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# PUBLIC HEALTH REPORTS

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## THE HEALTH OF WORKERS IN DUSTY TRADES

The health hazards of dusty trades have for a long time engaged the attention of industrial hygienists. The great interest attached to this subject is due to two important facts: (1) The workmen employed in what are termed the "dusty trades" comprise the largest group of workers exposed to any one industrial hazard, and (2) exposure to certain kinds of dust has strikingly increased the mortality rate from respiratory diseases, especially tuberculosis.

While a great amount of work has been done in the study of the dust hazard in industry, there are certain questions that remain unanswered; and in the hope of contributing to a better understanding of the problem as a whole, the United States Public Health Service has undertaken special studies which are planned to cover the entire field of dusty trades. For this study the following six industries were chosen, in each of which the principal dust to which the employees were exposed represents a large group of dusts:

1. The cement industry, representing calcium dust.
2. Silver polish, representing metal dust.
3. The granite industry, representing silica dust.
4. The hard-coal industry, representing carbon dust.
5. The cotton industry, representing vegetable dust.
6. Street sweeping, representing municipal dust.

The first of these studies, dealing with the health of workers in a large Portland cement plant, has been completed and the report has recently been published as Public Health Bulletin No. 176. The investigation was conducted in one of the older, dustier plants, so that the effect of large quantities of the dust could be observed. Records of all absences from work were kept for three years, and the nature of disabling sickness was ascertained. Physical examinations were made, X-ray films were taken, and the character and amounts of dust in the atmosphere of the plant were determined.

The results of this investigation indicated that the calcium dusts generated in the process of manufacturing Portland cement do not predispose workers to tuberculosis nor to pneumonia. The workers exposed to dust experienced, however, an abnormal number of attacks of diseases of the upper respiratory tract, especially colds, acute bronchitis, diseases of the pharynx and tonsils, and also influenza, or grippe. Attacks of these diseases serious enough to cause absence for two consecutive working days or longer occurred among the men in the dustier departments at a rate which was about 60 per cent above that for the men in the comparatively nondusty departments. Limestone dust appeared to be slightly more deleterious in this respect than cement dust.

Outdoor work in all kinds of weather, such as was experienced by the quarry workers, appeared to predispose to diseases of the upper respiratory tract even more than did exposure to the calcium dusts. In the outdoor departments of the plant, also, the highest attack rates of rheumatism were found. The study also indicated that work in a cement-dusty atmosphere may predispose to certain skin diseases such as boils, to conjunctivitis, and to deafness when cement dust in combination with ear wax forms plugs in the external ear. When the dust in the atmosphere is less than about 10,000,000 particles per cubic foot of air it is doubtful that the above-mentioned diseases and conditions would be found at greater than average frequency.

Modernization of plants and installation of ventilating systems are helping to solve the dust problem of the industry.

A limited number of free copies of the bulletin containing this report are available and may be had upon application to the Surgeon General, United States Public Health Service, Washington, D. C.

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## SEWAGE-POLLUTED SURFACE WATERS AS A SOURCE OF WATER SUPPLY [1]

By H. W. Streeter, *Sanitary Engineer, United States Public Health Service*

One of the outstanding features of American waterworks practice is the extensive use made of surface bodies of water, and especially of streams, as a source of public water supplies. Although the actual number of public water supplies originating in underground sources is greater in this country than the number taken from surface sources, it is probable that surface sources provide at least two-thirds of the total volume of, and serve two-thirds of the population using, public water supplies.

This situation has been a natural outgrowth of the physical conditions prevailing in those sections of the United States, notably in the extensive inland areas of the Middle West and in certain portions of the Atlantic Seaboard States, in which the most intensive development of industrial cities has occurred. In these regions water readily available from underground sources is frequently insufficient in volume

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[1] Read at the meeting of the American Society of Civil Engineers held at Asheville, N. C., Apr. 20, 1927, and published here by permission of the society.

and often excessively hard; hence recourse necessarily has been had to surface streams and lakes. Present indications, moreover, point to the likelihood that an increasing amount of dependence must be placed, in future years, on surface sources of water supply for public use, both in the regions named and in other sections of the country, owing to the steady diminution in the volume of underground water resulting from overdrafts made to supply increasing populations.

Coincidently with these developments has occurred a steady increase in the pollution of surface watercourses by sewage and industrial wastes, particularly in the areas above noted. This tendency has been due both to a disproportionate growth in urban population, as compared with that of rural population, and to the extension of water-carriage sewerage systems in the existing urban population groups. A good example of the rapidity with which the urban population of the Middle West has increased is furnished by population estimates for the Ohio River basin,[2] which have shown that, in the period of 25 years extending from 1890 to 1915, the urban population inhabiting this area increased 109 per cent, whereas the rural population increased but 16 per cent. It has been estimated that from 85 to 90 per cent of all domestic sewage in the Ohio River basin is discharged without any treatment into the nearest surface watercourse. The proportion of industrial wastes similarly discharged without treatment probably approaches very closely 100 per cent.

Until very recently the use of surface streams for the dual purpose of water supply and sewage disposal has been attended by comparatively few serious difficulties in obtaining reasonably safe water supplies from such sources. One contributory factor has been the ample length and relatively large volume of our major inland streams, affording an opportunity for dilution and self-purification to act as natural protective agencies. A second and more important element has been the remarkable advance made in the development and application of water purification in this country during the past three decades. In 1924 statistics collected by Gillespie [3] showed that over 23,000,000 people in the United States were being served by public water supplies purified by filtration processes.

During the past two decades or so, a steady reduction has taken place in the incidence of typhoid fever and other water-borne diseases throughout the country, notably in urban communities using purified surface water supplies. In spite of this tendency, pollution of the sources of many surface supplies has increased with such rapidity that questions have arisen as to the possibility of a failure of existing safeguards, both natural and artificial, to afford an adequate degree

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[2] Public Health Bulletin No. 143, U. S. Public Health Service, Section III, Table No. 34.

[3] Gillespie, C. G.: Filtration Plant Census, 1924. Jour. Am. W. W. Assoc., vol. 14, July, 1925, pp. 123–142.

of protection to such supplies. In other instances, where an ample margin of safety still exists, sanitary authorities are considering what measures may be necessary in order to forestall a situation such as has developed in the more populous areas of the country. The extent to which the availability of these sources may be affected by their progressively increased pollution is, therefore, a question of practical importance to all sanitary engineers and others who are concerned with maintaining the safety of public water supplies. It is proposed here to consider this question mainly in relation to the pollution of surface water supplies by domestic sewage, which, to a large extent, involves problems quite distinct from those resulting from their pollution by industrial wastes. It is intended, however, to mention very briefly at a later point one or two aspects of the latter which bear a particularly significant relation to the quality of water supplies in certain important industrial areas of the country.

In a broad sense, the suitability of sewage-polluted bodies of surface water as sources of water supply is dependent on a number of factors, including the following:

(*a*) The character and extent of their pollution;

(*b*) The location of the sources of pollution with respect to sources of water supply;

(*c*) The degree of protection to these sources afforded by various natural agencies, such as dilution and self-purification;

(*d*) The extent of further protection afforded by artificial water-purification; and

(*e*) The practicability and relative economy of supplementary artificial measures for reinforcing, where necessary, the protection afforded by water purification.

From a practical standpoint the most important of the five factors above named is the extent of protection afforded by artificial processes of water purification, which have become the main source of reliance in safeguarding the sanitary quality of surface water supplies in this country. Standing next in the order of relative importance is the practicability and economy of further artificial measures, both of water purification and of sewage treatment, for reinforcing the protection afforded by water purification as now currently practiced. Before discussing these two questions, however, it is proposed to consider rather briefly some of the agencies of pollution and of natural purification which influence more or less directly the relative suitability of sources of water supply located in surface bodies of water.

## AGENCIES OF POLLUTION

*Domestic sewage.*—The most important agency of pollution affecting the quality of public water supplies derived from surface sources is, of course, domestic sewage, which contains large numbers of intestinal bacteria originating in both human and domestic animal populations. A secondary, though sometimes highly significant agency of bacterial pollution consists of the surface drainage waters from unsewered areas, which usually contain some bacteria of intestinal origin. A third agency may be said to include, in general, certain kinds of industrial wastes, which, under some conditions, may cause unpalatable tastes in water supplies or may add measurably to the costs and difficulties involved in their efficient purification.

It has long been recognized that the numbers of intestinal bacteria contained in ordinary domestic sewage are extremely high. Thus, it commonly has been stated that the total bacterial count of sewage ranges from 1,000,000 to 10,000,000 per cubic centimeter, and that the *B. coli* content approximates 100,000 per cubic centimeter. Assuming a daily sewage flow equal to 120 gallons per capita, a fair average for the larger American cities, the *B. coli* figure given would indicate a contribution of this organism roughly approximating 200,000,000,000 per capita daily. Observations made by investigators of the United States Public Health Service in the Ohio and Illinois Rivers during the years 1914–1916 and 1921–22, respectively, indicated [4] that the average numbers of *B. coli* contributed to these streams by the metropolitan areas of Cincinnati, Louisville, Chicago, and Peoria, ranged from about 190,000,000,000 to 360,000,000,000 and averaged about 250,000,000,000 per capita daily. These figures, being derived from observations made in the stream above and below each city, represent the effect of combined sewage and surface drainage water from the areas considered. They are very considerably in excess of those which have been given as representing the normal bacterial content of human feces, which was found by MacNeal, Latzer, and Kerr [5] to be about 5,000,000,000 per capita daily, as expressed in terms of the numbers of bacteria growing on agar plates at 37° C. While making due allowance for the fact that combined sewage contains many sources of bacteria other than feces, the wide disparity of the figures above given suggests the possibility that bacteria of intestinal origin may increase in sewage for some time after its discharge into a sewerage system, or a stream, either by actual multiplication or by the progesssive disintegration of particles containing bacteria.

*Industrial wastes.*—In some of the industrial sections of the country, the pollution of streams and lakes by wastes from certain industries has been causing serious, and in some cases widespread, damage to

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[4] (*a*) A study of the Pollution and Natural Purification of the Ohio River. Part II. Results of Surveys and Laboratory Studies. Public Health Bulletin No. 143, pp. 251-256. (*b*) A Symposium on Stream Pollution Part IV. Quantitative Studies of Bacterial Pollution and Natural Purification in the Ohio and Illinois Rivers. By J. K. Hoskins. Trans. Am. Soc. C. E., vol. 89, pp. 1365–1377; also Reprint No. 1063 from Public Health Reports, January 19, 1926, pp. 319–331.

[5] MacNeal, W. J., Latzer, L. L., and Kerr, J. F.: The Fecal Bacteria of Healthy Men. Jour. Infect. Dis., 1909, vol. 6, Nos. 2 and 5.

sources of public water supply. In general, such damage usually is æsthetic or economic rather than hygienic in its nature, though in some instances it may and does assume the aspect last named. A good example of æsthetic damage has been afforded during the past few years by the pollution of sources of water supply located in the Ohio River basin and along the Great Lakes by phenol-bearing wastes from by-product coke plants. The unpleasant tastes in water supplies caused by the presence of minute traces of phenols and their chlorine derivatives are so well known that it is hardly necessary to dwell on them here. Examples of economic damage by industrial wastes are provided by instances in which the presence of acids and acid wastes have increased the hardness of water supplies to such an extent as to render such supplies unfit for boiler use. Although accurate and up-to-date statistics on this point are not available, it is safe to say that pollution of this general character has added many thousands of dollars annually to the cost of producing steam power in certain areas of the Middle West, notably in the upper Ohio River basin.

The hygienic aspects of industrial waste pollution of water supplies, though in many cases obscured to some extent by their indirectness, are in the aggregate far from being a negligible factor in the growing complexities of water-supply sanitation. In some instances the hygienic and economic features of the problem are inseparably bound together, as, for example, where the presence of certain kinds of industrial wastes, notably from tanneries and steel mills, in raw water supplies taken for purification, increases both the difficulty and the cost of securing efficient treatment. In at least one case known to the writer the physical deterioration in municipal water filtration plants resulting from the presence of excessive amounts of acid wastes in their raw water supply has diminished very measurably their average bacterial efficiency, even with highly skilled operation. In other instances, particularly those involving the causation of disagreeable tastes, water consumers have been known to have sought unsafe private sources of drinking water in preference to using the safer but less palatable public supply.

## MODIFYING INFLUENCES

The extent to which the several agencies of pollution above described may influence the quality of water supplies taken from polluted streams or lakes is modified by a number of factors, of which the following are the more important: (*a*) Seasonal changes, (*b*) dilution, and (*c*) natural purification. Although the three factors enumerated are interrelated to some extent, each one of them produces more or less characteristic and measurable effects.

In considering these effects, distinction should be made between conditions prevailing in flowing streams and those frequently observed in quiescent and semiquiescent bodies of water. In the former instance the dispersion of polluting matters within the stream, though often proceeding slowly in a lateral direction, is usually extremely rapid in a vertical plane and has a tendency in general to become stabilized after a fairly definite interval of flow. In the latter case, however, the admixture of polluting wastes, discharged along the shores of lakes and ponded streams, frequently is subject to the vagaries of winds and countercurrents to such an extent that uniform dispersion in the diluting body of water seldom is attained, even after relatively long intervals of time.

*Seasonal influences.*—Cyclic changes of season exert their influence in two general ways: (*a*) Through their effect on variations in the bacterial content of sewage as discharged at the outfall; and (*b*) through their influence on variations in the rate of natural purification. Studies by investigators of the United States Public Health Service in the Ohio, Illinois, and Upper Mississippi Rivers have given marked evidences [6] of a fairly orderly seasonal variation in the numbers of *B. coli* per capita contributed daily to these rivers by the larger centers of sewered population, the numbers reaching a maximum during the late summer and a minimum during the winter. In the Ohio River below Cincinnati the ratio of the summer average to the winter average numbers of *B. coli* was found to be equal to 4.9, and in the Illinois River below Chicago and Peoria, 10.5 and 11.4, respectively. Similar variations were observed [7] by the International Joint Commission in the St. Clair, Detroit, Niagara, and St. Lawrence Rivers below major points of pollution.

As to the causes of the phenomenon above noted, they still remain a matter for speculation. A few experiments have been made to determine whether the numbers of intestinal bacteria voided by healthy persons are consistently greater in the summer than in the winter, but the results of these experiments thus far have been inconclusive. It is possible that, under the more favorable temperature conditions prevailing in summer, organisms of the *B. coli* group actually multiply in sewage during its passage through sewerage systems and even in streams immediately below sewer outfalls, whereas under the less favorable winter temperatures they fail to do so, at least to a like extent. Regardless of its underlying causes, the phenomenon noted has been observed so consistently as to remove it from the category of mere chance. Its significance would appear to lie in the indication that the density of bacterial pollution

[6] Public Health Bulletin No. 143, pp. 246–251. Public Health Bulletin No. 171, pp. 163–165.

[7] Pollution of Boundary Waters. Report of Consulting Sanitary Engineer on Remedial Measures. March, 1916.

of sources of water supply located in highly polluted sections of streams, or in shoreward zones of lakes not distant from sewer outfalls, may be expected to be considerably higher during the summer months than during the winter season, all other conditions being equal. In general, this indication has been borne out by observation, subject to such modification as may be imposed by the effects of seasonal changes on the rate of natural purification, which will be discussed later under that heading.

In so far as industrial wastes are concerned, seasonal changes do not appear to exert any marked effect on their pollution density, except under conditions in which a particular industry is seasonal in its character. In some instances, notably in the pollution of water supply sources by phenol-bearing wastes, the winter season has been, in general, the far more critical; but as the gas and coke by-product industries producing such wastes are not seasonal in their activities, this condition hardly appears to be due to any seasonal variation in the amount or strength of the wastes from these industries.

*Dilution.*—In general, the modifying effects of dilution on the density of polluting matters discharged into natural bodies of water are fairly simple, except when complicated by secondary chemical or biological reactions following the process of dilution. If, for example, two streams ($A$) and ($B$), having, respectively, discharges equal to ($Q_a$) and ($Q_b$) and pollution densities ($P_a$) and ($P_b$) combine to form a third stream ($C$), the pollution density of ($C$) ordinarily would be:

$$\frac{P_aQ_a+P_bQ_b}{Q_a+Q_b}$$

except as modified by imperfect mixture of the two streams.

In some instances involving secondary reactions, as above noted, the changes associated with dilution are less simple. Examples involving secondary chemical reactions frequently have been observed where certain types of industrial wastes, such as those of an acid character, are discharged into alkaline streams. Below the confluence of the Monongahela and Allegheny Rivers, in the Pittsburgh-Wheeling zone of the Ohio River, the admixture of the highly acid Monongahela with the less acid Allegheny produces a marked precipitation of iron salts, which are carried by the former in large quantities and are also discharged by steel mills in the Pittsburgh district. Although reactions of this kind may benefit a stream temporarily in some respects, they also may result in the formation of end-products which may interfere with the efficient operation of water purification plants.

When domestic sewage is discharged into a diluting body of water, there sometimes occurs initially a temporary increase in the bacterial content of the mixture. An increase of this kind was observed in

1914–16 in the Ohio River[8] immediately below Cincinnati, and, in 1921–22, in the Illinois River[9] immediately below the outlet of the Chicago Main Drainage Canal. In the instances cited, the bacterial content was observed to reach a fairly well-defined maximum at a point tending to move downstream during the winter but confined within a river zone extending about 25 miles below the source of pollution. It is not thus far definitely known as to whether the increase observed represents a true bacterial multiplication or whether it is the result of a progressive disintegration of "clumps" of suspended matter containing masses of bacterial cells. Possibly both processes are involved to some extent. Regardless of its underlying cause, this phenomenon suggests the possibility that sources of water supply located within river or lake zones lying in close proximity to sewer outfalls may be subject, under some conditions, to a disproportionately excessive bacterial pollution due to an increase such as above described.

*Natural purification.*—The fact that sewage-polluted bodies of water tend to become progressively self-purified through natural agencies is so well established that it hardly seems necessary here to dwell on it. Although the underlying causes of natural purification phenomena are little understood, the effects produced by them are well known and frequently observed. Of these effects, the most important one in relation to the use of polluted bodies of water as sources of water supply is the tendency toward a progressive decrease in the density of bacteria, especially those commonly associated with sewage, which occurs in all such bodies of water.

Quantitative studies of bacterial self-purification in flowing streams have indicated that, following the attainment of a maximum density below a major source of pollution, bacteria of the types included both in the ordinary plate count and in the *B. coli* group tend to diminish in numbers progressively along a fairly well defined time-function curve, which follows closely a logarithmic path in its earlier stages, but tends to become increasingly flatter than such a path after passing through its initial phase. The proportionate rate of bacterial decrease is further modified by the temperature and other changes associated with seasonal cycles, the rate being higher in summer than in winter.

