decline in infant mortality in the Registration States of this country unquestionably is much smaller than the apparent decline, and in at least some foreign countries the same exception must be noted and taken into account in comparing their official infant mortality figures.

By far the largest percentage of deaths under age 1 due to any one class of causes is that of infant deaths caused by diseases of the digestive system, which in 1909 for illustration amounted to 29.5 per cent. That is to say, almost one-third of all the deaths under age 1 in the Registration Area of the United States in the last year were due to that one class of diseases. Deaths due to diseases of early infancy ranked second in numerical importance, footing up 23.9 per cent., or nearly one-quarter of the dread total, and diseases of the respiratory system accounted for 16.5 per cent. of the infant deaths in the Registration Area. All told, these three classes of causes carried off 69.9 per cent. of all the babies under 1 year of age who died in that area in 1909.

As that eminent authority on the diseases of children, Dr. L. Emmett Holt, put it in his address on "Infant Mortality and Its Reduction, Especially in New York City," before the Section on Diseases of Children of the American Medical Association, in June, 1909: "The fundamental causes of infant mortality, as we may call them, are mainly the result of three conditions—poverty, ignorance and neglect. The curve of diarrhoeal diseases is so important that it practically controls the curve of infant mortality. This group embraces acute gastritis, gastroenteritis, all forms of acute diarrhoea, dysentery and cholera infantum and makes up the largest part of the immense summer mortality. It is these diseases which cause regularly each year the sharp rise in the death curve in July and August." In citing these quotations from Dr. Holt's paper, I have deliberately associated, and brought together, his authoritative statement of the fundamental causes of infant mortality—poverty, ignorance and neglect—and his comment on the commanding importance of diarrhoeal diseases—especially in connection with the immense summer mortality—although they were not associated in his address. For, it seems to me, if a layman may venture to express an opinion on a phase of the infant mortality problem which the specialists in pediatrics are so much more competent to discuss, that the fundamental causes named by Dr. Holt—poverty, ignorance and neglect—in the natural course of things are much more potent factors, in the summer

months in making the infant mortality rate what it is than in any other season of the year. In his paper on "Infantile Mortality and Its Principal Cause—Dirty Milk," the late Dr. Charles Harrington, secretary of the State Board of Health of Massachusetts, remarked apropos of the seasonal distribution of infant mortality: "From the facts and figures thus shown it might be inferred that all infants under one year of age are in great danger during the hot summer months, but this is far from being the case. Not the three summer months, but the first three months of life, are the dangerous period." Unquestionably true though this statement is, so comparatively few accurate records of infants' deaths by ages expressed in months are available and there is such a wealth of information as to the seasonal distribution of infant mortality, that public attention has much more graphically been drawn to the abnormal dangers of the summer months, and in my judgment the unusual infant mortality of that season of the year offers the foremost strategic point of effective attack for movements like that of this Association.

I think it was Mr. Homer Folks who once said, in a lecture which I had the pleasure of hearing, that he was afraid there was but one really promising method of attacking tuberculosis so as to arouse the public on the subject, and that was, "to yellow-journalize the movement," or bring forward and rivet attention on the high places, the conspicuous features, of the white plague, so to speak. I am inclined to believe that the same principle applies to this infant mortality movement, and that the most vulnerable point of attack, as it were, is the infant mortality rate at the highest point, namely, that of the summer months, and the causes primarily responsible for that high rate. It is at that season of the year that the subject of infant mortality invariably receives most attention at the hands of the press, then it is that summer nursing corps—like that which has done such excellent work in New York of late years, for illustration—are temporarily at least disseminating information as to the proper care of babies among the class which most needs such information, and it is in the third quarter of the year that the infant mortality rates are most apt to set people thinking on the subject.

Of course the fundamental causes of which Dr. Holt spoke are operative the year around, but it is in the summer months that those luxuries for the poor, abundant ice and pure milk, play the most important part in determining whether the babies of the poor shall live or die. Then it is that the unbearable heat of the tenements drives their unfortunate occupants of all ages into the streets, to the fire escapes, and to the roofs, and then it is, as I see it, that poverty, ignorance and neglect, devel-

oped as it were by the summer heat, are most apt to exercise their baneful influence in raising the infant mortality rate to its top notch. Then it is, that the poor and ignorant are most apt unknowingly to bring about the death of their babies by doing the things that should not be done, and leaving undone the things that should be done, for those same babies. It is notoriously true that diarrhoeal diseases are primarily responsible for the high infant death rate of the summer months, in other words, that the greatest danger then confronting the babies of the tenements is that whose principal preventive and antidote, abundant ice and pure milk, they are then least likely to have. And for these and many other reasons, as I see it, that summer infant mortality, at once class mortality and seasonal mortality, is in every way the high spot, the most conspicuous phase, and the most hopeful mark of the crusade to which this Association is committed.

With the world at large it is the array of large figures, and not mere percentages, which makes the deepest impression. Consequently, in endeavoring to bring out the importance of the summer infant death rate I have first tabulated a comparative statement, by weeks, of the births and infant deaths in the greatest city on this Continent—and its various boroughs—in the third quarter of 1910 and 1909 (See Chart V), and have then emphasized the disheartening regularity of that sharp rise in infant mortality by a somewhat similar, though less detailed, presentation of corresponding figures for an entire State, Connecticut, for which monthly comparative figures for both years were available. These figures are to be found in Tables IV, V, and VI, attached to this paper, and not only show how conspicuously the infant mortality rate mounts up in that season of the year, but how inflexible the increase seems to be, despite all the efforts now being made to grapple with it. The contrast between the summer rate and the annual rate of infant mortality is sharply brought out by the fact that in the third quarter of 1909 the ratio of deaths under age 1 to registered living births in the City of New York was 169 per 1,000, as against a ratio of only 130 for the entire year 1909—that is to say, was larger by an even 30 per cent.—and that the infant deaths in that quarter amounted to 32.15 per cent. of the total for the entire year. In the State of Connecticut, the infant death rate in the third quarter of 1909 was 192, as compared with one of 131 for the entire year 1909, an excess of nearly 47 per cent.

But those statistical facts are mere mathematical demonstrations of a well-known truth; a much more important showing of the tables in question is the fact that, despite all the wide fluctuations for individual weeks and individual boroughs in