In Figure 1 are shown two bacterial reduction curves derived from *B. coli* observations[10] made in the Ohio River below Cincinnati, one curve being based on summer and the other on winter conditions. In each instance the curve has its initial point at the maximum density of *B. coli* attained in the river immediately below Cincinnati. On comparing the two curves it will be noted that the percentage of

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[8] Public Health Bulletin No. 143, U. S. Public Health Service, pp. 276–277.
[9] Public Health Bulletin No. 171, U. S. Public Health Service, pp. 163–166.
[10] Public Health Bulletin No. 143, U. S. Public Health Service. Tables 38 and 43.

initial *B. coli* density remaining after a mean time of flow equivalent to 100 hours is approximately 4.7 per cent under winter conditions and 1.5 per cent under summer conditions. For shorter times, the two residual percentages fall more closely together and for longer times diverge more widely from each other.

The relative effect at a given point in a stream of bacterial pollution originating from population groups located at more or less distant points upstream would be expected, on this basis, to be considerably greater under winter than summer conditions, all other things being equal. The converse may be true, however, of the

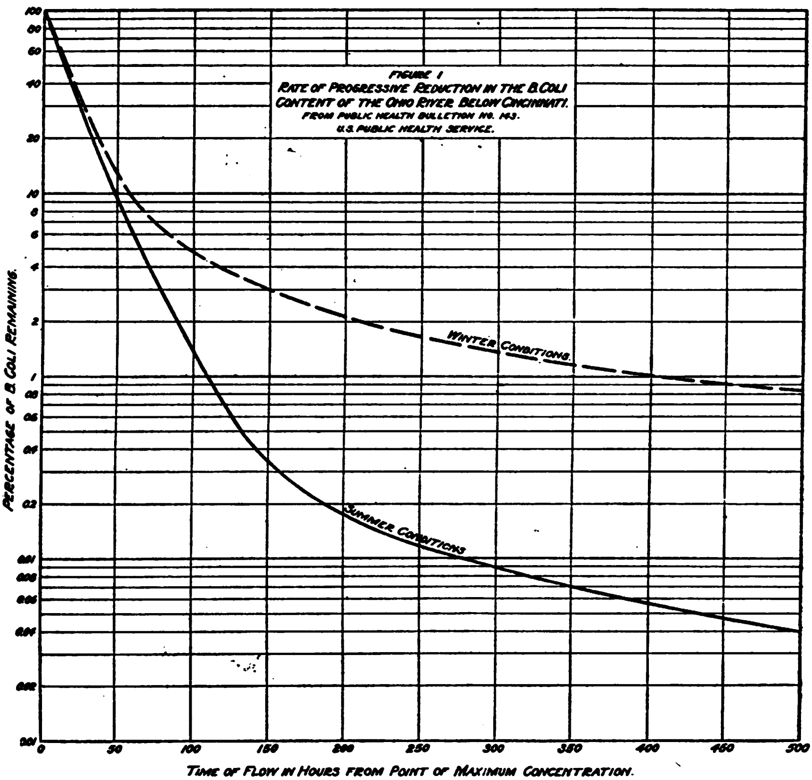



Figure 1
Rate of Progressive Reduction in the B. Coli Content of the Ohio River Below Cincinnati.
From Public Health Bulletin No. 143.
U.S. Public Health Service.

effect of pollution originating at more near-by sources, owing to lower stream flow and to the greater per capita contribution of sewage bacteria during the summer, both of which factors may offset the higher rate of natural purification in its earlier stages. The same general principle should hold with respect to the pollution of quiescent and semiquiescent bodies of water, when considered in reference to the times of passage of water between various sources of pollution and points at which water supplies are taken.

An illustration of the application of these principles is found in a calculation made of the relative effects of bacterial pollution derived from sewered population groups draining into the Ohio River and its tributaries in successive 50-mile zones by water above the Cincinnati and Louisville intakes, respectively, during the summer and winter seasons of the year 1915.[11] In making this calculation the actual sewered population draining into each successive zone was tabulated, as shown in Table 1, together with the estimated mean time of flow of the river from the mid-point of each zone to the respective intake. By applying to each zone population a reduction factor represented by the percentage of *B. coli* remaining after the given time of flow, as shown in Figure 1, a series of "calculated equivalent" population figures was obtained representing, in each instance, the population which, if discharging sewage immediately above the intake, would have the same pollution effect at this point as did the actual corresponding population located in the particular upstream zone, under the seasonal and flow condition specified.

TABLE 1.[a]—*Actual sewered populations draining into the Ohio River and its tributaries in successive 50-mile zones, by water, above the Cincinnati and Louisville water intakes, respectively, together with their corresponding calculated equivalents with respect to the total bacterial pollution, in terms of B. coli, at each intake*

A. ABOVE CINCINNATI INTAKE

| Zone | Actual sewered population | | Estimated mean time of flow from center of zone to intake (Hours) | | Calculated equivalent at intake | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Winter | | Summer | |
| Stream miles above Cincinnati intake | Number | Per cent of total | Winter | Summer | Population | Per cent of total | Population | Per cent of total |
| 0-50 | 1,900 | 0.1 | 9 | 11 | 1,200 | 1.5 | 1,140 | 8.6 |
| 50-100 | 7,100 | .3 | 27 | 34 | 1,920 | 2.4 | 1,570 | 11.8 |
| 100-150 | 32,300 | 1.4 | 45 | 59 | 4,520 | 5.5 | 2,360 | 17.7 |
| 150-200 | 244,700 | 10.2 | 63 | 88 | 21,300 | 26.0 | 5,630 | 42.5 |
| 200-250 | 41,300 | 1.7 | 82 | 116 | 2,480 | 3.0 | 326 | 2.5 |
| 250-300 | 63,200 | 2.7 | 100 | 145 | 2,970 | 3.6 | 234 | 1.8 |
| 300-350 | 32,200 | 1.4 | 118 | 174 | 1,260 | 1.5 | 74 | .6 |
| 350-400 | 140,100 | 5.9 | 138 | 212 | 4,490 | 5.5 | 217 | 1.6 |
| 400-450 | 131,100 | 5.5 | 158 | 252 | 3,670 | 4.5 | 160 | 1.2 |
| 450-500 | 1,186,400 | 50.0 | 177 | 286 | 28,500 | 34.9 | 1,210 | 9.1 |
| 500-550 | 153,900 | 6.5 | 194 | 317 | 3,230 | 4.0 | 129 | 1.0 |
| 550-600 | 149,400 | 6.3 | 210 | 341 | 2,910 | 3.6 | 111 | .8 |
| 600-650 | 80,000 | 3.4 | 225 | 365 | 1,440 | 1.8 | 51 | .4 |
| 650-700 | 62,000 | 2.6 | 241 | 389 | 1,040 | 1.3 | 35 | .3 |
| 700-750 | 38,100 | 1.6 | 256 | 413 | 598 | .7 | 19 | .1 |
| 750-800 | 9,000 | .4 | 272 | 437 | 135 | .2 | 4 | .0+ |
| | 2,372,700 | 100.0 | | | 81,663 | | 13,300 | |

B. ABOVE LOUISVILLE INTAKE

| Zone | Number | Per cent of total | Winter | Summer | Winter Population | Winter Per cent of total | Summer Population | Summer Per cent of total |
|---|---|---|---|---|---|---|---|---|
| 0-50 | 800 | 0.03 | 10 | 24 | 472 | 0.4 | 276 | 1.9 |
| 50-100 | 200 | .01 | 31 | 61 | 47 | .04 | 14 | .1 |
| 100-150 | 532,000 | 17.2 | 50 | 91 | 63,300 | 51.0 | 10,640 | 76.5 |
| 150-200 | 121,800 | 3.9 | 69 | 117 | 9,010 | 7.3 | 938 | 6.7 |
| 200-250 | 70,700 | 2.3 | 87 | 140 | 3,960 | 3.2 | 293 | 2.1 |
| 250-300 | 51,200 | 1.6 | 105 | 165 | 2,280 | 1.8 | 133 | 1.0 |
| 300-350 | 20,400 | .7 | 123 | 194 | 765 | .6 | 37 | .3 |
| 350-400 | 245,500 | 7.9 | 141 | 223 | 7,800 | 6.3 | 358 | 2.6 |
| 400-450 | 72,100 | 2.3 | 159 | 252 | 1,930 | 1.5 | 86 | .6 |
| 450-500 | 26,600 | .9 | 178 | 281 | 638 | .5 | 27 | .2 |
| 500-550 | 138,400 | 4.5 | 197 | 319 | 2,920 | 2.4 | 115 | .8 |
| 550-600 | 774,000 | 25.1 | 217 | 358 | 14,500 | 11.6 | 511 | 3.7 |
| 600-650 | 604,100 | 19.6 | 236 | 398 | 10,300 | 8.3 | 332 | 2.3 |
| 650-700 | 106,900 | 3.5 | 254 | 424 | 1,710 | 1.4 | 49 | .4 |
| 700-750 | 162,200 | 5.3 | 269 | 448 | 2,430 | 2.0 | 66 | .5 |
| 750-800 | 63,400 | 2.2 | 285 | 472 | 900 | .7 | 21 | .1 |
| 800-850 | 83,900 | 2.7 | 300 | 496 | 1,130 | .9 | 26 | .2 |
| 850-900 | 9,000 | .3 | 316 | 520 | 117 | .1 | 2 | .01 |
| | 3,083,100 | 100.0 | | | 124,000 | 100.0 | 13,900 | 100.0 |

[a] Data transcribed from Public Health Bulletin No. 143, Tables Nos. 133, 134, 137, and 138.

[11] The data for this calculation have been derived from Public Health Bulletin No. 143, Tables Nos. 133, 134, 137, and 138, pp. 329-334.

A comparison of the percentages of the total actual population located in each zone with the corresponding percentages which their "calculated equivalents" are of their respective totals, provides an index of the relative effects which the various population groups

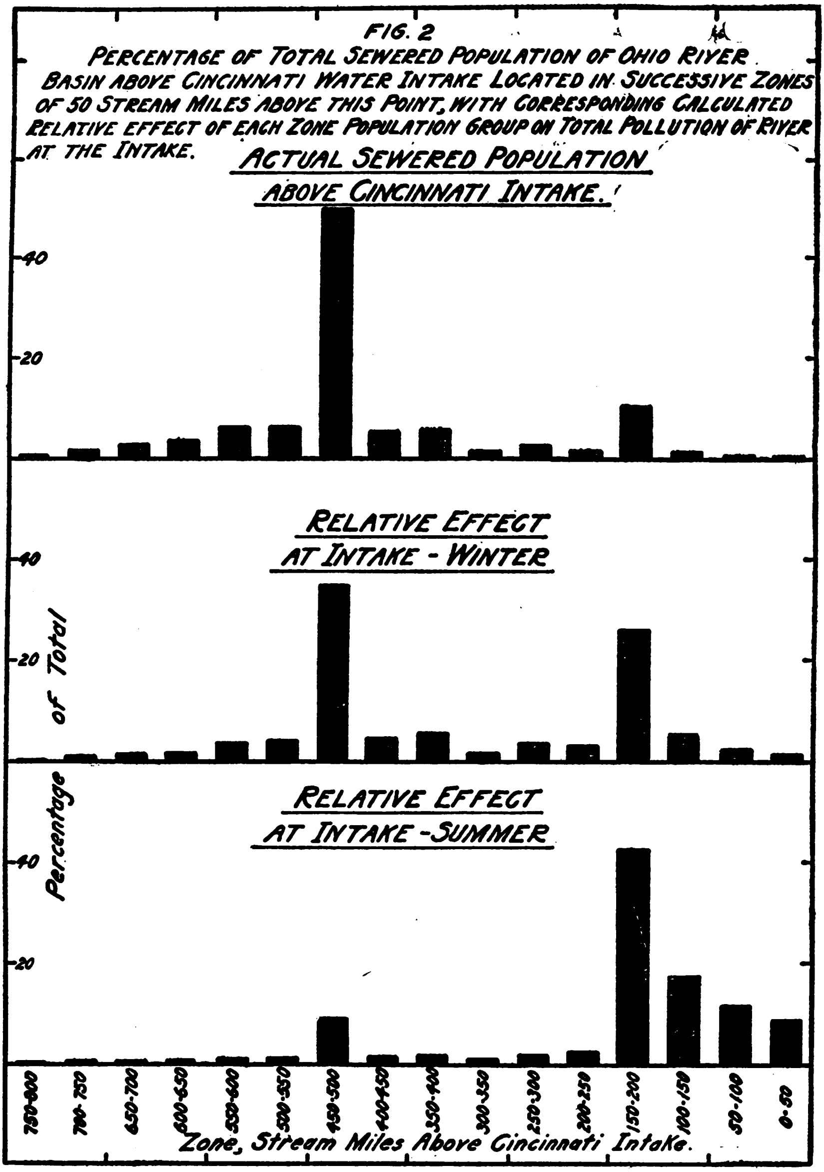
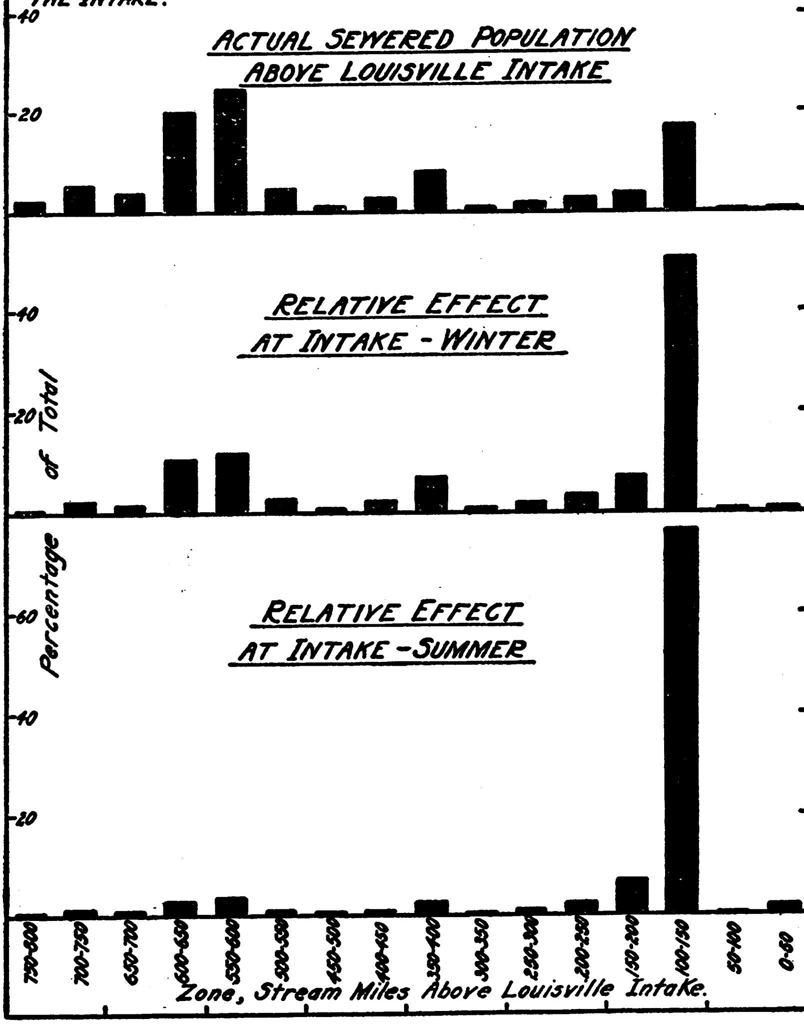



FIG. 2
PERCENTAGE OF TOTAL SEWERED POPULATION OF OHIO RIVER BASIN ABOVE CINCINNATI WATER INTAKE LOCATED IN SUCCESSIVE ZONES OF 50 STREAM MILES ABOVE THIS POINT, WITH CORRESPONDING CALCULATED RELATIVE EFFECT OF EACH ZONE POPULATION GROUP ON TOTAL POLLUTION OF RIVER AT THE INTAKE.

were estimated as exerting on the pollution of the river at each one of the two intakes. The comparison is illustrated graphically in Figures 2 and 3, referring, respectively, to pollution conditions at the Cincinnati and Louisville intakes. In Figure 2, the effect of bacterial pollution originating in the 50-mile zone located 450 to 500 miles above the Cincinnati intake, which includes the Pittsburgh metropolitan district, is indicated as being about 35 per cent of the total during the winter and only 9 per cent in the summer, when approxi-

FIG. 3

PERCENTAGE OF TOTAL SEWERED POPULATION OF OHIO RIVER ABOVE LOUISVILLE WATER INTAKE LOCATED IN SUCCESSIVE ZONES OF 50 STREAM MILES ABOVE THIS POINT, WITH CORRESPONDING CALCULATED RELATIVE EFFECT OF EACH ZONE POPULATION GROUP ON TOTAL POPULATION OF RIVER AT THE INTAKE.




mately 70 per cent of the total bacterial pollution at the intake is indicated as having been derived from zones lying within 200 miles above the intake. In Figure 3, sewage from the Cincinnati district and from Dayton, Hamilton, and other communities located in the zone 100–150 miles above the Louisville intake is shown as being responsible for a large proportion of the pollution of the river at this point, both in winter and in summer. In this instance the relative effect of pollution derived from the Pittsburgh district (zones 550–600 and 600–650 miles) is small, even in the winter.

The illustrative examples above cited indicate, first, that in any appraisal of conditions of bacterial pollution surrounding a given source of water supply, full account should be taken not only of the relative sizes of the various population groups jointly responsible for the particular conditions at that source, but also of their respective locations, on a time-distance basis, with respect to the source in question. They further indicate that in any systematic stream-cleaning measures designed to protect sources of water supply, primary consideration should be given to sewage derived from population groups located in zones extending immediately above a given intake. Finally, they afford evidence that conditions of bacterial pollution occurring in streams during the winter season, when natural purification agencies are less active, may impose a more severe burden on sources of water supply than those prevailing during the summer season, as is shown by a comparison of the corresponding "equivalent population" figures given in Table No. 1. In this respect, the situation is quite the reverse of that which usually holds where the other aspects of stream pollution are concerned.

Having thus considered briefly some of the more significant elements involved in the bacterial pollution of surface sources of water supply and the extent to which it may be modified by natural agencies, it is proposed now to discuss the degree to which the effects of such pollution may be further offset by artificial methods.

## EXTENT OF PROTECTION AFFORDED BY ARTIFICIAL PROCESSES OF WATER PURIFICATION

The extent of sanitary protection to water supplies of surface origin afforded by artificial processes of water purification may be said to depend primarily on the limitations of such processes with respect to their bacterial efficiency. Owing to the progressive advancement which has been and is occurring in the art of water purification, these limitations can hardly be regarded as being static; nevertheless they now appear to be sufficiently well defined to be capable of approximate determination for practical purposes.

In spite of the high degree of efficiency to which water purification has been developed, both in this country and in other countries, experience has shown that none of the processes involved in large-scale operations of this kind ordinarily are capable of removing from a bacterially polluted water all of the living organisms present in it. This is true not only of sedimentation and filtration processes, aided or unaided by coagulation, but also, under normal conditions of practice, of those processes of chemical disinfection, such as chlorination, which have become such important adjuncts of modern filtration plants.