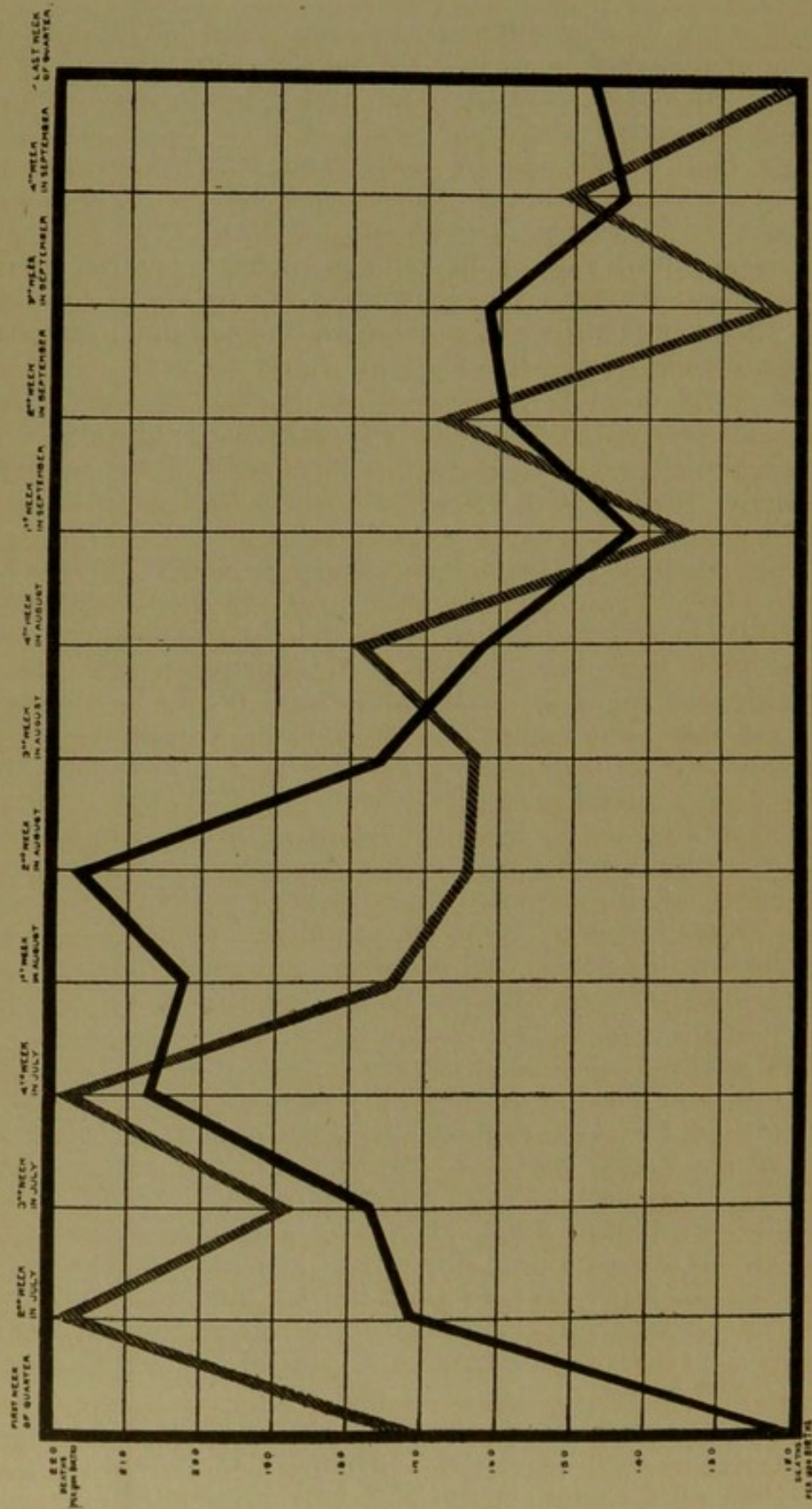


CHART V.—A graphic comparison by weeks of New York City's heavy infant mortality in the third quarter of 1910 and 1909. Lighter line, starting at middle of left border, represents weekly infant death rate of 1910; black line, weekly infant death rate of 1909.

1909 and 1910, the infant death rate of the City of New York in the third quarter of 1910 was precisely identical with that for the corresponding quarter of 1909, namely, 169 per 1,000 registered living births. And the seeming inflexibility of summer infant mortality is strongly confirmed by the fact that in the entire State of Connecticut, of course including the rural districts along with the cities, the infant death rate in the third quarter of 1910 was practically identical with that for the corresponding quarter of 1909, being 193 per 1,000 registered living births this year as compared with 192 per 1,000 registered living births in 1909. To be sure, comparisons for only two years are by no means convincing, but it is at least notable that in the case of both one of the world's greatest cities and an adjoining State with a scattered population barely one-fifth as large as that of the great metropolis, in the third quarter of 1909 and 1910 the respective infant death rates for both years should be practically identical. If allowance were to be made for the probable slight improvement in the registration of births in both instances in 1910, of course that would mean that the actual infant death rates for the third quarter in both cases were slightly larger in 1910 than in 1909. But, in any event, the figures would seem to show that, in so far as merely two-year records can tell the story, the infant mortality in both cases was quite as high this year as last year, to say the least.

In the final tables appended to this paper, Tables VII and VIII, I have attached a succinct statement of the number and percentage of infant deaths in the Registration Area of the United States in the last 10 years due to the four principal causes of infant mortality, aside from diseases of the respiratory system, namely, diarrhoea and enteritis, those diseases of early infancy, premature birth and congenital debility, and that cause of death perhaps more or less closely allied with the causes which contribute to premature birth and congenital debility, to wit., malformations. In the decade 1900-1909, these four classes of causes of deaths were responsible for no less than 52.05 per cent. of all the deaths under age 1 recorded in the Registration Area of the United States, and in the latter half of that period the percentage of deaths due to them was considerably higher than in the former half, namely, 54.19 as compared with 49.33. In every case except that of congenital debility, the percentage of deaths from each of these four causes was higher in 1905-1909 than in 1900-1904. Probably the inclusion of five additional States with many heavily-populated cities in the Registration Area in the latter half of the period had something to do with increasing the percentage of deaths due to these causes in 1905-1909 as compared with 1900-1904, but my recollection

is that a similar tabulation of deaths from these causes in certain large manufacturing cities for a long series of years which I prepared some years ago showed an almost unbroken increase from year to year in each of those cities. As to this phase of the subject, the statistician's work properly ends when he has tabulated, and presented in effective form, the actual figures; the discussion of the reasons for the fact, and the significance of it, does not come within his province, and that branch of the subject of infant mortality belongs to, and should be left with, you gentlemen of the medical profession.

In the preparation and presentation of this paper, I have tried to keep clearly in mind the purpose expressed in its title, or, in other words, to demonstrate by indisputable statistics an infant mortality rate of at least 13 deaths under age 1 for every 100 living births, the world around, and the existence of appalling causative conditions of such a nature as urgently to call for carefully planned, and steadfastly executed, remedial work—not only on the part of this Association, but of all thinking men and women in this country. The same conditions which cause the death of 13 out of every 100 babies born throughout the civilized world, on the broadest of averages, leave more or less permanent stamps on perhaps two or three times as many more babies who somehow manage to crawl over the infant dead line, many of whom will be the fathers and mothers of the next generation. The problem of infant mortality, therefore, is far more than one as to means of decreasing the number of infant deaths. Its scope is world-wide, and on its partial solution at least depends the welfare of posterity. The call for action on such a problem may fairly be termed urgent.

TABLE I

The Infant Mortality Rates, by Five-Year Periods, of 31 of the Principal Countries of the Civilized World for the Quarter-Century, 1881-1905, Inclusive, and the Annual Infant Mortality Rates of 16 of Those Countries for the Three Years, 1906-1908

COUNTRIES.	Ratios of deaths under age 1 per 1,000 living births.									
	1881	1886	1891	1896	1901	1881	1906	1907	1908	1906
	1885	1890	1895	1900	1905	1905				1908
Norway.....	99	96	98	96	81	94	.....	.....	.....	.....
Ireland.....	94	95	102	106	98	99	93	92	97	94
Sweden.....	116	105	103	101	92*	104*	.....	.....	.....	.....
Bulgaria.....	81	95	140	143	145*	120*	.....	.....	.....	.....
Scotland.....	117	121	126	129	120	123	.....	.....	.....	.....
Denmark.....	134	137	139	132	119	132	.....	.....	.....	.....
Finland.....	162	144	145	139	131	144	.....	.....	.....	.....
England and Wales.....	139	145	151	156	138	146	132	118	120	123
Switzerland.....	171	159	155	143	134	153	.....	.....	.....	.....
Belgium.....	156	163	164	158	148	158	.....	.....	.....	.....
Servia.....	157	158	172	159	149	159	144	147	158	150
France.....	167	166	171	159	139	160	.....	.....	.....	.....
The Netherlands.....	181	175	165	151	136	162	127	112	125	121
Italy.....	175†	175†	185	168	168	175*	.....	.....	.....	.....
Spain.....	193	186*	185†	185†	173	185*	.....	.....	.....	.....
Prussia.....	207	208	205	201	190	202	177	168	173	173
Roumania.....	182	195	220	216*	203†	203*	.....	.....	.....	.....
Austria.....	223†	223†	223†	226	213*	223*	.....	.....	.....	.....
Hungary.....	226†	226†	250	219	212	226*	205	208	199	204
Russia in Europe.....	271	264	276	261	268†	268*	.....	.....	.....	.....
Averages for Europe....	163	162	169	162	153	162	146	141	145	144
New Zealand.....	90	84	87	80	75	83	62	89	68	73
Tasmania.....	109	103	94	98	90	99	91	82	75	83
South Australia.....	101†	105	99	112	87	101*	76	66	70	71
Queensland.....	136	119	103	104	95	111	75	77	70	74
New South Wales.....	124	115	111	113	97	112	75	89	76	80
Victoria.....	122	131	111	111	96	114	93	73	86	84
Western Australia.....	135†	123	130	160	126	135*	110	98	85	98
Averages for Australasia..	117	111	105	111	95	108	83	82	76	80
Japan.....	104	116	147	153	154	135	.....	.....	.....	.....
Ceylon.....	158	158	169	168	171	165	198	186	183	189
Jamaica.....	158	170	171	175	174	169	197	223	175	198
Chili.....	314†	264	336	333	332*	314*	328	297	320	315
Averages for countries named.....	184	177	206	207	208	196	241	235	226	234

RECAPITULATION

Europe.....	163	162	169	162	153	162	146	141	145	144
Australasia.....	117	111	105	111	95	108	83	82	76	80
Other lands.....	184	177	206	207	208	196	241	235	226	234
†Grand Averages.....	155	152	159	157	147	154	136	133	130	133

*Returns for one or more years wanting, and averages have been calculated on basis of returns for other years of period in question.