During the past few years a systematic effort has been made by the Public Health Service to determine, by combined observation and experiment, the nature and extent of the limitations above noted. These studies have had as their primary object the establishment of a basis for formulating, in specific physical and bacteriological terms, permissible limits of pollution of raw water supplies taken for purification from sewage-polluted sources of various classes, particularly in the inland navigable waters of the country on which large and important sections of the population are dependent for their public drinking-water supplies.

From these studies, which at the present writing still are in progress, a number of interesting conclusions of considerable practical significance have been drawn. Without entering into a detailed discussion of them here,[12] it is pertinent to note briefly the more significant conclusions thus far reached from them concerning the limitations surrounding the bacterial efficiency of water purification.

In general, the studies have shown that the efficiency of each separate process involved in water purification, such as, for example, coagulation, sedimentation, filtration, and chemical disinfection, is influenced by a number of factors, some of which are, and some are not, subject to physical control. Among the former may be noted the various conditions of plant design, such as retention periods provided in basins and depths and sizes of filtering material; likewise certain measures of operation, such as the amounts of coagulants and disinfectants used, the pH of the chemical reactions, and the rate of filtration. Among the latter are seasonal changes, notably those of temperature, and variations in the turbidity and bacterial content of the raw water.

More specifically, the studies have indicated that the average well-designed and well-operated rapid sand filtration plant, treating river waters such as are found in the Ohio and other river basins of the great Middle-Western plains, is capable of producing, with a fair degree of consistency, a final chlorinated effluent of acceptable palatability and conforming to the revised United States Treasury Department standard,[13] if the *B. coli* index of the raw water does not

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[12] For such a discussion, see Public Health Reoprts: March 31, 1922 (Reprint No. 737), Jan. 30, 1925 (Reprint No. 987), Oct. 1, 1926 (Reprint No. 1114), July 15, 1927 (Reprint No. 1170); also Public Health Bulletin No. 172, U. S. Public Health Service.

[13] The original Treasury Department standard, adopted in 1914 (Public Health Reports, vol. 29, No. 45, Nov. 6, 1914, Reprint No. 232) specified, in effect, that water served for drinking purposes by the interstate carriers should not contain numbers of *B. coli* exceeding 2 per 100 cubic centimeters, as expressed in terms of the *B. coli* index. The revised standard, adopted in 1925 (Public Health Reports, vol. 40, No. 15, Apr. 10, 1925, Reprint No. 1029) provides that the average *B. coli* index shall not exceed 1 per 100 cubic centimeters.

exceed approximately 5,000 per 100 cubic centimeters. A preliminary survey, now in progress, of a group of water-purification plants located along the Great Lakes has indicated thus far, however, that the average plant treating raw waters derived from these lakes can not produce consistently a final effluent of acceptable palatability and meeting the same standard of bacterial quality if the *B. coli* index of the raw water exceeds an amount falling somewhere below 2,000 per 100 cubic centimeters.

The extent to which modern water filtration plants treating surface waters from sewage-polluted sources are now dependent on continuous and effective chlorination of their effluents in order to produce drinking waters of acceptable bacterial quality is shown by the results obtained, in connection with these studies, from systematic observations of the quality of unchlorinated filter effluents as related to that of the various raw-water supplies. These observations have indicated, for example, that under the most favorable conditions thus far met in practice, the average water filtration plant treating river waters of the type above noted can not produce consistently an unchlorinated effluent conforming to the Treasury Department standard if the *B. coli* index of the raw water exceeds 60 to 100 per 100 cubic centimeters. In so far as plants treating Great Lakes waters are concerned, the corresponding average limit appears to fall somewhere less than 10 per 100 cubic centimeters.

Although the limits above stated are observational and, in the former instance, provide no working factor of safety, they may be regarded tentatively as representing the extreme limits of pollution of raw water supplies derived from the two respective types of sources named, which thus far have appeared to be most nearly consistent with the production, by the average plant, of effluents meeting a commonly accepted standard of bacterial quality under the particular conditions noted. These maxima may be said, therefore, to provide an approximate basis for judgment as to the suitability of sewage-polluted sources of water intended for purification to the respective degrees named.

It is especially worthy of note, in this connection, that for some reason or reasons not as yet fully determined, the bacterial efficiency of filtration plants treating raw waters such as are derived from the Great Lakes appears to be of a decidedly lower order of magnitude than that of similar plants treating river waters such as are found in the Ohio and other inland river basins lying east of the Mississippi.[14] If further observations now in progress should confirm this finding, it would appear logical to expect that any standard of bacterial pollution applicable to sources of purified water supplies located along the Great Lakes necessarily would be more rigid in its limiting require-

[14] No systematic observations thus far have been made west of the Mississippi River.

ments than would be a corresponding standard with respect to river waters of the Ohio type. In this connection reference should be made to the standard of raw water pollution set up by the International Joint Commission, in 1914, with respect to Great Lakes waters, the standard requiring, in effect, that the *B. coli* index of these waters, as delivered to purification plants for treatment, should not exceed 500 per 100 cubic centimeters.[15] Taking into account the factors of safety necessary to protect water purification plants treating waters of the Great Lakes from the effects of sudden and excessive variations in their bacterial content resulting from conditions somewhat peculiar to these waters in zones affected by shore pollution, the International Joint Commission standard would appear, from present indications, as being not far from that which ultimately may be found to be a reasonable one for such lake waters, though it probably is more rigid than is necessary for application to river waters of the Ohio River type.

### SUPPLEMENTARY MEASURES FOR REINFORCING THE PROTECTION AFFORDED BY EXISTING WATER PURIFICATION SYSTEMS

The supplementary measures available for reinforcing the protection afforded by existing systems of water purification are of two general classes:

(1) Further elaboration of current water-purification processes; and

(2) Treatment of sewage and other wastes at their sources.

These measures are theoretically feasible to almost any desired degree. Practically, however, they are limited by a number of considerations, including those of economy. Let us consider, first, the further elaboration of current water-purification processes.

During the past three decades methods of water purification as practiced in the United States have undergone a steady course of improvement and of adaptation to the diversity of conditions existing in this country. In spite of their variations in respect to details, these methods have remained, however, substantially as they were at the time of Fuller's experiments at Louisville and Cincinnati in the late nineties. In New England and a few other limited areas of the country the English slow sand filter has proved satisfactory for the treatment of the relatively clear upland waters of these sections. Throughout the remainder of the country, including by far the greater portion, the rapid sand filtration process has been found best adapted to the purification of the variable and highly turbid river waters found in these extensive regions. The latter method, therefore, may be regarded as the more representative of current practice in the United States.

[15] Final report of the International Joint Commission on the Pollution of International Boundary Waters Reference. 1918.

In its ordinary and more simple development the rapid sand filtration system provides facilities (*a*) for coagulating the raw water, (*b*) for subjecting it to a single stage of sedimentation after coagulation, (*c*) for passing it through rapid sand filters after sedimentation, and (*d*) for chlorinating it either before or after filtration.

Various elaborations of these ordinary water purification processes are being practiced, both in this country and abroad, with a considerable measure of success. Among the more important of these measures are—

(1) Long-time preliminary storage;

(2) Double-stage preliminary sedimentation, aided, in some instances, by two-stage coagulation;

(3) Double filtration;

(4) Prechlorination of the raw water, prior to its delivery to preliminary sedimentation basins.

In general, prolonged storage of sewage-polluted surface waters as a preliminary step in their more complete purification by filtration has not been adopted in the United States to the extent that it is practiced in Europe, notably in Great Britain. An important reason is the existence of unfavorable topography found along the relatively flat plains of many of our inland rivers and lakes, where the difficulties and cost of constructing storage reservoirs of large capacity are great. Although numerous stored water supplies are found in the mountainous sections of the Appalachian and Pacific coastal ranges, as a rule they are derived from relatively unpolluted upland sources and require little or no further treatment. Aside from a very few instances, notably at Albany, N. Y., double filtration, likewise, has had less use in this country than abroad, largely because of the added costs of treatment entailed by the added operating head required by this method.

Mainly for the reasons above noted, elaboration of the more simple types of filtration plants in the United States, when undertaken principally as a measure of offsetting increased raw water pollution, has had a tendency toward the extension of sedimentation devices and the intensification of chemical treatment. Along the Ohio River, for example, five municipal filtration plants now are equipped with double-stage sedimentation basins, aided, in three instances, by coagulation at both stages of treatment. At the new filtration plant located at Springfield, Ill., a mechanical clarifying device has been installed in advance of sedimentation. At three filtration plants located along the Great Lakes and at a few river plants treating highly polluted waters, prechlorination of the raw water prior to its treatment by coagulation, sedimentation, and filtration is being tested. Mention also should be made of the intensification of lime treatment (commonly termed the "excess-lime" method) which is being practiced at a number of large water-softening plants and at a few plants devoted more strictly to water purification without softening.

In so far as can be judged from observational and experimental data now at hand, the elaboration of water filtration plants along the two lines last indicated above has resulted in extending very decidedly the permissible limits of raw water pollution, consistent with the production of effluents having a satisfactory bacterial quality, though in some instances, at the expense of their palatability, where the chemical treatment is too greatly intensified. Observations made at the five Ohio River plants, using double-stage preliminary sedimentation, have indicated that, as an average, they are capable of producing final chlorinated effluents conforming to the Treasury Department *B. coli* standard from raw river water having a *B. coli* index ranging as high as about 50,000 per 100 cubic centimeters. Although data concerning the corresponding efficiency of raw water prechlorination are too meager at present to warrant drawing any definite conclusions from them, they appear to indicate that this measure, when added to complete sedimentation and filtration treatment, can be made to yield a final effluent of satisfactory bacterial quality from raw river water having a *B. coli* index ranging as high as 10,000 or even 20,000 per 100 cubic centimeters.

The cost of these various added measures of water treatment is a factor, however, to which an increasing amount of attention probably will be given as sources of surface water supply become more highly polluted and recourse necessarily is had to such measures. In a recent paper,[16] Hansen states that the ordinary water purification system will cost up to $4 or $4.50 per capita, and the most highly elaborated plant up to $10 per capita. He gives the annual cost of purification as being usually less than 85 cents per capita.

In this connection, some interesting data bearing on the relation between the cost of water purification and the average density of raw water pollution have been obtained from surveys of a group of municipal water purification plants made during the past few years by investigators of the Public Health Service. In Table 2 is given a tabulation of the costs of operation of 10 municipal water filtration plants from which fairly complete data in this respect were secured. In order to reduce the costs to a comparable basis, they have been calculated to terms of the cost per million gallons of water treated and of the annual cost per capita.

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[16] Hansen, Paul: Trend of Practice in Water Purification. Canadian Engineer, vol. 52, No. 10, pp. 95–97 (Mar. 8, 1927).

TABLE 2.—*Costs of water purification at 10 municipal rapid sand filtration plants, with average B. coli index of raw water as delivered to each plant*

[Data covering one year during years 1923-24]

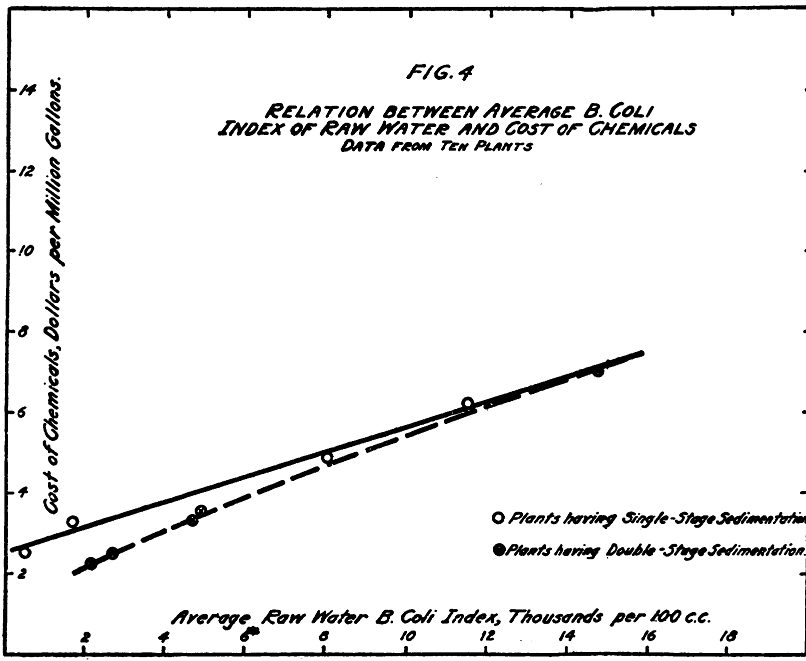
| Plant | Population supplied (estimated) | Average volume of water treated | | Cost of treatment | | | | Average B. coli index of raw water per 100 c. c. |
|---|---|---|---|---|---|---|---|---|
| | | Million gallons daily | Gallons per capita, daily | Per million gallons | | Per capita annually | | |
| | | | | Total | Chemicals | Total | Chemicals | |
| E. Liverpool, Ohio[1] | 23,000 | 3.470 | 151 | $11.63 | $4.87 | $0.62 | $0.26 | 8,050 |
| Steubenville, Ohio | 32,000 | 4.695 | 144 | 9.38 | 3.68 | .40 | .20 | 4,780 |
| Ashland, Ky | 20,000 | 1.400 | 70 | 15.20 | 6.22 | .70 | .29 | 11,500 |
| Ironton, Ohio | 15,000 | 1.930 | 129 | 18.50 | 7.07 | .87 | .33 | 14,900 |
| Portsmouth, Ohio[1] | 42,200 | 6.190 | 147 | 8.41 | 3.55 | .45 | .19 | 4,930 |
| Cincinnati, Ohio | 400,000 | 49.560 | 123 | 6.76 | 2.44 | .31 | .11 | 2,980 |
| Louisville, Ky | 250,000 | 35.951 | 144 | 3.88 | 2.19 | .20 | .11 | 2,220 |
| Henderson, Ky | 13,000 | 2.158 | 55 | (2) | 3.28 | 1.32 | .20 | 1,740 |
| Elmira, N. Y | 50,000 | 4.491 | 90 | (3) | 2.53 | .47 | .08 | 580 |
| Niagara Falls, N. Y | 58,500 | 11.040 | 189 | 10.90 | [4] 1.38 | .75 | .09 | 8,290 |
| Means | | | 124 | 12.22 | 3.72 | .62 | .19 | 5,000 |

[1] Average for three years, 1924, 1925, 1926.
[2] Affected by abnormal conditions, therefore omitted.
[3] Included pumping costs which could not be separated, therefore omitted.
[4] Raw water relatively clear, comparatively small amounts of coagulants used. Omitted from plot in Fig. 6.

In Figure 4, plotted from the data contained in Table 2, is shown graphically the relation observed between the annual average density of raw water pollution expressed in terms of the *B. coli* index, and the cost of chemical treatment per million gallons of water treated. It will be noted that, for a given degree of raw water pollution, this cost is slightly less at plants equipped with double-stage sedimentation than at plants having only single-stage sedimentation. Against this advantage, however, should be balanced the added cost, in the former instance, of constructing and operating the extra basins necessary to provide the two separate stages of sedimentation.

In Figure 5, also derived from Table 2, is shown the corresponding relation observed between the density of raw water pollution and the total cost of operation, which is indicated as ranging from about $5 to $20 per million gallons coincidently with a raw water *B. coli* index varying, as an extreme range, from 1,000 to 16,000 per 100 cubic centimeters. The graphs shown in Figures 4 and 5 indicate that for each successive increase of 1,000 in the average raw water *B. coli* index the total cost of purification is increased by approximately $1 per million gallons, and the cost of chemical treatment by about 30 cents per million gallons. These figures do not include the cost of pumping or any fixed charges against construction. From the figures given by Hansen, the latter would be expected, at 6 per cent, to range from 24 to 60 cents per capita annually, or from about $6 to $16 per million gallons of water treated, depending on the extent of elaboration of the plant.

By combining the fixed and operating costs above given, it may be estimated very roughly that the total cost of water purification, including construction and operation, may vary, in round numbers, from about \$10 to \$35 per million gallons, or from about \$0.40 to \$1.40 per capita per year, according to the degree of pollution of the raw water and the extent of plant elaboration required. Although the upper limiting figure of this range represents a degree of raw water pollution thus far encountered by relatively few water purification plants in this country, the difference between the two limiting figures, amounting to \$1 per capita annually, is significant as indicating the extent by which an extreme condition of this kind, where prevalent, may increase the total cost of water purification over and

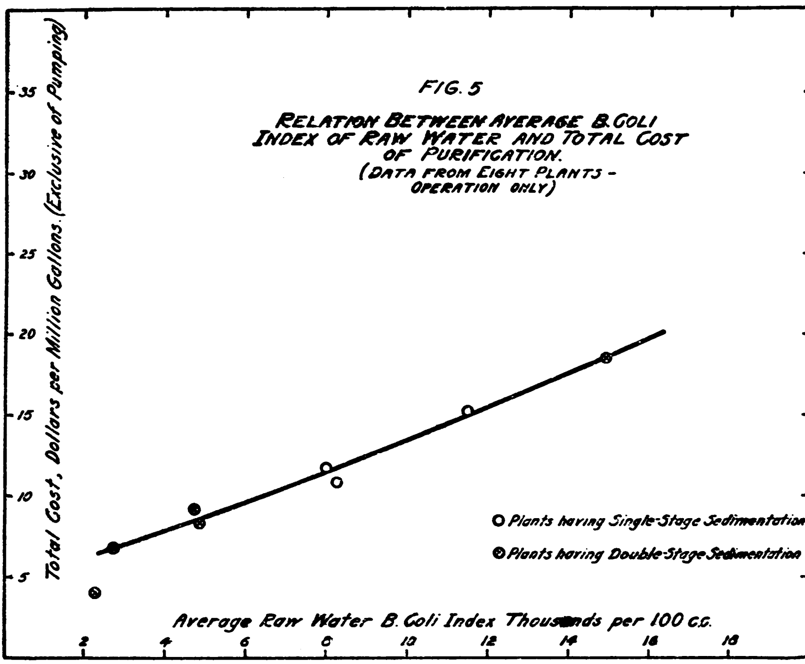



above that which is required for treating a moderately polluted water. It may be said, in fact, to represent approximately the added tax which an excessive pollution of sources of raw water supply, if allowed to become increased to an extent such as now prevails in portions of our more highly polluted river systems, may be expected to impose on the consumers of purified water supplies derived from such sources.

*Sewage treatment measures.*—The use of sewage treatment as a specific measure for protecting sources of water supply has been regarded, with justification, as being necessarily secondary to that of water purification, for reasons which are well known to all students of the problem as it has developed in this country. With the increasing pollution of our large river systems and the possible overburdening of some of the more highly elaborated water purification plants, more consideration may be expected to be given to this measure than heretofore has been necessary.

In this connection, a number of questions arise, among which two are of primary importance: First, What general method of sewage treatment may be regarded as affording adequate protection to sources of water supply? Second, What is the relative cost of such treatment, in comparison with the cost of other measures which may be utilized for relieving the overburdening of existing water-purification plants?