†Figures represent estimates for periods for which no returns were available, estimate in each case being average of actual returns for balance of entire twenty-five year period.

‡Computed by division of totals for all countries represented in table by number of countries in question.

Above table has been compiled in part from Table III, in Phelps' "A Statistical Study of Infant Mortality," in the Quarterly Publications of the American Statistical Association, New Series, No. 83 (Vol. XI), September, 1908, and data for years 1906-8 have been compiled from Seventy-First Annual Report of the Registrar-General for England and Wales (p. lxvii).

TABLE II

A Comparison for the Last Decade of Deaths Under 1 Year, Between 1 and 5 Years, Under 5 Years, and all Over 1 Year with the Total Number of Deaths at all Ages in the Registration Area of the United States, and the Ratios of Deaths in Each of these Age-Groups to the Total Number of Deaths at all Ages, as Shown by the Annual Mortality Statistics of the Bureau of the Census for the Ten Years, 1900-1909

Years.	Deaths in the Registration Area.					Ratios to total deaths at all ages.			
	Total at all ages.	Under 1 year.	Between 1 and 5 years.	Under 5 years.	At all ages over 1 year.	Under 1 year.	1-5 years.	Under 5 years.	Over 1 year.
1900	539,939	111,687	53,450	164,137	428,252	20.7	9.7	30.4	79.3
1901	518,207	97,477	44,201	141,678	420,730	18.8	8.5	27.3	81.2
1902	508,640	98,575	44,940	143,515	410,065	19.4	8.8	28.2	80.6
1903	524,415	96,857	43,083	139,940	427,558	18.5	8.2	26.7	81.5
1904	551,354	102,880	43,022	145,902	448,474	18.7	7.8	26.5	81.3
1905	545,533	105,553	41,831	147,384	439,980	19.3	7.7	27.0	80.7
1906	658,105	133,105	53,873	186,978	525,000	20.2	8.2	28.4	79.8
1907	687,034	131,110	52,664	183,774	555,924	19.1	7.7	26.8	80.9
1908	691,574	136,432	53,433	189,865	555,142	19.7	7.7	27.5	80.3
1909	732,538	140,057	56,477	196,534	592,481	19.1	7.7	26.8	80.9
Total	5,957,339	1,153,733	485,974	1,639,707	4,803,606	19.4	8.2	27.5	80.6
1900-4	2,642,555	507,476	227,696	735,172	2,135,079	19.2	8.6	27.8	80.8
1905-9	3,314,784	646,257	258,278	904,535	2,668,527	19.5	7.8	27.3	80.5