As regards the first of these two questions, opinions appear to differ. In England, where the streams are short and small in volume,




the view seems to prevail that nothing short of complete treatment of sewage, including its clarification, oxidation, and bacterial disinfection, may be considered as adequate for water-supply protection. In this country, partial clarification and disinfection have been advocated as being ordinarily sufficient, on the assumption that the treatment of sewage to this extent will render it bacterially innocuous and that more extensive purification is required only where the natural oxidation capacity of a stream is overtaxed. Superficially, the latter procedure would seem to be a reasonable one under most of the conditions prevailing in the United States, where the rivers are relatively long, are large in volume and, in a number of cases, possess an ample capacity for natural oxidation of sewage matters. On the other hand, it must be admitted that comparatively little scientific information exists in this country as to the efficacy of partial sewage treatment when practiced solely as a measure for water-supply protection.

As regards the cost of complete sewage treatment, Hansen [17] has stated recently that the annual cost would average approximately 95 cents per capita, exclusive of the cost of necessary intercepting sewers, which would range from $1 to $10 per capita per year. From cost statistics [18] from a group of representative American sewage treatment plants, as given by Wagenhals, Theriault, and Hommon, it has been estimated that if the costs as given were corrected to a basis of the year 1924, the average total annual cost of treatment, including fixed and operation charges, would be about 90 cents per capita, which figure corresponds closely to that given by Hansen. (See Table 3.) With the cost of intercepting sewers excluded, the balance of cost as between complete sewage treatment and water purification would appear to be about equal where the more highly elaborated types of the latter are concerned, but to favor the latter in its more simple forms as ordinarily practiced. With intercepting sewers included, the balance clearly favors water purification, regardless of its degree of elaboration. Where highly elaborated water purification plants are overburdened, and the only remaining alternatives are sewage treatment or preliminary storage of the raw water at the intake, the relative costs of these two measures will be the determining factor.

TABLE 3.—*Per capita costs of sewage treatment, both as of date and corrected to the year 1924, as indicated by data from 11 representative sewage-treatment plants in the United States*

[Compiled from data given in Public Health Bulletin No. 132, U. S. Public Health Service]

| Plant | Year constructed | Cost per capita: Construction, Initial, As of date (1) | Construction, Initial, As of 1924 (2) | Construction, Annual, at 6 per cent, As of date (3) | Construction, Annual, at 6 per cent, As of 1924 (4) | Operation (annual), 1919–1920 (5) | Operation (annual), As of 1924 (6) | Total as of 1924 (4)+(6) (7) | Factors: Construction [a] | Factors: Operation [b] |
|---|---|---|---|---|---|---|---|---|---|---|
| Alliance, Ohio | 1913 | $8.46 | $19.45 | $0.51 | $1.17 | $0.26 | $0.30 | $1.47 | 2.30 | 1.15 |
| Atlanta, Ga | 1913 | 3.78 | 8.69 | .23 | .52 | .08 | .09 | .61 | 2.30 | 1.15 |
| Baltimore, Md | 1911 | 5.25 | 12.70 | .32 | .76 | .13 | .15 | .91 | 2.42 | 1.15 |
| Canton, Ohio | 1916 | 5.27 | 8.80 | .32 | .53 | .18 | .21 | .74 | 1.67 | 1.15 |
| Columbus, Ohio | 1908 | 3.37 | 8.63 | .20 | .52 | .58 | .67 | 1.19 | 2.56 | 1.15 |
| Fitchburg, Mass | 1915 | 8.55 | 18.90 | .51 | 1.13 | .30 | .34 | 1.47 | 2.21 | 1.15 |
| Houston, Tex | 1916 | 3.73 | 6.23 | .22 | .37 | .44 | .51 | .88 | 1.67 | 1.15 |
| Lexington, Ky | 1918 | 5.22 | 5.17 | .31 | .31 | .16 | .18 | .49 | .99 | 1.15 |
| Reading, Pa | 1907 | 3.74 | 9.16 | .23 | .55 | .26 | .30 | .85 | 2.45 | 1.15 |
| Rochester, N. Y. [c] | 1915 | 4.12 | 9.11 | .25 | .55 | .13 | .15 | .70 | 2.21 | 1.15 |
| San Marcos, Tex | 1916 | 1.60 | 2.67 | .10 | .16 | .43 | .49 | .65 | 1.67 | 1.15 |
| Total | | 53.09 | 109.51 | 3.20 | 6.57 | 2.95 | 3.39 | 9.96 | 22.47 | |
| Mean | | 4.83 | 9.96 | .29 | .60 | .27 | .31 | .91 | 2.04 | |

[a] Obtained from factors given in Table 33, "Water Works Practice," Am. W. W. Assoc., 1925, p. 490.
[b] Estimated from factors given in Table 38, "Water Works Practice," Am. W. W. Assoc., 1925, p. 495.
[c] Irondequoit plant.

[17] Canadian Engineer, vol. 52, No. 10, pp. 95–97, Mar. 8, 1927.

[18] Wagenhals, H. H., Theriault, E. J., and Hommon, H. B.: Sewage Treatment in the United States. Public Health Bulletin No. 132, U. S. Public Health Service.

In the foregoing estimates, a relatively complete degree of sewage treatment has been assumed. If such treatment were restricted to fine screening, or plain sedimentation, and chlorination, such as is commonly practiced for the protection of bathing beaches, the cost of sewage treatment would be correspondingly lowered. Thus, the cost of fine screening and chlorination combined may be estimated very roughly as being about $10 per million gallons of sewage treated or about 40 cents per capita annually. If this figure were used as the basis of comparison, the cost of such partial sewage treatment would appear to be practically the same as that of the more simple types of water purification. If the added cost of intercepting sewers were included, the balance again would favor water purification as being the more economical.

In estimating the extent of sewage treatment required in order to effect a specified degree of reduction in the average bacterial pollution of a stream at a given source of water supply, an analysis of the problem along lines such as are indicated in Table 1 and Figures 2 and 3 may be helpful. Let it be assumed, for example, that it were desired to reduce the average bacterial pollution of the Ohio River at the Louisville water intake by sewage treatment applied to population groups located in zones above that point. On referring to Table 1 it will be noted that the relative influence on the *B. coli* content of the river at Louisville exerted by sewered population groups located in the zones lying within 200 stream miles above that point was 58.7 per cent of the total under winter conditions and 85.2 per cent of the total under summer conditions such as prevailed in the year 1915, as is indicated by the percentages of the total "calculated equivalent" population effective at this point. If all of the sewage of this population, aggregating 654,800, were given treatment such as to cause a 90 per cent reduction in its *B. coli* content, the average density of *B. coli* at the Louisville intake, attributable to domestic sewage discharged into the river above that point, would be expected, on this basis, to be diminished by $0.90 \times 58.7$ per cent, or 53 per cent, under winter conditions, and by $0.90 \times 85.2$ per cent, or 77 per cent, under summer conditions. Under the more unfavorable winter condition, therefore, a reduction approximating one-half the total sewage pollution of the river at the Louisville intake, as expressed in terms of *B. coli*, would be expected to result from effective sewage treatment applied within the restricted zone specified. In this connection it is also significant to note that, on the basis of the percentages given in Table 1, equally effective treatment of all the sewage discharged into the Ohio River by the 1,378,100 of sewered population located in the two zones, 550–600 miles and 600–650 miles, in which the Pittsburgh district is included, would be expected to reduce the average *B. coli* content of the river at Louisville by less than 20 per cent under the winter conditions of 1915 and by less than 6 per cent under summer conditions.

The foregoing illustration, though it should not be interpreted too literally as regards the actual figures obtained from the calculation, is instructive in showing that systematic stream-cleaning measures, if undertaken primarily for the protection of water supplies, may be applied with a considerable degree of economy if a thorough study is made of the comparative influence of wastes derived from various population groups, when considered in their time-distance relationships to the sources of such supplies. It is further significant as indicating a fairly simple method, in specific cases, for balancing the total cost of stream-cleaning measures against that of additional water purification, where practicable. In the instance above cited, for example, the cost of sewage treatment as applied to a sewered population aggregating 654,800 would be balanced against the cost of added water purification as applied to the population of Louisville, which in 1915 was estimated as being about 308,000. In this case, the balance clearly would favor added measures of water purification up to a point such that their per capita cost would be slightly more than double that of sewage treatment.

## CONCLUSION

In concluding this paper it may be well to note very briefly the present status, in this country, of the general problem with which it has been concerned.

The excessive sewage pollution of surface bodies of water used as sources of water supply has begun to attain serious proportions in certain areas of the eastern and middle-western States, notably in the Ohio and Hudson River basins, and in some marginal zones of the Great Lakes, particularly at a few points located along Lake Erie, in the extreme southern end of Lake Michigan, and in some of the connecting waters as in the Detroit and Niagara Rivers. In portions of these areas water purification plants have been and are being elaborated more and more in an effort to offset increased raw water pollution. In some instances, recourse either to additional water storage or to sewage treatment measures probably will be necessary in the not distant future. In certain cases the presence of industrial wastes in sources of raw water supply is a further complicating factor, especially in the upper portions of the Ohio River and at some points along the Great Lakes.

Although isolated instances of excessive pollution, such as above mentioned, are found in other sections of the country, the situation in these areas is, in general, such that existing water purification systems, where properly designed and efficiently operated, are not overburdened. In these regions systematic measures for preventing any widespread overloading of water purification plants can readily be taken and, in some cases, notably in North Carolina, are being actively considered by the State health authorities.

The effectiveness of measures for relieving or preventing the excessive pollution of water-supply sources will involve, however, not only a thorough knowledge of the technical phases of the problem, some of which have been discussed in this paper, but also the provision of an adequate and well coordinated administrative machinery, backed, where necessary, by intelligent legislation. Thus far, efforts to set up such a machinery have been hampered, to some extent, by a lack of the necessary technical groundwork, and further by the fact that the problem, in many cases, transcends State and even international boundaries. Studies such as are being made by the Public Health Service and other agencies are being aimed to evaluate the more essential technical factors involved in the problem. On the administrative side, an interesting experiment is being made by the States bordering the Ohio River in forming an interstate association with a view to coordinating the legislative and regulatory policies of these several States in dealing with stream pollution matters. In another case, an effort is being made to solve this question by interstate treaty. Within some States, sanitary districts are being organized for the purpose of effecting a well-coordinated joint solution of existing problems of water supply and sewage disposal.

The several activities thus noted, together with others of a similar nature, appear to give promise that a wise solution of these problems ultimately will be found. Further technical studies are needed, especially those concerned with the economic phases of the question, which are becoming increasingly important. There also remains the difficult problem of dealing with the excessive pollution of water supplies by industrial wastes, with its baffling technical and administrative aspects. In spite of these and numerous other unanswered questions, these matters can be faced with the renewed assurance bestowed by an awakened public interest in the conservation of our water resources and by the support which efforts to meet the problem are receiving both from the public at large and from various professional organizations. These resources are indeed our greatest national asset, indispensable both to our industrial development and to the continued health and happiness of our population. If unduly neglected, they may well become our greatest liability.

## COURT DECISIONS RELATING TO PUBLIC HEALTH

*Enforcement of laundry ordinance not enjoined.*—(Illinois Supreme Court; Ruban et al. *v.* City of Chicago et al., 161 N. E. 133; decided April 21, 1928.) Suit was brought by the plaintiffs to restrain the city of Chicago from enforcing an ordinance regulating the laundry business. The plaintiffs received soiled clothes and linens, had the same collected, washed, dried, and returned by steam laundry companies, and then hand-ironed the articles themselves. The city ordinance provided that any place, etc., which was used for the purpose of washing, drying, starching, or ironing wearing apparel, linens, etc., for the general public should be deemed a laundry, and required a license to conduct the same. The court held that the city had the power to direct the location and regulate the use and construction of laundries, and that the requirement of a license was legal. The plaintiffs contended that they were not engaged in the laundry business, the basis of their contention being that a laundry was a place where clothing and other articles were washed and ironed. But the court pointed out that the definition in the ordinance of a laundry, which definition it was held was a proper incident to the power conferred to regulate laundries, was that it was any place, etc., used for the purpose of marking, sorting, washing, drying, starching, *or* ironing the articles therein mentioned, and decided that the plaintiffs were engaged in the laundry business and were not entitled to the relief asked.

*Recovery of damages for injuries from glass in milk denied.*—(Massachusetts Supreme Judicial Court; Carlson *v.* Turner Centre System, 161 N. E. 245; decided April 5, 1928.) The plaintiff, who purchased a bottle of milk from a retail dealer, sought damages, for injuries from a small piece of glass in the milk, from the defendant corporation, which bottled and sold the milk to the retailer, in an action of contract on the ground of an implied warranty by the defendant that the milk was wholesome and fit for human consumption, but the supreme court denied recovery because there was no contractual relation between the defendant and the plaintiff, who had dealt only with the retailer.

*Property owner personally liable for installation of sanitary toilet by city.*—(Alabama Supreme Court; Town of Leeds *v.* Cason, 116 So. 519; decided April 14, 1928.) In an action by a municipality to recover the cost of installing a sanitary toilet on private property, upon failure of the owner to install same, as provided by an ordinance adopted pursuant to law, the court held that, although the city had failed to comply with the statutory provisions necessary to the enforcement of a lien on the property, there was a personal liability on the owner for the expense and that a contract action could be maintained.

# PUBLIC HEALTH ENGINEERING ABSTRACTS

**Some of the Newer Industrial Hazards.** Frederick B. Flinn. *The Boston Medical and Surgical Journal*, vol. 197, No. 28 January 12, 1928, pp. 1309–1314. (Abstract by R. R. Sayers.)

While toxicology is only one of the fields of preventive medicine, it is being considered of increasing importance as it is realized that perhaps exposure to industrial poisons may explain some of the obscure symptoms of which patients complain, but for which there is no apparent cause. It is known that many of the toxic substances are rendered harmless if the amount present in the air or dust can be kept below a certain maximum point. This can be done by proper methods of ventilation adapted to each particular hazard. It is the province of the medical man to determine the limits that can be tolerated by the human system, and that of the ventilating engineer to determine the methods of remedying the conditions.

Results are given of a study made by investigators of the United States Public Health Service among granite workers to determine whether or not a standard of dustiness could be set up as a maximum which might safely be considered as the limit for that industry. From the results of this study the conclusion is drawn that a certain amount of this dust is tolerated by the human system.

Lead is discussed as still being the most important industrial poison, with the exception of carbon monoxide. An analysis of 18 industries in which the most of the lead cases appear, shows that the precise cause of the incidence in all of them is the inhalation of either dust or fumes. If the dust and fumes should be completely eliminated, lead poisoning in the industries will be stopped. The statement is made that the suspicion seems justified at the present moment that a change in the hydrogen ion of a cell affects its affinity for lead, and the author is not willing to place all the blame for cases of lead poisoning among persons addicted to alcohol or lack of personal cleanliness. The symptoms and pathological effects of lead poisoning are pointed out.

The danger of the use of benzol in quick-drying paints is pointed out but; on account of the hazard, benzol is being replaced by such substances as xylol. Acute cases of poisoning from benzol occur most frequently in industry either when the benzol is being prepared from coal tar or is used in concentrated form, as in the blending of motor oils or in the extraction of certain chemicals, where the very nature of the process requires that the operation be carried on in a closed system for economical if for no other reasons. The symptoms and pathological effects of benzol poisoning are described.

Attention is called to deaths occurring among workers employed in painting dials with luminous material. The symptoms of poisoning from this source and the pathological effects are described. Two main exposures in the industrial production and use of radium are described: (1) Exposure to the emanation which may result in radioactive deposits in the body or in external burns when the material is handled in a careless manner; and (2) the ingestion of the radioactive material, either by inhalation of the dust or by actually swallowing the material through ignorance or willfulness on the part of the employees.

**Deaths from Lead Poisoning.** Frederick L. Hoffman. Bulletin No. 426, United States Bureau of Labor Statistics, Washington, February, 1927. (Abstract by Leonard Greenburg.)

Lead continues to occupy a position of supreme importance as an industrial poison, and for this reason the present bulletin is of much interest and value. In this volume Doctor Hoffman has analyzed the available statistics of chronic lead poisoning in the United States, Canada, Great Britain, and certain other foreign countries. In addition to this, there is presented an analysis of deaths from chronic lead poisoning in the United States registration area from 1914 to 1924. The death certificates for lead poisoning are further classified by occupation and age, and in certain cases statistics concerning contributory causes of death are presented and analyzed. Lastly, in part 3 of the bulletin, are presented the statistics for chronic lead poisoning from four State accident boards, namely, Massachusetts, Pennsylvania, California, and New York.

It is obviously quite impossible in a brief abstract to present Doctor Hoffman's findings in any detail. The death statistics of the United States registration area as well as those of the Metropolitan Life Insurance Co. show that the death rate has been declining since the year 1912, and now, according to these data, has reached the rate of 1.6 per 1,000,000 persons exposed. The rate for white males and for colored males appears to be very nearly the same.

The largest number of deaths took place in the occupational group of painters, and but 62 deaths occurred in the group of lead workers in smelting plants, etc.

The worker in the field of industrial hygiene can not fail to be interested in this report, and to those interested in the problem of lead poisoning it is of great value.

**The Use of Ozone in the Ventilation of the Automobile Service Station.** M. R. Mayers. Indust. Hyg. Bull. New York, 1927, v. 3, 37–38. (Abstract by P. S. Lelean in *Bulletin of Hygiene*, vol. 2, No. 12, December, 1927, p. 971.)

"The author gives the analysis of motor-car exhaust air as: Carbon dioxide, 8.6 per cent; carbon monoxide, 6.3 per cent; oxygen, 2.3 per cent; methane, 0.9 per cent; hydrogen, 3.0 per cent; nitrogen, 78.6 per cent.

"The carbon monoxide increases to 11 per cent in the exhaust-air of cars under test in garages in hot weather.

"Hence 54 per cent of garage air tested had over the 0.1 per cent of CO which is regarded as the danger limit in the United States, while 69 per cent of garage men had CO in their blood in amounts ranging from 2.3 to 40 per cent of saturation point, in association with reduction of oxygen from the normal of 19 vol. per cent to as low as 2.4.

"Dizziness, smarting of the eyes, nausea, drowsiness, and incoordination caused complaints and inefficiency; but the most marked effect, and the predominant cause of stopping work, was intense headache.

"As an antidote, firms have marketed 'ozonators' under the erroneous idea that the ozone will oxidize the carbon monoxide to dioxide. The garage men have, however, found so much reduction of headache to follow use of these "ozonators' that the cause is being investigated. It is provisionally attributed to (*a*) psychological effect, and (*b*) action of ozone in preventing the carbon monoxide from markedly reducing the partial pressure of oxygen in the alveolar air."

**Municipal Developments at Noranda, Quebec.** Alex. M. Hogg. *Canadian Engineer*, vol. 54, No. 3, January 17, 1928, pp. 135–137. (Abstract by R. E. Thompson.)

An illustrated description of the municipal activities at Noranda, Quebec, a town fostered by the Horne Copper Co., in connection with the smelter being erected at that point. The present town of Rouyn and the new town of Noranda are situated on the shore of a small lake, from which both towns derive their water supply and which is the only possible point of discharge for the sewage of Noranda. This situation demands, of course, complete treatment of the sewage. A narrow peninsula extending well out into the lake was selected as a site for both plants, the water supply being taken from one side of the peninsula and the sewage being discharged into the lake on the other side. There is a flow line of 2½ miles between the intake and the point of sewage discharge. The sewage plant is designed to deal ultimately with a flow of 1 m. g. d. and consists of coarse bar screens, a Dorrco screen, aeration units providing retention period of 6 to 8 hours, and a Dorr clarifier. The sludge return will be about 20 per cent. During storms, when the flow exceeds 1 m. g. d., the excess will be diverted into a Dorr clarifier before being discharged into the lake. This tank will also be employed for sludge digestion. The water purification process consists of coagulation, filtration, and chlorination. The air for backwashing the filters and for aerating the sewage will be provided by air compressors located in the pumping station of the water plant. The plant is of the mechanical gravity type, with an ultimate capacity of 1 m. g. d.

**Activated Sludge Plant for Wahiawa, Territory of Hawaii.** F. M. Veatch. *Engineering News-Record*, vol. 100, No. 12, March 22, 1928, pp. 478–480. (Abstract by C. R. Cox.)

Wahiawa, a village of 3,000 population, is located on the island of Oahu, about 23 miles from Honolulu, on the shores of a large irrigation reservoir. A site for a sewage treatment plant was not available unless sewage could be piped about 2 miles to a point below the dam of the reservoir, where complete treatment would be necessary owing to the practically negligible flow of the stream during parts of the year. The same degree of treatment would permit the discharge of the effluent into the reservoir, so the cost of the sewer was avoided by constructing the plant near the village on the shores of the reservoir. The sewage works are designed for a population of 6,000, assuming an estimated flow of 100 gallons per capita per day. The disposal plant will consist of plain settling tanks, mixing tank, aeration tank, final settling tanks, sludge digestion tanks, glass-covered sludge drying beds, chlorination tank, and the building which houses the blowers and sludge-pumping equipment. The preliminary settling tanks are designed with a detention period of 30 minutes and are fitted with hopper bottoms. They are designed for radial flow. Sludge will flow through suitable pipes to a sump, from which it will be pumped to the digestion tanks. Sewage flows from the preliminary settling tanks to the mixing tank, where 20 per cent return sludge is mixed by air agitation. Six aeration tanks are provided, with a detention period of six hours with 20 per cent return sludge. A single row of filtros plates are placed to one side of the center line of each tank to produce spiral flow. Short-circuiting is prevented by the use of two division walls provided with square ports. Two final settling tanks of the Dorr clarifier type are provided, each 20 feet in diameter and with 1 to 2 hour detention period. At periods of low water in the reservoir the settled effluent will be disinfected with liquid chlorine. A hopper-bottom tank with a capacity of 15 minutes will be provided for the chlorine reaction. Sludge from the chlorination tank will flow by gravity to the sludge sump. A sludge-digestion tank, with capacity of 2 cubic feet per capita, is provided. This tank will be divided into six compartments so that the total length of flow from inlet to outlet will be approximately 200 feet, thus preventing the undigested sludge from reaching the outlet. A gas-collecting dome is provided over the digestion tanks, and the water level will be maintained somewhat above the level of the scum to prevent caking. The supernatant liquid from the sludge-digestion tanks will be returned to the preliminary settling tank for retreatment. Provisions have been made for circulating the digesting sludge and for adjusting the pH of the sludge by the use of lime when necessary. Covered sludge drying beds with an area of ⅔ square foot per capita are provided.

A motor-driven diaphragm pump is used to pump activated sludge, and the sludge from the other tanks will be removed by centrifugal pumps. An air pressure of 4 pounds per square inch will be produced by 3 motor-driven rotary blowers, with capacities of 100, 200, and 300 cubic feet per minute, respectively, which is equivalent to 0.25, 0.5, 0.75 cubic foot per gallon of sewage. The cost of the plant will be $96,130.

**The Industrial Waste Research Problem in Southern California.** R. F. Goudey. *Western Construction News*, vol. 3, No. 1, January 10, 1928, pp. 18–20. (Abstract by E. A. Reinke.)

Southern California has about 5,000 industries, many of which have serious difficulties in disposing of liquid wastes. No streams are available for dilution and inland towns will be dependent on high-grade treatment with disposal on land or in dry stream beds.

Research in industrial wastes is a logical extension of research in sewage disposal. Factors of temperature, staleness of sewage reaching plants due to low grades or long travel, and variable quality of sewage constituents due to high fruit and vegetable diets, all tend to make the problem of sewage disposal different from that in the East. The industrial wastes are also different, and separate study must be made of each kind of waste.

The only practical solution of the problem seems to be to have a research organization either as a part of the department of public health, the department of natural resources or some other State department. Private engineers can not afford to carry on this kind of research; industries will not carry it on unless forced to do so; salesmen can only try out their equipment, which is not likely to bring about fundamental solutions; student theses are not sufficiently prolonged to allow a complete solution; and the various organizations now working intermittently are not equipped to handle the work adequately.

**The Sewage Treatment Works at Delaware, Ohio.** Wm. L. Havens. *The American City*, vol. 38, No. 3, March, 1928, pp, 78–80. (Abstract by C. R. Cox.)

Sewage treatment works consisting of septic tanks and contact beds, built in 1902, were neglected within five years, but no improvements were made until the recent construction of the new plants of the Imhoff trickling filter type. Sewage is passed through bar screens and then pumped by low-lift pumps with automatic controls. Two Imhoff tanks, with detention period of two hours, are provided with facilities for reversing with flow. Sludge is drawn by gravity. Two dosing tanks with twin siphons are provided to alternate the flow of sewage to the two trickling filters with total area of 0.55 acre, which provides a loading of 26,400 people per acre. The filter material consists of 7 feet of broken limestone with 1 foot of crushed granite. The granite is used to prevent disintegration. Nozzles are spaced 15 feet on centers. Underdrains are vitrified channel blocks on which vitrified supports for filtering material are laid. A Dorr clarifier with 45-minute period is used as humus tank. Covered sludge drying beds will be provided later. The per capita cost of the plant was $13.92.

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## DEATHS DURING WEEK ENDED JUNE 2, 1928

*Summary of information received by telegraph from industrial insurance companies for the week ended June 2, 1928, and corresponding week of 1927. (From the Weekly Health Index, June 6, 1928, issued by the Bureau of the Census, Department of Commerce)*

| | Week ended June 2, 1928 | Corresponding week, 1927 |
|---|---|---|
| Policies in force | 71, 296, 695 | 67, 837, 137 |
| Number of death claims | 12, 482 | 11, 089 |
| Death claims per 1,000 policies in force, annual rate | 9. 2 | 8. 5 |

***Deaths from all causes in certain large cities of the United States during the week ended June 2, 1928, infant mortality, annual death rate, and comparison with corresponding week of 1927. (From the Weekly Health Index, June 6, 1928, issued by the Bureau of the Census, Department of Commerce)***

| City | Week ended June 2, 1928 | | Annual death rate per 1,000 corresponding week, 1927 | Deaths under 1 year | | Infant mortality rate, week ended June 2, 1928 [2] |
|---|---|---|---|---|---|---|
| | Total deaths | Death rate [1] | | Week ended June 2, 1928 | Corresponding week, 1927 | |
| Total (67 cities) | 7,649 | 13.3 | 11.8 | 811 | 684 | [3] 65 |
| Albany [4] | 43 | 18.7 | 15.3 | 6 | 3 | 123 |
| Atlanta | 96 | 19.7 | 19.3 | 13 | 11 | |
| White | 41 | | 15.8 | 3 | 8 | |
| Colored | 55 | (5) | 27.5 | 10 | 3 | |
| Baltimore [4] | 223 | 14.0 | 11.4 | 28 | 12 | 89 |
| White | 159 | | 9.6 | 16 | 7 | 64 |
| Colored | 64 | (5) | 22.1 | 12 | 5 | 188 |
| Birmingham | 75 | 17.6 | 17.0 | 8 | 13 | 68 |
| White | 35 | | 12.6 | 5 | 7 | 69 |
| Colored | 40 | (5) | 24.0 | 3 | 6 | 68 |
| Boston | 241 | 15.8 | 15.2 | 31 | 39 | 86 |
| Bridgeport | 36 | | | 0 | 3 | 0 |
| Buffalo | 181 | 17.0 | 14.1 | 16 | 20 | 69 |
| Cambridge | 38 | 15.8 | 11.4 | 0 | 6 | 0 |
| Camden | 26 | 10.0 | 12.5 | 4 | 4 | 64 |
| Canton | 18 | 8.1 | 12.0 | 4 | 3 | 95 |
| Chicago [4] | 705 | 11.7 | 11.0 | 91 | 70 | 78 |
| Cincinnati | 129 | 16.3 | 14.4 | 16 | 4 | 97 |
| Cleveland | 203 | 10.5 | 9.2 | 27 | 24 | 73 |
| Columbus | 64 | 11.3 | 13.1 | 2 | 5 | 19 |
| Dallas | 60 | 14.4 | 13.8 | 6 | 5 | |
| White | 47 | | 11.9 | 5 | 4 | |
| Colored | 13 | (5) | 26.6 | 1 | 1 | |
| Dayton | 40 | 11.3 | 11.0 | 6 | 6 | 99 |
| Denver | 85 | 15.1 | 14.4 | 12 | 4 | |
| Des Moines | 24 | 8.3 | 8.8 | 7 | 2 | 116 |
| Detroit | 324 | 12.3 | 10.5 | 43 | 35 | 66 |
| Duluth | 20 | 9.0 | 10.0 | 1 | 0 | 23 |
| El Paso | 36 | 16.0 | 16.5 | 7 | 10 | |
| Erie | 27 | | | 3 | 4 | 62 |
| Fall River [4] | 44 | 17.1 | 11.0 | 4 | 5 | 69 |
| Flint | 30 | 10.5 | 11.3 | 6 | 3 | 77 |
| Fort Worth | 31 | 9.6 | 10.8 | 4 | 8 | |
| White | 21 | | 8.0 | 2 | 6 | |
| Colored | 10 | (5) | 31.9 | 2 | 2 | |
| Grand Rapids | 36 | 11.5 | 8.4 | 2 | 5 | 30 |
| Houston | 48 | | | 11 | 8 | |
| White | 31 | | | 8 | 7 | |
| Colored | 17 | (5) | | 3 | 1 | |
| Indianapolis | 77 | 10.5 | 10.3 | 6 | 6 | 46 |
| White | 64 | | 10.6 | 5 | 4 | 44 |
| Colored | 13 | (5) | 8.1 | 1 | 2 | 61 |
| Jersey City | 79 | 12.7 | 9.7 | 10 | 4 | 75 |
| Kansas City, Kans. | 19 | 8.4 | 10.7 | 1 | 1 | 21 |
| White | 9 | | 10.3 | 1 | 1 | 25 |
| Colored | 10 | (5) | 12.3 | 0 | 0 | 0 |
| Knoxville | 21 | 10.4 | 20.4 | 4 | 1 | 87 |
| White | 10 | | 18.0 | 1 | 1 | 24 |
| Colored | 11 | (5) | 38.5 | 3 | 0 | 640 |
| Los Angeles | 214 | | | 21 | 25 | 60 |
| Louisville | 115 | 18.3 | 10.9 | 4 | 3 | 33 |
| White | 78 | | 9.2 | 1 | 3 | 10 |
| Colored | 37 | (5) | 20.3 | 3 | 0 | 207 |
| Lowell | 37 | 17.5 | 16.1 | 7 | 4 | 146 |
| Lynn | 30 | 14.9 | 7.0 | 4 | 1 | 101 |
| Memphis | 90 | 24.7 | 15.2 | 7 | 6 | 82 |
| White | 46 | | 10.8 | 5 | 2 | 94 |
| Colored | 44 | (5) | 23.0 | 2 | 4 | 63 |
| Milwaukee | 128 | 12.3 | 12.3 | 6 | 10 | 27 |
| Minneapolis | 81 | 9.3 | 8.9 | 8 | 7 | 48 |

[1] Annual rate per 1,000 population.
[2] Deaths under 1 year per 1,000 births. Cities left blank are not in the registration area for births.
[3] Data for 66 cities.
[4] Deaths for week ended Friday, June 1, 1928.
[5] In the cities for which deaths are shown by color, the colored population in 1920 constituted the following percentages of the total population: Atlanta, 31; Baltimore, 15; Birmingham, 39; Dallas, 15; Fort Worth, 14; Houston, 25; Indianapolis, 11; Kansas City, Kans., 14; Knoxville, 15; Louisville, 17; Memphis, 38; Nashville, 30; New Orleans, 26; Richmond, 32; and Washington, D. C., 25.

*Deaths from all causes in certain large cities of the United States during the week ended June 2, 1928, infant mortality, annual death rate, and comparison with corresponding week of 1927. (From the Weekly Health Index, June 6, 1928, issued by the Bureau of the Census, Department of Commerce)*—Continued

| City | Week ended June 2, 1928 | | Annual death rate per 1,000 corresponding week, 1927 | Deaths under 1 year | | Infant mortality rate, week ended June 2, 1928 |
|---|---|---|---|---|---|---|
| | Total deaths | Death rate | | Week ended June 2, 1928 | Corresponding week, 1927 | |
| Nashville | 67 | 25.3 | 18.2 | 8 | 1 | 126 |
| White | 36 | | 16.9 | 6 | 0 | 128 |
| Colored | 31 | ([5]) | 21.4 | 2 | 1 | 120 |
| New Bedford | 27 | 11.8 | 8.7 | 4 | 2 | 87 |
| New Haven | 61 | 17.0 | 6.5 | 10 | 1 | 141 |
| New Orleans | 165 | 20.1 | 17.8 | 20 | 20 | 97 |
| White | 97 | | 14.6 | 10 | 10 | 73 |
| Colored | 68 | ([5]) | 26.9 | 10 | 10 | 145 |
| New York | 1,570 | 13.6 | 11.6 | 162 | 122 | 65 |
| Bronx Borough | 194 | 10.7 | 9.1 | 8 | 6 | 24 |
| Brooklyn Borough | 548 | 12.4 | 10.0 | 60 | 46 | 60 |
| Manhattan Borough | 634 | 18.9 | 16.4 | 79 | 53 | 94 |
| Queens Borough | 158 | 9.7 | 8.2 | 12 | 13 | 48 |
| Richmond Borough | 36 | 12.5 | 13.9 | 3 | 4 | 54 |
| Newark, N. J | 130 | 14.4 | 8.4 | 15 | 5 | 77 |
| Oakland | 43 | 8.2 | 10.3 | 5 | 3 | 54 |
| Oklahoma City | 23 | | | 0 | 2 | |
| Omaha | 32 | 7.5 | 12.8 | 0 | 8 | 0 |
| Paterson | 38 | 13.7 | 9.4 | 3 | 2 | 52 |
| Philadelphia | 519 | 13.1 | 10.8 | 33 | 48 | 44 |
| Pittsburgh | 179 | 13.9 | 14.3 | 30 | 19 | 98 |
| Portland, Oreg | 57 | | | 3 | 4 | 32 |
| Providence | 68 | 12.4 | 12.1 | 5 | 14 | 44 |
| Richmond | 61 | 16.4 | 13.6 | 3 | 5 | 39 |
| White | 38 | | 10.7 | 1 | 2 | 20 |
| Colored | 23 | ([5]) | 20.6 | 2 | 3 | 73 |
| Rochester | 73 | 11.6 | 10.6 | 5 | 8 | 41 |
| St. Louis | 220 | 13.6 | 12.2 | 10 | 9 | 33 |
| St. Paul | 60 | 12.4 | 9.4 | 4 | 1 | 38 |
| Salt Lake City [4] | 30 | 11.4 | 8.5 | 3 | 2 | 49 |
| San Antonio | 80 | 19.2 | 18.7 | 24 | 22 | |
| San Diego | 45 | 19.7 | 17.2 | 1 | 3 | 19 |
| San Francisco | 129 | 11.5 | 15.3 | 8 | 5 | 50 |
| Schenectady | 22 | 12.3 | 9.0 | 1 | 2 | 31 |
| Seattle | 59 | 8.1 | 11.4 | 6 | 4 | 62 |
| Somerville | 36 | 18.3 | 5.6 | 6 | 1 | 207 |
| Spokane | 22 | 10.5 | 11.0 | 4 | 1 | 103 |
| Springfield, Mass | 28 | 9.8 | 8.8 | 0 | 2 | 0 |
| Syracuse | 57 | 15.0 | 11.1 | 8 | 2 | 97 |
| Toledo | 56 | 9.3 | 12.0 | 4 | 7 | 38 |
| Trenton | 42 | 15.8 | 12.6 | 7 | 3 | 119 |
| Washington, D. C | 127 | 12.0 | 11.4 | 4 | 5 | 23 |
| White | 85 | | 9.6 | 2 | 3 | 17 |
| Colored | 42 | ([5]) | 16.8 | 2 | 2 | 37 |
| Waterbury | 17 | | | 2 | 0 | 58 |
| Wilmington, Del | 40 | 16.3 | 9.1 | 4 | 4 | 105 |
| Worcester | 53 | 14.0 | 14.4 | 6 | 6 | 73 |
| Yonkers | 21 | 9.1 | 7.0 | 2 | 3 | 46 |
| Youngstown | 40 | 12.0 | 6.8 | 5 | 4 | 67 |

[4] Deaths for week ended Friday, June 1, 1928.
[5] In the cities for which deaths are shown by color, the colored population in 1920 constituted the following percentages of the total population: Atlanta, 31; Baltimore, 15; Birmingham, 39; Dallas, 15; Fort Worth, 14; Houston, 25; Indianapolis, 11; Kansas City, Kans., 14; Knoxville, 15; Louisville, 17; Memphis, 38; Nashville, 30; New Orleans, 26; Richmond, 32; and Washington, D. C., 25.