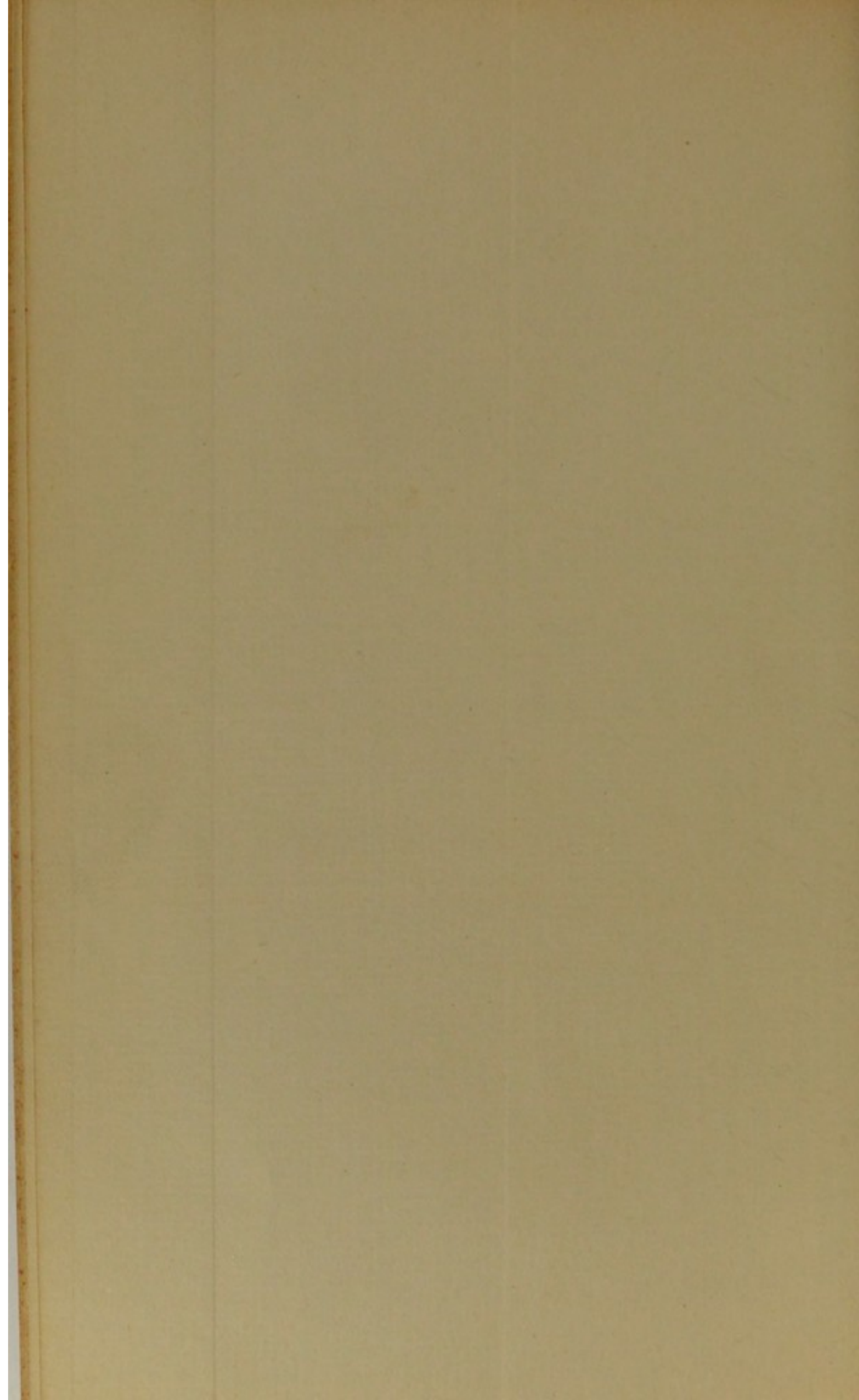
TABLE III

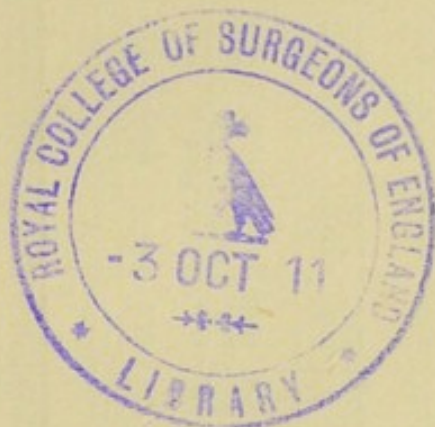
A Comparison for the Last Decade of Living Births, Deaths Under 1 Year, and Total Deaths at all Ages, and the Ratios of Deaths Under 1 Year to Births and Deaths at all Ages, in the States of Connecticut, Massachusetts and New York, as Shown by Their Respective Annual Registration Reports

Years	Connecticut				Massachusetts				New York			
	Deaths		Living births		Deaths		Living births		Deaths		Living births	
	At all ages	Under 1 year	To total deaths	Ratios of deaths under 1 year	At all ages	Under 1 year	To total deaths	Ratios of deaths under 1 year	At all ages	Under 1 year	To total deaths	Ratios of deaths under 1 year
1900	16,368	3,521	20,560	21.5	51,156	11,500	73,386	22.5	.....	.....	.....	.....
1901	14,856	2,805	20,294	18.9	48,275	9,952	71,976	20.6	.....	.....	.....	.....
1902	14,386	2,864	21,216	19.9	47,491	10,075	72,219	21.2	.....	.....	.....	.....
1903	15,490	2,972	21,751	19.2	49,054	10,269	73,584	20.9	.....	.....	.....	.....
1904	15,711	3,033	22,864	19.3	48,482	9,992	75,014	20.6	.....	.....	.....	.....
1905	16,298	3,159	23,271	19.4	50,486	10,519	75,022	20.8	.....	.....	.....	.....
1906	16,766	3,455	24,641	20.6	50,624	11,106	80,237	21.9	.....	.....	.....	.....
1907	17,490	3,433	25,945	19.6	54,234	11,293	85,001	20.8	.....	.....	.....	.....
1908	16,000	3,251	26,694	20.3	51,788	11,606	86,911	22.4	.....	.....	.....	.....
1909	16,460	3,353	25,530	20.4	51,236	10,693	84,039	20.9	.....	.....	.....	.....
1900-1909	159,825	31,846	232,766	19.9	502,826	107,005	777,389	21.3	.....	.....	.....	.....
1900-1904	76,811	15,195	106,685	19.8	244,458	51,788	366,179	21.2	.....	.....	.....	.....
1905-1909	83,014	16,651	126,081	20.1	258,368	55,217	411,210	21.4	.....	.....	.....	.....
									704,359	133,544	955,315	19.0
												139.8