# PREVALENCE OF DISEASE

*No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring*

## UNITED STATES

### CURRENT WEEKLY STATE REPORTS

These reports are preliminary and the figures are subject to change when later returns are received by the State health officers

**Reports for Weeks Ended June 9, 1928, and June 11, 1927**

*Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended June 9, 1928, and June 11, 1927*

| Division and State | Diphtheria | | Influenza | | Measles | | Meningococcus meningitis | |
|---|---|---|---|---|---|---|---|---|
| | Week ended June 9, 1928 | Week ended June 11, 1927 | Week ended June 9, 1928 | Week ended June 11, 1927 | Week ended June 9, 1928 | Week ended June 11, 1927 | Week ended June 9, 1928 | Week ended June 11, 1927 |
| New England States: | | | | | | | | |
| Maine | 2 | 3 | 41 | 10 | 40 | 115 | 0 | 0 |
| New Hampshire | | | | | 26 | | 0 | |
| Vermont | | 2 | | | 49 | 57 | 0 | 0 |
| Massachusetts | 66 | 88 | 51 | 1 | 767 | 475 | 3 | 4 |
| Rhode Island | 6 | 6 | 2 | | 196 | 1 | 0 | 0 |
| Connecticut | 11 | 31 | 2 | 2 | 340 | 67 | 0 | 0 |
| Middle Atlantic States: | | | | | | | | |
| New York | 362 | 443 | [1] 52 | [1] 15 | 3,833 | 951 | 37 | 5 |
| New Jersey | 152 | 112 | 70 | 4 | 1,646 | 69 | 2 | 2 |
| Pennsylvania | 141 | 162 | | | 2,002 | 474 | 19 | 2 |
| East North Central States: | | | | | | | | |
| Ohio | 54 | | 38 | | 785 | | 3 | |
| Indiana | 17 | 30 | 17 | 2 | 331 | 77 | 0 | 0 |
| Illinois | 112 | 87 | 68 | 11 | 195 | 532 | 6 | 9 |
| Michigan | 90 | 82 | 10 | 4 | 1,007 | 204 | 9 | 5 |
| Wisconsin | 16 | 26 | 126 | 21 | 116 | 797 | 6 | 20 |
| West North Central States: | | | | | | | | |
| Minnesota | 18 | 23 | 3 | 2 | 87 | 81 | 2 | 2 |
| Iowa | 11 | 21 | | | | 135 | 2 | 1 |
| Missouri | 25 | 25 | 5 | | 291 | 113 | 5 | 2 |
| North Dakota | 3 | 1 | 127 | | 20 | 23 | 0 | 0 |
| South Dakota | | 5 | | | 66 | 39 | 0 | 0 |
| Nebraska | 11 | 9 | 1 | | 43 | 100 | 0 | 0 |
| Kansas | 7 | 5 | 3 | | 76 | 414 | 2 | 2 |
| South Atlantic States: | | | | | | | | |
| Delaware | | 1 | | | 10 | 5 | 0 | 0 |
| Maryland [2] | 36 | 62 | 10 | 3 | 318 | 13 | 0 | 1 |
| District of Columbia | 18 | 13 | 1 | | 192 | 3 | 0 | 0 |
| Virginia | | | | | | | | |
| West Virginia | 11 | 12 | 115 | 3 | 51 | 210 | 1 | 1 |
| North Carolina | 19 | 13 | | | 576 | 1,404 | 0 | 0 |
| South Carolina | 14 | 6 | 287 | 183 | 133 | 239 | 0 | 0 |
| Georgia | 8 | 7 | 32 | 27 | 75 | 43 | 2 | 0 |
| Florida | 3 | 17 | 24 | 29 | 79 | 49 | 0 | 0 |
| East South Central States: | | | | | | | | |
| Kentucky | 7 | | 2 | | 96 | | 3 | |
| Tennessee | 4 | 5 | 77 | 3 | 86 | 58 | 1 | 0 |
| Alabama | 8 | 5 | 110 | 6 | 219 | 221 | 0 | 1 |
| Mississippi | 1 | 6 | | | | | 1 | 0 |
| West South Central States: | | | | | | | | |
| Arkansas | 8 | 5 | 120 | 17 | 181 | 51 | 0 | 0 |
| Louisiana | 15 | 11 | 61 | 18 | 146 | 70 | 3 | 0 |
| Oklahoma [3] | 7 | 7 | 51 | 17 | 177 | 290 | 1 | 0 |
| Texas | 26 | 17 | 10 | 34 | 237 | 204 | 0 | 0 |
| Mountain States: | | | | | | | | |
| Montana | 4 | | | | 13 | 16 | 2 | 2 |
| Idaho | | | | | | 23 | 1 | 0 |
| Wyoming | | | 6 | | 5 | 55 | 0 | 0 |
| Colorado | 6 | 30 | | 1 | 67 | 129 | 1 | 1 |

[1] New York City only. [2] Week ended Friday. [3] Exclusive of Tulsa.

*Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended June 9, 1928, and June 11, 1927*—Continued

| Division and State | Diphtheria | | Influenza | | Measles | | Meningococcus meningitis | |
|---|---|---|---|---|---|---|---|---|
| | Week ended June 9, 1928 | Week ended June 11, 1927 | Week ended June 9, 1928 | Week ended June 11, 1927 | Week ended June 9, 1928 | Week ended June 11, 1927 | Week ended June 9, 1928 | Week ended June 11, 1927 |
| Mountain States—Continued | | | | | | | | |
| New Mexico | | 2 | | | 13 | 85 | 0 | 0 |
| Arizona | 2 | 9 | 28 | 2 | 14 | 105 | 1 | 0 |
| Utah [2] | 1 | 7 | 2 | | 2 | 9 | 1 | 0 |
| Pacific States: | | | | | | | | |
| Washington | 15 | 6 | | | 62 | 352 | 2 | 3 |
| Oregon | 5 | 5 | 3 | 7 | 24 | 183 | 0 | 1 |
| California | 76 | 113 | 34 | 16 | 71 | 649 | 3 | 5 |

| Division and State | Poliomyelitis | | Scarlet fever | | Smallpox | | Typhoid fever | |
|---|---|---|---|---|---|---|---|---|
| | Week ended June 9, 1928 | Week ended June 11, 1927 | Week ended June 9, 1928 | Week ended June 11, 1927 | Week ended June 9, 1928 | Week ended June 11, 1927 | Week ended June 9, 1928 | Week ended June 11, 1927 |
| New England States: | | | | | | | | |
| Maine | 0 | 0 | 17 | 24 | 0 | 0 | 2 | 2 |
| New Hampshire | 0 | | 2 | | 0 | | 0 | |
| Vermont | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 |
| Massachusetts | 2 | 4 | 201 | 389 | 0 | 0 | 1 | 6 |
| Rhode Island | 0 | 1 | 24 | 12 | 0 | 0 | 0 | 0 |
| Connecticut | 0 | 0 | 39 | 89 | 3 | 0 | 2 | 2 |
| Middle Atlantic States: | | | | | | | | |
| New York | 2 | 1 | 420 | 606 | 2 | 2 | 9 | 19 |
| New Jersey | 3 | 3 | 149 | 212 | 0 | 0 | 0 | 3 |
| Pennsylvania | 1 | 1 | 225 | 321 | 1 | 1 | 24 | 17 |
| East North Central States: | | | | | | | | |
| Ohio | 1 | | 186 | | 21 | | 6 | |
| Indiana | 0 | 0 | 47 | 109 | 76 | 134 | 3 | 4 |
| Illinois | 2 | 0 | 239 | 181 | 22 | 3 | 9 | 15 |
| Michigan | 2 | 1 | 303 | 190 | 97 | 59 | 2 | 7 |
| Wisconsin | 1 | 0 | 168 | 165 | 2 | 26 | 16 | 3 |
| West North Central States: | | | | | | | | |
| Minnesota | 0 | 0 | 81 | 125 | 0 | 4 | 5 | 6 |
| Iowa | 0 | 0 | 44 | 26 | 54 | 6 | 0 | 2 |
| Missouri | 0 | 0 | 50 | 31 | 29 | 17 | 1 | 6 |
| North Dakota | 0 | 0 | 24 | 16 | 2 | 0 | 0 | 0 |
| South Dakota | 0 | 0 | 15 | 10 | 1 | 3 | 3 | 7 |
| Nebraska | 0 | 0 | 50 | 27 | 33 | 11 | 0 | 0 |
| Kansas | 0 | 1 | 52 | 27 | 45 | 7 | 3 | 4 |
| South Atlantic States: | | | | | | | | |
| Delaware | 1 | 0 | 0 | 5 | 0 | 0 | 2 | 2 |
| Maryland [3] | 1 | 0 | 38 | 44 | 0 | 0 | 6 | 9 |
| District of Columbia | 0 | 0 | 44 | 21 | 1 | 2 | 0 | 1 |
| Virginia | | 0 | | | | 1 | | |
| West Virginia | 1 | 0 | 15 | 46 | 5 | 30 | 4 | 13 |
| North Carolina | 1 | 0 | 23 | 6 | 57 | 26 | 11 | 19 |
| South Carolina | 2 | 0 | 5 | 2 | 14 | 14 | 36 | 134 |
| Georgia | 0 | 0 | 9 | 9 | 0 | 17 | 8 | 62 |
| Florida | 1 | 1 | 1 | 5 | 2 | 44 | 5 | 19 |
| East South Central States: | | | | | | | | |
| Kentucky | 0 | | 37 | | 10 | | 2 | |
| Tennessee | 0 | 0 | 18 | 2 | 8 | 12 | 11 | 32 |
| Alabama | 0 | 1 | 2 | 6 | 7 | 41 | 14 | 45 |
| Mississippi | 1 | 0 | 3 | 6 | 1 | 1 | 13 | 24 |
| West South Central States: | | | | | | | | |
| Arkansas | 0 | 2 | 7 | 10 | 1 | 1 | 5 | 22 |
| Louisiana | 0 | 2 | 8 | 3 | 10 | 6 | 28 | 17 |
| Oklahoma [3] | 1 | 1 | 38 | 25 | 82 | 46 | 4 | 38 |
| Texas | 0 | 2 | 84 | 7 | 53 | 49 | 29 | 34 |
| Mountain States: | | | | | | | | |
| Montana | 0 | 0 | 11 | 17 | 16 | 14 | 15 | 2 |
| Idaho | 0 | 0 | 1 | 2 | 2 | 3 | 0 | 2 |
| Wyoming | 0 | 0 | 11 | 8 | 1 | 1 | 15 | 0 |
| Colorado | 0 | 0 | 18 | 45 | 3 | 1 | 0 | 7 |
| New Mexico | 0 | 0 | 11 | 4 | 1 | 0 | 1 | 1 |
| Arizona | 0 | 5 | 8 | 27 | 0 | 0 | 7 | 3 |
| Utah [2] | 0 | 0 | 7 | 26 | 7 | 3 | 0 | 0 |
| Pacific States: | | | | | | | | |
| Washington | 2 | 0 | 29 | 36 | 13 | 19 | 4 | 4 |
| Oregon | 0 | 0 | 9 | 9 | 22 | 8 | 1 | 0 |
| California | 6 | 4 | 126 | 141 | 9 | 20 | 13 | 1 |

[2] Week ended Friday.

[3] Exclusive of Tulsa.

## Report for Week Ended June 2, 1928

| COLORADO | Cases |
|---|---|
| Diphtheria | 5 |
| Measles | 119 |
| Poliomyelitis | 2 |

| COLORADO—continued | Cases |
|---|---|
| Scarlet fever | 37 |
| Smallpox | 8 |
| Typhoid fever | 2 |

## SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of monthly State reports is published weekly and covers only those States from which reports are received during the current week:

| State | Meningococcus meningitis | Diphtheria | Influenza | Malaria | Measles | Pellagra | Poliomyelitis | Scarlet fever | Smallpox | Typhoid fever |
|---|---|---|---|---|---|---|---|---|---|---|
| *April, 1928* | | | | | | | | | | |
| Hawaii Territory | 6 | 31 | 8 | | 18 | | 0 | 4 | 0 | 12 |
| Montana | 15 | 23 | 168 | | 30 | | 2 | 87 | 105 | 2 |
| Virginia | 7 | 80 | 2,879 | 63 | 3,348 | 35 | 5 | 161 | 33 | 29 |
| Washington | 19 | 41 | 55 | | 662 | | 6 | 190 | 195 | 17 |
| *May, 1928* | | | | | | | | | | |
| Alabama | 4 | 40 | 1,141 | 142 | 1,348 | 102 | 4 | 30 | 51 | 26 |

*April, 1928*

| | Cases |
|---|---|
| Chicken pox: | |
| Hawaii Territory | 49 |
| Montana | 71 |
| Virginia | 628 |
| Washington | 401 |
| Conjunctivitis (follicular): | |
| Hawaii Territory | 159 |
| Dysentery: | |
| Virginia | 50 |
| German measles: | |
| Montana | 4 |
| Washington | 37 |
| Hookworm disease: | |
| Virginia | 9 |
| Impetigo contagiosa: | |
| Washington | 16 |
| Leprosy: | |
| Hawaii Territory | 7 |
| Lethargic encephalitis: | |
| Montana | 1 |
| Washington | 4 |
| Mumps: | |
| Hawaii Territory | 30 |
| Montana | 7 |
| Washington | 368 |
| Paratyphoid fever: | |
| Hawaii Territory | 1 |
| Rocky Mountain spotted or tick fever: | |
| Montana | 4 |
| Washington | 1 |
| Scabies: | |
| Washington | 6 |
| Trachoma: | |
| Hawaii Territory | 160 |
| Montana | 1 |
| Whooping cough: | |
| Hawaii Territory | 2 |
| Montana | 42 |
| Virginia | 500 |
| Washington | 61 |

*May, 1928*

| | Cases |
|---|---|
| Alabama: | |
| Chicken pox | 156 |
| Dengue | 2 |
| Lethargic encephalitis | 4 |
| Mumps | 89 |
| Whooping cough | 107 |

## Number of Cases of Certain Communicable Diseases Reported for the Month of March, 1928, by State Health Officers

| State | Chicken pox | Diphtheria | Measles | Mumps | Scarlet fever | Smallpox | Tuberculosis | Typhoid fever | Whooping cough |
|---|---|---|---|---|---|---|---|---|---|
| Maine | 115 | 26 | 245 | 302 | 158 | 0 | 36 | 12 | 172 |
| New Hampshire | | 17 | | | 93 | 0 | | 0 | |
| Vermont | 170 | 3 | 325 | 448 | 60 | 0 | 17 | 1 | 141 |
| Massachusetts | 974 | 411 | 8,227 | 1,496 | 1,408 | 0 | 604 | 13 | 1,198 |
| Rhode Island | 34 | 44 | 481 | 185 | 225 | 0 | 53 | 1 | 23 |
| Connecticut | 417 | 108 | 1,574 | 1,269 | 453 | 4 | 198 | 3 | 572 |
| New York | 2,732 | 1,583 | 10,394 | 3,464 | 3,912 | 37 | 2,199 | 79 | 2,024 |
| New Jersey | 862 | 557 | 5,345 | | 1,303 | 24 | 499 | 18 | 568 |
| Pennsylvania | 2,888 | 954 | 6,670 | 4,611 | 2,620 | 2 | 797 | 53 | 1,307 |
| Ohio | 1,530 | 577 | 4,598 | 2,322 | 1,289 | 187 | 694 | 35 | 728 |
| Indiana | 425 | 132 | 1,038 | 713 | 720 | 710 | 149 | 11 | 169 |
| Illinois | 1,738 | 643 | 896 | 1,743 | 1,669 | 232 | 1,257 | 42 | 1,131 |
| Michigan | 663 | 281 | 5,813 | 2,398 | 1,229 | 161 | 436 | 19 | 651 |
| Wisconsin | 1,306 | 147 | 583 | 1,413 | 1,142 | 118 | 190 | 14 | 495 |
| Minnesota | 748 | 97 | 350 | | 760 | 21 | 278 | 22 | 215 |
| Iowa | 244 | 56 | 173 | 395 | 343 | 257 | 114 | 4 | 33 |
| Missouri | 439 | 246 | 1,349 | 1,188 | 628 | 296 | 275 | 10 | 404 |
| North Dakota | 66 | 22 | 15 | 94 | 309 | 6 | 18 | 10 | 46 |
| South Dakota | 90 | 11 | 168 | 57 | 273 | 55 | 15 | 7 | 55 |
| Nebraska | 330 | 52 | 137 | 437 | 582 | 255 | 10 | 1 | 59 |
| Kansas | 592 | 52 | 410 | 649 | 729 | 386 | 179 | 5 | 349 |
| Delaware | 14 | 5 | 54 | 45 | 22 | 0 | [1] 5 | 0 | 5 |
| Maryland | 557 | 139 | 4,699 | 166 | 310 | 6 | 274 | 16 | 251 |
| District of Columbia | 115 | 89 | 744 | | 226 | 13 | 107 | 2 | 43 |
| Virginia | 657 | 153 | 3,753 | | 233 | 39 | [1] 107 | 22 | 590 |
| West Virginia | 303 | 112 | 628 | | 241 | 391 | 76 | 33 | 75 |
| North Carolina | 848 | 237 | 14,823 | | 126 | 477 | | 12 | 661 |
| South Carolina | 427 | 241 | 5,043 | 79 | 31 | 49 | 228 | 15 | 463 |
| Georgia | 330 | 59 | 1,091 | 140 | 101 | 70 | [1] 92 | 19 | 58 |
| Florida | 425 | 56 | 227 | 66 | 35 | 40 | 94 | 33 | 43 |
| Kentucky [2] | | | | | | | | | |
| Tennessee | 206 | 85 | 2,158 | 396 | 171 | 148 | 237 | 31 | 125 |
| Alabama | 365 | 108 | 2,321 | 223 | 76 | 67 | 413 | 51 | 103 |
| Mississippi | 894 | 77 | 8,536 | 1,507 | 64 | 31 | 320 | 51 | 1,579 |
| Arkansas | 137 | 18 | 1,986 | 195 | 81 | 27 | [1] 38 | 22 | 107 |
| Louisiana | 79 | 96 | 1,202 | 24 | 63 | 122 | [1] 125 | 80 | 31 |
| Oklahoma [3] | 148 | 99 | 1,694 | 168 | 241 | 859 | 61 | 29 | 61 |
| Texas [2] | | | | | | | | | |
| Montana | 54 | 34 | 9 | 1 | 55 | 80 | 45 | 3 | 56 |
| Idaho | 83 | 4 | 2 | 100 | 149 | 41 | [1] 5 | 5 | 7 |
| Wyoming | 60 | 1 | 254 | 48 | 83 | 32 | | 1 | 25 |
| Colorado [4] | | | | | | | | | |
| New Mexico [2] | | | | | | | | | |
| Arizona | 58 | 29 | 109 | 56 | 26 | 132 | 69 | 8 | 23 |
| Utah [2] | | | | | | | | | |
| Nevada [5] | | | | | | | | | |
| Washington | 463 | 54 | 1,205 | 449 | 195 | 203 | 229 | 21 | 53 |
| Oregon | 238 | 55 | 495 | 96 | 95 | 347 | 61 | 12 | 6 |
| California | 3,402 | 454 | 1,001 | 1,530 | 765 | 98 | 906 | 32 | 772 |

[1] Pulmonary.
[2] Reports received weekly.
[3] Exclusive of Oklahoma City and Tulsa.
[4] Reports not received at time of going to press.
[5] Reports received annually.

## Case Rates per 1,000 Population (Annual Basis) for the Month of March, 1928

| State | Chicken pox | Diphtheria | Measles | Mumps | Scarlet fever | Smallpox | Tuberculosis | Typhoid fever | Whooping cough |
|---|---|---|---|---|---|---|---|---|---|
| Maine | 1.71 | 0.39 | 3.64 | 4.49 | 2.35 | 0.00 | 0.53 | 0.18 | 2.55 |
| New Hampshire | -------- | .44 | -------- | -------- | 2.41 | .00 | -------- | .00 | -------- |
| Vermont | 5.70 | .10 | 10.89 | 15.01 | 2.01 | .00 | .57 | .03 | 4.72 |
| Massachusetts | 2.68 | 1.13 | 22.64 | 4.12 | 3.87 | .00 | 1.66 | .04 | 3.30 |
| Rhode Island | .56 | .73 | 7.93 | 3.05 | 3.71 | .00 | .87 | .02 | .38 |
| Connecticut | 2.95 | .76 | 11.15 | 8.99 | 3.21 | .03 | 1.40 | .02 | 4.05 |
| New York | 2.79 | 1.62 | 10.62 | 3.54 | 4.00 | .04 | 2.25 | .08 | 2.07 |
| New Jersey | 2.66 | 1.72 | 16.52 | -------- | 4.03 | .07 | 1.54 | .06 | 1.76 |
| Pennsylvania | 3.46 | 1.14 | 7.99 | 5.52 | 3.14 | .00 | .95 | .06 | 1.57 |
| Ohio | 2.65 | 1.00 | 7.95 | 4.02 | 2.23 | .32 | 1.20 | .06 | 1.26 |
| Indiana | 1.58 | .49 | 3.86 | 2.65 | 2.68 | 2.64 | .55 | .04 | .63 |
| Illinois | 2.77 | 1.03 | 1.43 | 2.78 | 2.66 | .37 | 2.01 | .07 | 1.81 |
| Michigan | 1.71 | .72 | 14.95 | 6.17 | 3.16 | .41 | 1.12 | .05 | 1.67 |
| Wisconsin | 5.22 | .59 | 2.33 | 5.65 | 4.57 | .47 | .76 | .06 | 1.98 |
| Minnesota | 3.24 | .42 | 1.52 | -------- | 3.30 | .09 | 1.21 | .10 | .93 |
| Iowa | 1.19 | .27 | .84 | 1.92 | 1.67 | 1.25 | .55 | .02 | .16 |
| Missouri | 1.47 | .82 | 4.52 | 3.98 | 2.10 | .99 | .92 | .03 | 1.35 |
| North Dakota | 1.22 | .41 | .28 | 1.73 | 5.69 | .11 | .33 | .18 | .85 |
| South Dakota | 1.51 | .18 | 2.82 | .96 | 4.58 | .92 | .25 | .12 | .92 |
| Nebraska | 2.77 | .44 | 1.15 | 3.66 | 4.88 | 2.14 | .08 | .01 | .49 |
| Kansas | 3.81 | .33 | 2.64 | 4.18 | 4.69 | 2.48 | 1.15 | .03 | 2.25 |
| Delaware | .68 | .24 | 2.61 | 2.18 | 1.06 | .00 | [1] .24 | .00 | .24 |
| Maryland | 4.07 | 1.02 | 34.33 | 1.21 | 2.26 | .04 | 2.00 | .12 | 1.83 |
| District of Columbia | 2.46 | 1.90 | 15.91 | -------- | 4.83 | .28 | 2.29 | .04 | .92 |
| Virginia | 3.01 | .70 | 17.21 | -------- | 1.07 | .18 | [1] .49 | .10 | 2.71 |
| West Virginia | 2.07 | .77 | 4.30 | -------- | 1.65 | 2.68 | .52 | .23 | .51 |
| North Carolina | 3.41 | .95 | 59.57 | -------- | .51 | 1.92 | -------- | .05 | 2.66 |
| South Carolina | 2.70 | 1.53 | 31.94 | .50 | .20 | .31 | 1.44 | .10 | 2.93 |
| Georgia | 1.22 | .22 | 4.02 | .52 | .37 | .26 | [1] .34 | .07 | .21 |
| Florida | 3.56 | .47 | 1.90 | .55 | .29 | .33 | .79 | .28 | .36 |
| Kentucky [2] | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- |
| Tennessee | .97 | .40 | 10.18 | 1.87 | .81 | .70 | 1.12 | .15 | .59 |
| Alabama | 1.67 | .50 | 10.65 | 1.02 | .35 | .31 | 1.90 | .23 | .47 |
| Mississippi | 5.90 | .51 | 56.29 | 9.94 | .42 | .20 | 2.11 | .34 | 10.41 |
| Arkansas | .83 | .11 | 12.06 | 1.18 | .49 | .16 | [1] .23 | .13 | .65 |
| Louisiana | .48 | .58 | 7.28 | .15 | .38 | .74 | [1] .76 | .18 | .19 |
| Oklahoma [3] | .81 | .54 | 9.32 | .92 | 1.33 | 4.73 | .34 | .16 | .34 |
| Texas [2] | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- |
| Montana | 1.16 | .73 | .19 | .02 | 1.18 | 1.72 | .97 | .06 | 1.20 |
| Idaho | 1.79 | .09 | .04 | 2.16 | 3.22 | .89 | [1] .11 | .11 | .15 |
| Wyoming | 2.87 | .05 | 12.14 | 2.29 | 3.97 | 1.53 | -------- | .05 | 1.19 |
| Colorado [4] | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- |
| New Mexico [2] | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- |
| Arizona | 1.44 | .72 | 2.71 | 1.39 | .65 | 3.29 | 1.72 | .20 | .57 |
| Utah [2] | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- |
| Nevada [5] | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- |
| Washington | 3.44 | .40 | 8.96 | 3.34 | 1.45 | 1.51 | 1.70 | .16 | .39 |
| Oregon | 3.12 | .72 | 6.48 | 1.26 | 1.24 | 4.54 | .80 | .16 | .08 |
| California | 8.81 | 1.18 | 2.59 | 3.96 | 1.98 | .25 | 2.35 | .08 | 2.00 |

[1] Pulmonary.
[2] Reports received weekly.
[3] Exclusive of Oklahoma City and Tulsa.
[4] Reports not received at time of going to press.
[5] Reports received annually.

## PLAGUE-PREVENTION WORK IN THE UNITED STATES

*California.*—The weekly reports of plague-suppressive measures in California during the 10 weeks from March 11 to May 19, 1928, show a total of 7,968 rodents received and 6,728 examined during the period. None was reported plague infected. The last rodent infection reported was six ground squirrels February 25–28, 1928, in Santa Cruz, Calif. The last case of human plague was reported as occurring on February 9, 1928, also in Santa Cruz, Calif.

*Los Angeles, Calif.*—The rodent division of the Los Angeles Board of Health reports 8,485 rodents collected and 4,767 examined during the nine weeks from March 18 to May 19, 1928. None was found plague infected.

*Seattle, Wash.*—The report of rat-trapping operations at Seattle for the months of March and April, 1928, show a total of 2,460 rodents taken and 1,197 examined during the two months. None was found plague infected.

## GENERAL CURRENT SUMMARY AND WEEKLY REPORTS FROM CITIES

The 100 cities reporting cases used in the following table are situated in all parts of the country and have an estimated aggregate population of more than 31,570,000. The estimated population of the 95 cities reporting deaths is more than 30,960,000. The estimated expectancy is based on the experience of the last nine years, excluding epidemics.

*Weeks ended May 26, 1928, and May 28, 1927*

| | 1928 | 1927 | Estimated expectancy |
|---|---|---|---|
| *Cases reported* | | | |
| Diphtheria: | | | |
| 41 States | 1,351 | 1,567 | |
| 100 cities | 778 | 1,016 | 841 |
| Measles: | | | |
| 39 States | 16,597 | 10,807 | |
| 100 cities | 7,900 | 3,225 | |
| Poliomyelitis: | | | |
| 41 States | 27 | 21 | |
| Scarlet fever: | | | |
| 41 States | 3,424 | 3,777 | |
| 100 cities | 1,416 | 1,747 | 1,113 |
| Smallpox: | | | |
| 41 States | 822 | 637 | |
| 100 cities | 105 | 170 | 110 |
| Typhoid fever: | | | |
| 41 States | 282 | 407 | |
| 100 cities | 50 | 56 | 63 |
| *Deaths reported* | | | |
| Influenza and pneumonia: | | | |
| 95 cities | 1,187 | 633 | |
| Smallpox: | | | |
| 95 cities | 0 | 0 | |

## *City reports for week ended May 26, 1928*

The "estimated expectancy" given for diphtheria, poliomyelitis, scarlet fever, smallpox, and typhoid fever is the result of an attempt to ascertain from previous occurrence the number of cases of the disease under consideration that may be expected to occur during a certain week in the absence of epidemics. It is based on reports to the Public Health Service during the past nine years. It is in most instances the median number of cases reported in the corresponding weeks of the preceding years. When the reports include several epidemics or when for other reasons the median is unsatisfactory, the epidemic periods are excluded and the estimated expectancy is the mean number of cases reported for the week during non-epidemic years.

If the reports have not been received for the full nine years, data are used for as many years as possible but no year earlier than 1919 is included. In obtaining the estimated expectancy, the figures are smoothed when necessary to avoid abrupt deviations from the usual trend. For some of the diseases given in the table the available data were not sufficient to make it practicable to compute the estimated expectancy.

| Division, State, and city | Population, July 1, 1926, estimated | Chicken pox, cases reported | Diphtheria | | Influenza | | Measles, cases reported | Mumps, cases reported | Pneumonia, deaths reported |
|---|---|---|---|---|---|---|---|---|---|
| | | | Cases, estimated expectancy | Cases reported | Cases reported | Deaths reported | | | |
| **NEW ENGLAND** | | | | | | | | | |
| Maine: | | | | | | | | | |
| Portland | 76,400 | 11 | 1 | 0 | 0 | 0 | 24 | 11 | 4 |
| New Hampshire: | | | | | | | | | |
| Concord | [1] 22,546 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 |
| Manchester | 84,000 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 5 |
| Vermont: | | | | | | | | | |
| Barre | [1] 10,008 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Massachusetts: | | | | | | | | | |
| Boston | 787,000 | 24 | 44 | 10 | 8 | 2 | 96 | 5 | 45 |
| Fall River | 131,000 | 2 | 3 | 2 | 1 | 2 | 14 | 0 | 2 |
| Springfield | 145,000 | 2 | 2 | 1 | 2 | 1 | 2 | 18 | 7 |
| Worcester | 193,000 | 9 | 3 | 4 | 0 | 1 | 54 | 12 | 4 |
| Rhode Island: | | | | | | | | | |
| Pawtucket | 71,000 | 3 | 1 | 0 | 0 | 0 | 19 | 16 | 4 |
| Providence | 275,000 | 0 | 6 | 0 | 0 | 1 | 187 | 3 | 14 |
| Connecticut: | | | | | | | | | |
| Bridgeport | ([2]) | 0 | 5 | 7 | 0 | 1 | 19 | 0 | 6 |
| Hartford | [1] 164,000 | 8 | 5 | 3 | 0 | 0 | 86 | 7 | 16 |
| New Haven | 182,000 | 15 | 2 | 1 | 3 | 0 | 55 | 25 | 8 |
| **MIDDLE ATLANTIC** | | | | | | | | | |
| New York: | | | | | | | | | |
| Buffalo | 544,000 | 14 | 9 | 12 | -------- | 0 | 49 | 45 | 19 |
| New York | 5,924,000 | 186 | 254 | 318 | 78 | 20 | 2,549 | 42 | 265 |
| Rochester | 321,000 | 9 | 10 | 4 | -------- | 2 | 128 | 20 | 5 |
| Syracuse | 185,000 | 30 | 4 | 6 | -------- | 0 | 169 | 7 | 4 |
| New Jersey: | | | | | | | | | |
| Camden | 131,000 | 3 | 5 | 13 | 1 | 1 | 72 | 2 | 3 |
| Newark | 459,000 | 19 | 11 | 29 | 5 | 3 | 215 | 6 | 17 |
| Trenton | 134,000 | 1 | 3 | 2 | 0 | 0 | 15 | 1 | 7 |
| Pennsylvania: | | | | | | | | | |
| Philadelphia | 2,008,000 | 46 | 66 | 35 | 0 | 7 | 1,160 | 45 | 65 |
| Pittsburgh | 637,000 | 32 | 18 | 17 | 0 | 10 | 108 | 44 | 44 |
| Reading | 114,000 | 9 | 2 | 1 | 0 | 0 | 21 | 1 | 4 |
| **EAST NORTH CENTRAL** | | | | | | | | | |
| Ohio: | | | | | | | | | |
| Cincinnati | 411,000 | 10 | 8 | 1 | 0 | 5 | 17 | 0 | 14 |
| Cleveland | 960,000 | 61 | 22 | 28 | 15 | 11 | 109 | 68 | 29 |
| Columbus | 285,000 | 1 | 3 | 1 | 4 | 0 | 136 | 2 | 4 |
| Toledo | 295,000 | 27 | 4 | 5 | 5 | 5 | 158 | 0 | 6 |
| Indiana: | | | | | | | | | |
| Fort Wayne | 99,900 | 2 | 2 | 2 | 0 | 1 | 0 | 0 | 4 |
| Indianapolis | 367,000 | 46 | 4 | 4 | 0 | 0 | 144 | 0 | 21 |
| South Bend | 81,700 | 0 | 1 | 0 | 0 | 0 | 3 | 0 | 1 |
| Terre Haute | 71,900 | 2 | 1 | 0 | 0 | 0 | 3 | 0 | 2 |
| Illinois: | | | | | | | | | |
| Chicago | 3,048,000 | 72 | 72 | 77 | 27 | 15 | 59 | 31 | 122 |
| Springfield | 64,700 | 2 | 0 | 0 | 1 | 0 | 0 | 4 | 0 |
| Michigan: | | | | | | | | | |
| Detroit | [1] 1,242,044 | 24 | 45 | 33 | 15 | 10 | 447 | 15 | 46 |
| Flint | 136,000 | 6 | 4 | 3 | 0 | 0 | 253 | 12 | 8 |
| Grand Rapids | 156,000 | 0 | 2 | 0 | 0 | 2 | 7 | 9 | 0 |

[1] Estimated, July 1, 1925. [2] No estimate made.

*City reports for week ended May 26, 1928*—Continued

| Division, State, and city | Population, July 1, 1926, estimated | Chicken pox, cases reported | Diphtheria | | Influenza | | Measles, cases reported | Mumps, cases reported | Pneumonia, deaths reported |
|---|---|---|---|---|---|---|---|---|---|
| | | | Cases, estimated expectancy | Cases reported | Cases reported | Deaths reported | | | |
| EAST NORTH CENTRAL—continued | | | | | | | | | |
| Wisconsin: | | | | | | | | | |
| Kenosha | 52,700 | 24 | 1 | 0 | 0 | 0 | 1 | 2 | 3 |
| Milwaukee | 517,000 | 37 | 12 | 7 | 5 | 5 | 2 | 10 | 9 |
| Racine | 69,400 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 3 |
| Superior | [1] 39,671 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| WEST NORTH CENTRAL | | | | | | | | | |
| Minnesota: | | | | | | | | | |
| Duluth | 113,000 | 10 | 0 | 1 | 0 | 1 | 0 | 3 | 2 |
| Minneapolis | 434,000 | 32 | 15 | 5 | 0 | 2 | 82 | 172 | 5 |
| St. Paul | 248,000 | 13 | 10 | 1 | 0 | 1 | 12 | 21 | 9 |
| Iowa: | | | | | | | | | |
| Davenport | [1] 52,469 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | ------- |
| Des Moines | 146,000 | 0 | 2 | 0 | 0 | ------- | 0 | 0 | ------- |
| Sioux City | 78,000 | ------- | 1 | ------- | ------- | ------- | ------- | ------- | ------- |
| Waterloo | 36,900 | 12 | 0 | 0 | 0 | ------- | 1 | 4 | ------- |
| Missouri: | | | | | | | | | |
| Kansas City | 375,000 | 23 | 5 | 2 | 0 | 0 | 64 | 37 | 9 |
| St. Joseph | 78,400 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 4 |
| St. Louis | 830,000 | 14 | 37 | 25 | 0 | 0 | 299 | 12 | ------- |
| North Dakota: | | | | | | | | | |
| Fargo | [1] 26,403 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| Grand Forks | [1] 14,811 | 0 | 0 | 0 | 0 | ------- | 0 | 0 | ------- |
| South Dakota: | | | | | | | | | |
| Aberdeen | [1] 15,036 | 0 | 0 | 0 | 0 | ------- | 0 | 0 | ------- |
| Sioux Falls | [1] 30,127 | 0 | 0 | 0 | 0 | ------- | 0 | 0 | ------- |
| Nebraska: | | | | | | | | | |
| Omaha | 216,000 | 6 | 1 | 2 | 0 | 0 | 2 | 6 | 9 |
| Kansas: | | | | | | | | | |
| Topeka | 56,500 | 10 | 1 | 0 | 1 | 1 | 10 | 5 | 0 |
| Wichita | 92,500 | 4 | 1 | 1 | 0 | 0 | 11 | 0 | 2 |
| SOUTH ATLANTIC | | | | | | | | | |
| Delaware: | | | | | | | | | |
| Wilmington | 124,000 | 0 | 1 | 4 | 0 | 0 | 8 | 2 | 5 |
| Maryland: | | | | | | | | | |
| Baltimore | 808,000 | 53 | 22 | 22 | 1 | 2 | 300 | 59 | 25 |
| Cumberland | [1] 33,741 | 0 | 1 | 0 | 0 | 0 | 3 | 0 | 0 |
| Frederick | [1] 12,035 | 0 | 0 | 0 | 0 | 0 | 12 | 0 | 0 |
| District of Columbia: | | | | | | | | | |
| Washington | 528,000 | 11 | 10 | 27 | 1 | 1 | 191 | 0 | 9 |
| Virginia: | | | | | | | | | |
| Lynchburg | [3] 38,493 | 4 | 0 | 0 | 0 | 0 | 30 | 5 | 0 |
| Norfolk | 174,000 | 1 | 0 | 1 | 0 | 0 | 4 | 5 | 6 |
| Richmond | 189,000 | 2 | 1 | 1 | 0 | 1 | 53 | 1 | 3 |
| Roanoke | 61,900 | 5 | 0 | 1 | 0 | 0 | 14 | 0 | 0 |
| West Virginia: | | | | | | | | | |
| Charleston | 50,700 | 1 | 0 | 2 | 0 | 0 | 3 | 0 | 3 |
| Wheeling | [1] 56,208 | 3 | 1 | 0 | 0 | 0 | 1 | 0 | 1 |
| North Carolina: | | | | | | | | | |
| Raleigh | [1] 30,371 | 0 | 0 | 0 | 0 | 0 | 22 | 0 | 2 |
| Wilmington | 37,700 | 4 | 0 | 0 | 0 | 0 | 2 | 1 | 0 |
| Winston-Salem | 71,800 | 14 | 1 | 0 | 0 | 0 | 7 | 16 | 0 |
| South Carolina: | | | | | | | | | |
| Charleston | 74,100 | 0 | 0 | 1 | 6 | 0 | 3 | 0 | 0 |
| Columbia | 41,800 | 8 | 0 | 0 | 0 | 0 | 1 | 14 | 7 |
| Greenville | [1] 27,311 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Georgia: | | | | | | | | | |
| Atlanta | ([2]) | 6 | 1 | 2 | 12 | 0 | 27 | 10 | 3 |
| Brunswick | [1] 16,809 | 2 | 0 | 0 | 0 | 0 | 10 | 13 | 0 |
| Savannah | 94,900 | 5 | 0 | 0 | 9 | 2 | 1 | 1 | 3 |
| Florida: | | | | | | | | | |
| Miami | [3] 131,286 | 6 | 4 | 0 | 0 | 0 | 1 | 2 | 2 |
| St. Petersburg | [3] 47,629 | ------- | 0 | ------- | ------- | 0 | ------- | ------- | 0 |
| Tampa | 102,000 | 0 | 1 | 1 | 0 | 0 | 2 | 1 | 1 |

[1] Estimated, July 1, 1925. [2] No estimate made. [3] Special census.