*From the Bureau of the Census' advance Mortality Statistics for 1909.

†Totals for years 1904-9, deaths under 1 year not having been separately classified by the New York State Department of Health prior to 1904.





**A Comparative Weekly Age 1 in Each of the
Five Boroughs of the City of New York—The Third
Quarter—of the Year of the Department of
Health of the City of New York—Infant Deaths per 1,000
Registered Births**

Week ending	Manhattan		City of New York		
	Births	Deaths per year	Births	Deaths under 1 year	
				Total	Ratio births per 1,000
July 9, 1910.....	1,332	9	2,521	438	174
July 10, 1909.....	1,263	2	2,440	303	124
July 16, 1910.....	1,284	8	2,579	568	220
July 17, 1909.....	1,205	1	2,322	399	172
July 23, 1910.....	1,373	7	2,750	523	190
July 24, 1909.....	1,279	0	2,518	447	178
July 30, 1910.....	1,131	0	2,477	545	220
July 31, 1909.....	1,203	7	2,340	486	208
August 6, 1910.....	1,420	7	2,694	472	175
August 7, 1909.....	1,248	4	2,474	501	203
August 13, 1910.....	1,332	9	2,550	422	165
August 14, 1909.....	1,204	16	2,316	504	218
August 20, 1910.....	1,197	16	2,411	396	164
August 21, 1909.....	1,141	7	2,224	393	177
August 27, 1910.....	1,153	10	2,236	402	180
August 28, 1909.....	1,221	10	2,246	367	163
September 3, 1910..	1,354	9	2,661	365	137
September 4, 1909..	1,191	14	2,423	347	143
September 10, 1910..	1,132	5	2,383	403	169
September 11, 1909..	1,191	8	2,311	370	160
September 17, 1910..	1,374	2	2,659	329	124
September 18, 1909..	1,077	5	2,167	351	162
September 24, 1910..	1,122	6	2,261	343	152
September 25, 1909..	1,273	12	2,403	347	144
October 1, 1910.....	1,301	7	2,552	311	122
October 2, 1909.....	1,185	12	2,179	322	148
<i>Totals for third quarter:</i>					
1910	16,505	35	32,734	5,517	169
1909	15,681	38	30,363	5,137	169

TABLE V

A Comparative Resume of Births, Deaths Under Age 1, and the Ratios of Deaths per 1,000 Births in Each of the Five Boroughs of the City of New York in the Season of the Heaviest Infant Mortality—the Third Quarter—of the Years 1910 and 1909, Compiled from the Weekly Reports of the Department of Health of the City of New York

Boroughs of the City of New York	Third Quarter of 1910			Third Quarter of 1909		
	Living births	Deaths under 1 year		Living births	Deaths under 1 year	
		Number	Ratio per 1,000 births		Number	Ratio per 1,000 births
Manhattan.....	16,505	2,940	178	15,681	2,632	168
The Bronx.....	2,821	358	127	2,290	321	140
Brooklyn.....	11,065	1,736	157	10,324	1,725	167
Queens.....	1,781	348	195	1,571	321	204
Richmond.....	562	135	240	497	138	278
Totals.....	32,734	5,517	169	30,363	5,317	169

TABLE VI

A Similar Resume, by Months, for the State of Connecticut, Compiled from the Monthly Bulletins of the Connecticut State Board of Health

Months	Third Quarter of 1910			Third Quarter of 1909		
	Living births	Deaths under 1 year		Living births	Deaths under 1 year	
		Number	Ratio per 1,000 births		Number	Ratio per 1,000 births
July.....	2,363	587	248	2,115	407	192
August.....	2,353	404	172	2,290	483	211
September.....	2,210	343	155	2,180	373	171
Totals.....	6,926	1,334	193	6,585	1,263	192

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