*City reports for week ended May 26, 1928*—Continued

| Division, State, and city | Population, July 1, 1926, estimated | Chicken pox, cases reported | Diphtheria | | Influenza | | Measles, cases reported | Mumps, cases reported | Pneumonia, deaths reported |
|---|---|---|---|---|---|---|---|---|---|
| | | | Cases, estimated expectancy | Cases reported | Cases reported | Deaths reported | | | |
| EAST SOUTH CENTRAL | | | | | | | | | |
| Kentucky: | | | | | | | | | |
| Covington | 58,500 | 1 | 0 | 0 | 0 | 0 | 2 | 0 | 4 |
| Louisville | 311,000 | 3 | 3 | 1 | 5 | 0 | 110 | 12 | 11 |
| Tennessee: | | | | | | | | | |
| Memphis | 177,000 | 9 | 1 | 0 | 0 | 3 | 6 | 13 | 10 |
| Nashville | 137,000 | 2 | 0 | 6 | 0 | 3 | 36 | 4 | 1 |
| Alabama: | | | | | | | | | |
| Birmingham | 211,000 | 5 | 0 | 0 | 77 | 10 | 46 | 7 | 17 |
| Mobile | 66,800 | 0 | 1 | 0 | 1 | 1 | 2 | 0 | 1 |
| Montgomery | 47,000 | 3 | 0 | 0 | 1 | ------- | 14 | 0 | ------- |
| WEST SOUTH CENTRAL | | | | | | | | | |
| Arkansas: | | | | | | | | | |
| Fort Smith | [1] 31,643 | 1 | 0 | 0 | 0 | ------- | 3 | 0 | ------- |
| Little Rock | 75,900 | 1 | 0 | 0 | 0 | 2 | 8 | 2 | 6 |
| Louisiana: | | | | | | | | | |
| New Orleans | 419,000 | 3 | 6 | 3 | 8 | 5 | 3 | 0 | 12 |
| Shreveport | 59,500 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 5 |
| Oklahoma: | | | | | | | | | |
| Oklahoma City | (2) | 2 | 1 | 2 | 22 | 1 | 22 | 5 | 8 |
| Texas: | | | | | | | | | |
| Dallas | 203,000 | 22 | 3 | 2 | 0 | 0 | 29 | 0 | 2 |
| Fort Worth | 159,000 | 15 | 1 | 1 | 0 | 1 | 4 | 1 | 4 |
| Galveston | 49,100 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 2 |
| Houston | [1] 164,954 | 0 | 3 | 2 | 0 | 0 | 12 | 0 | 2 |
| San Antonio | 205,000 | 1 | 1 | 0 | 0 | 1 | 2 | 0 | 6 |
| MOUNTAIN | | | | | | | | | |
| Montana: | | | | | | | | | |
| Billings | [1] 17,971 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Great Falls | [1] 29,883 | 5 | 0 | 0 | 0 | 0 | 6 | 2 | 0 |
| Helena | [1] 12,037 | 0 | 0 | 1 | 0 | 0 | 2 | 0 | 0 |
| Missoula | [1] 12,668 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Idaho: | | | | | | | | | |
| Boise | [1] 23,042 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Colorado: | | | | | | | | | |
| Denver | 285,000 | 40 | 9 | 5 | ------- | 5 | 66 | 67 | 10 |
| Pueblo | 43,900 | 25 | 1 | 0 | 0 | 0 | 20 | 0 | 1 |
| New Mexico: | | | | | | | | | |
| Albuquerque | [1] 21,000 | 3 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| Utah: | | | | | | | | | |
| Salt Lake City | 133,000 | 15 | 3 | 2 | 0 | 1 | 0 | 0 | 3 |
| Nevada: | | | | | | | | | |
| Reno | [1] 12,665 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PACIFIC | | | | | | | | | |
| Washington: | | | | | | | | | |
| Seattle | (2) | 56 | 5 | 1 | 0 | ------- | 54 | 5 | ------- |
| Spokane | [2] 109,000 | 30 | 2 | 3 | 0 | ------- | 0 | 0 | ------- |
| Tacoma | 106,000 | 1 | 1 | 0 | 0 | 0 | 25 | 72 | 4 |
| Oregon: | | | | | | | | | |
| Portland | [1] 282,383 | 16 | 5 | 5 | 0 | 0 | 23 | 7 | 4 |
| California: | | | | | | | | | |
| Los Angeles | (2) | 101 | 38 | 23 | 31 | 0 | 22 | 47 | 18 |
| Sacramento | 73,400 | 8 | 3 | 2 | 0 | 0 | 5 | 13 | 2 |
| San Francisco | 567,000 | 43 | 18 | 7 | 4 | 2 | 13 | 37 | 3 |

[1] Estimated July 1, 1925. [2] No estimate made.

*City reports for week ended May 26, 1928*—Continued

| Division, State, and city | Scarlet fever: Cases, estimated expectancy | Scarlet fever: Cases reported | Smallpox: Cases, estimated expectancy | Smallpox: Cases reported | Smallpox: Deaths reported | Tuberculosis, deaths reported | Typhoid fever: Cases, estimated expectancy | Typhoid fever: Cases reported | Typhoid fever: Deaths reported | Whooping cough, cases reported | Deaths, all causes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| NEW ENGLAND | | | | | | | | | | | |
| Maine: | | | | | | | | | | | |
| Portland | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 6 | 23 |
| New Hampshire: | | | | | | | | | | | |
| Concord | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 13 |
| Manchester | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 36 |
| Vermont: | | | | | | | | | | | |
| Barre | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 3 |
| Massachusetts: | | | | | | | | | | | |
| Boston | 62 | 72 | 0 | 4 | 0 | 15 | 1 | 3 | 0 | 18 | 250 |
| Fall River | 3 | 4 | 0 | 0 | 0 | 5 | 1 | 0 | 0 | 6 | 38 |
| Springfield | 6 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 38 |
| Worcester | 9 | 5 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 13 | 68 |
| Rhode Island: | | | | | | | | | | | |
| Pawtucket | 1 | 4 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 22 |
| Providence | 8 | 23 | 0 | 0 | 0 | 4 | 0 | 2 | 0 | 1 | 79 |
| Connecticut: | | | | | | | | | | | |
| Bridgeport | 10 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 29 |
| Hartford | 4 | 6 | 0 | 0 | 0 | 3 | 1 | 0 | 0 | 3 | 77 |
| New Haven | 6 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 22 | 48 |
| MIDDLE ATLANTIC | | | | | | | | | | | |
| New York: | | | | | | | | | | | |
| Buffalo | 19 | 25 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 18 | 149 |
| New York | 238 | 315 | 0 | 0 | 0 | 115 | 10 | 9 | 0 | 133 | 1,671 |
| Rochester | 12 | 12 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 6 | 84 |
| Syracuse | 8 | 18 | 0 | 0 | 0 | 2 | 0 | 1 | 0 | 25 | 52 |
| New Jersey: | | | | | | | | | | | |
| Camden | 5 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 4 | 37 |
| Newark | 23 | 38 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 36 | 124 |
| Trenton | 2 | 1 | 0 | 0 | 0 | 4 | 1 | 0 | 0 | 0 | 56 |
| Pennsylvania: | | | | | | | | | | | |
| Philadelphia | 83 | 103 | 1 | 0 | 0 | 41 | 4 | 1 | 0 | 79 | 521 |
| Pittsburgh | 29 | 25 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 33 | 218 |
| Reading | 3 | 11 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 10 | 29 |
| EAST NORTH CENTRAL | | | | | | | | | | | |
| Ohio: | | | | | | | | | | | |
| Cincinnati | 13 | 41 | 2 | 4 | 0 | 14 | 0 | 1 | 1 | 2 | 160 |
| Cleveland | 32 | 27 | 0 | 0 | 0 | 19 | 1 | 1 | 0 | 43 | 240 |
| Columbus | 8 | 12 | 2 | 0 | 0 | 5 | 0 | 0 | 0 | 6 | 84 |
| Toledo | 11 | 3 | 2 | 0 | 0 | 3 | 0 | 0 | 0 | 5 | 89 |
| Indiana: | | | | | | | | | | | |
| Fort Wayne | 3 | 2 | 3 | 0 | 0 | 2 | 0 | 1 | 0 | 1 | 32 |
| Indianapolis | 9 | 15 | 14 | 6 | 0 | 6 | 1 | 0 | 0 | 4 | 96 |
| South Bend | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 |
| Terre Haute | 3 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 13 |
| Illinois: | | | | | | | | | | | |
| Chicago | 106 | 81 | 2 | 3 | 0 | 46 | 3 | 3 | 0 | 82 | 746 |
| Springfield | 3 | 6 | 0 | 0 | 0 | 2 | 0 | 1 | 1 | 2 | 22 |
| Michigan: | | | | | | | | | | | |
| Detroit | 82 | 111 | 1 | 5 | 0 | 27 | 2 | 1 | 0 | 73 | 318 |
| Flint | 5 | 7 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 8 | 33 |
| Grand Rapids | 6 | 3 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 5 | 27 |
| Wisconsin: | | | | | | | | | | | |
| Kenosha | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 7 |
| Milwaukee | 19 | 62 | 1 | 0 | 0 | 11 | 0 | 0 | 0 | 17 | 122 |
| Racine | 4 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 12 |
| Superior | 2 | 16 | 1 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 12 |
| WEST NORTH CENTRAL | | | | | | | | | | | |
| Minnesota: | | | | | | | | | | | |
| Duluth | 7 | 4 | 1 | 0 | 0 | 2 | 1 | 0 | 0 | 5 | 32 |
| Minneapolis | 35 | 21 | 7 | 0 | 0 | 2 | 1 | 0 | 0 | 20 | 92 |
| St. Paul | 21 | 11 | 3 | 0 | 0 | 4 | 1 | 0 | 0 | 56 | 56 |
| Iowa: | | | | | | | | | | | |
| Davenport | 0 | 2 | 1 | 2 | -------- | -------- | 0 | 0 | -------- | 0 | -------- |
| Des Moines | 6 | 5 | 2 | 15 | -------- | -------- | 0 | 0 | -------- | 0 | -------- |
| Sioux City | 1 | -------- | 2 | -------- | -------- | -------- | 0 | -------- | -------- | -------- | -------- |
| Waterloo | 1 | 8 | 0 | 0 | -------- | -------- | 0 | 0 | -------- | 3 | -------- |

*City reports for week ended May 26, 1928*—Continued

| Division, State, and city | Scarlet fever | | Smallpox | | | Tuberculosis, deaths reported | Typhoid fever | | | Whooping cough, cases reported | Deaths, all causes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cases, estimated expectancy | Cases reported | Cases, estimated expectancy | Cases reported | Deaths reported | | Cases, estimated expectancy | Cases reported | Deaths reported | | |
| WEST NORTH CENTRAL—continued | | | | | | | | | | | |
| Missouri: | | | | | | | | | | | |
| Kansas City | 8 | 31 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 15 | 100 |
| St. Joseph | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 40 |
| St. Louis | 29 | 18 | 3 | 3 | 0 | 13 | 2 | 1 | 0 | 19 | 228 |
| North Dakota: | | | | | | | | | | | |
| Fargo | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 8 | 10 |
| Grand Forks | 0 | 1 | 0 | 0 | -------- | -------- | 0 | 0 | -------- | 0 | -------- |
| South Dakota: | | | | | | | | | | | |
| Aberdeen | 2 | 0 | 0 | 0 | -------- | -------- | 0 | 0 | -------- | 1 | -------- |
| Sioux Falls | 1 | 0 | 0 | 0 | -------- | -------- | 0 | 0 | -------- | 0 | -------- |
| Nebraska: | | | | | | | | | | | |
| Omaha | 3 | 3 | 7 | 7 | 0 | 2 | 0 | 0 | 0 | 2 | 65 |
| Kansas: | | | | | | | | | | | |
| Topeka | 2 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 11 |
| Wichita | 2 | 2 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 32 |
| SOUTH ATLANTIC | | | | | | | | | | | |
| Delaware: | | | | | | | | | | | |
| Wilmington | 4 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 31 |
| Maryland: | | | | | | | | | | | |
| Baltimore | 33 | 28 | 0 | 0 | 0 | 16 | 2 | 1 | 1 | 52 | 218 |
| Cumberland | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 12 |
| Frederick | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| District of Columbia: | | | | | | | | | | | |
| Washington | 19 | 46 | 1 | 4 | 0 | 13 | 1 | 0 | 0 | 2 | 144 |
| Virginia: | | | | | | | | | | | |
| Lynchburg | 0 | 2 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 3 | 17 |
| Norfolk | 2 | 1 | 0 | 0 | 0 | 3 | 1 | 1 | 0 | 0 | -------- |
| Richmond | 3 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 39 |
| Roanoke | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 |
| West Virginia: | | | | | | | | | | | |
| Charleston | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 0 | 23 |
| Wheeling | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 23 |
| North Carolina: | | | | | | | | | | | |
| Raleigh | 0 | 1 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 1 | 13 |
| Wilmington | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 4 |
| Winston-Salem | 0 | 1 | 2 | 1 | 0 | 2 | 0 | 1 | 0 | 0 | 13 |
| South Carolina: | | | | | | | | | | | |
| Charleston | 0 | 0 | 1 | 3 | 0 | 1 | 1 | 1 | 0 | 1 | 22 |
| Columbia | 0 | 1 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 1 | 36 |
| Greenville | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 12 |
| Georgia: | | | | | | | | | | | |
| Atlanta | 3 | 8 | 7 | 5 | 0 | 6 | 1 | 0 | 1 | 3 | 72 |
| Brunswick | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 6 |
| Savannah | 0 | 0 | 1 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 35 |
| Florida: | | | | | | | | | | | |
| Miami | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 22 |
| St. Petersburg | 0 | -------- | 0 | -------- | 0 | 0 | 0 | -------- | 0 | -------- | 8 |
| Tampa | 1 | 0 | 0 | 0 | 0 | 3 | 1 | 0 | 0 | 0 | 24 |
| EAST SOUTH CENTRAL | | | | | | | | | | | |
| Kentucky: | | | | | | | | | | | |
| Covington | 1 | 5 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 25 |
| Louisville | 6 | 32 | 0 | 3 | 0 | 15 | 1 | 0 | 0 | 4 | 145 |
| Tennessee: | | | | | | | | | | | |
| Memphis | 5 | 1 | 2 | 1 | 0 | 6 | 1 | 1 | 2 | 0 | 73 |
| Nashville | 2 | 2 | 2 | 7 | 0 | 7 | 1 | 1 | 0 | 2 | 41 |
| Alabama: | | | | | | | | | | | |
| Birmingham | 1 | 1 | 6 | 1 | 0 | 4 | 2 | 0 | 0 | 6 | 82 |
| Mobile | 0 | 1 | 0 | 0 | 0 | 2 | 1 | 0 | 1 | 0 | 22 |
| Montgomery | 1 | 2 | 1 | 0 | -------- | -------- | 0 | 0 | -------- | 0 | -------- |
| WEST SOUTH CENTRAL | | | | | | | | | | | |
| Arkansas: | | | | | | | | | | | |
| Fort Smith | 1 | 2 | 0 | 0 | -------- | -------- | 0 | 0 | -------- | 5 | -------- |
| Little Rock | 1 | 20 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | -------- |

*City reports for week ended May 26, 1928*—Continued

| Division, State, and city | Scarlet fever | | Smallpox | | | Tuberculosis, deaths reported | Typhoid fever | | | Whooping cough, cases reported | Deaths, all causes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cases, estimated expectancy | Cases reported | Cases, estimated expectancy | Cases reported | Deaths reported | | Cases, estimated expectancy | Cases reported | Deaths reported | | |
| WEST SOUTH CENTRAL—continued | | | | | | | | | | | |
| Louisiana: | | | | | | | | | | | |
| New Orleans | 3 | 10 | 1 | 0 | 0 | 20 | 2 | 1 | 1 | 10 | 168 |
| Shreveport | 1 | 1 | 1 | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 26 |
| Oklahoma: | | | | | | | | | | | |
| Oklahoma City | 2 | 8 | 2 | 12 | 0 | 1 | 9<br>0 | 0 | 0 | 0 | 41 |
| Texas: | | | | | | | | | | | |
| Dallas | 2 | 15 | 3 | 3 | 0 | 1 | 1 | 0 | 0 | 21 | 46 |
| Fort Worth | 1 | 8 | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 26 |
| Galveston | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 15 |
| Houston | 1 | 3 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 1 | 63 |
| San Antonio | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 0 | 87 |
| MOUNTAIN | | | | | | | | | | | |
| Montana: | | | | | | | | | | | |
| Billings | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 8 |
| Great Falls | 3 | 0 | 1 | 4 | 0 | 0 | 0 | 0 | 0 | 2 | 9 |
| Helena | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 3 |
| Missoula | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 4 |
| Idaho: | | | | | | | | | | | |
| Boise | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 3 |
| Colorado: | | | | | | | | | | | |
| Denver | 11 | 2 | 0 | 1 | 0 | 9 | 0 | 0 | 0 | 21 | 89 |
| Pueblo | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 17 |
| New Mexico: | | | | | | | | | | | |
| Albuquerque | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 8 |
| Utah: | | | | | | | | | | | |
| Salt Lake City | 2 | 0 | 1 | 6 | 0 | 2 | 0 | 0 | 0 | 17 | 25 |
| Nevada: | | | | | | | | | | | |
| Reno | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |
| PACIFIC | | | | | | | | | | | |
| Washington: | | | | | | | | | | | |
| Seattle | 9 | 8 | 2 | 3 | -------- | -------- | 0 | 3 | -------- | 9 | -------- |
| Spokane | 5 | 0 | 4 | 7 | -------- | -------- | 1 | 0 | -------- | 0 | -------- |
| Tacoma | 2 | 3 | 3 | 0 | 0 | 1 | 0 | 0 | 0 | 2 | 16 |
| Oregon: | | | | | | | | | | | |
| Portland | 5 | 14 | 8 | 29 | 0 | 1 | 0 | 2 | 0 | 0 | 79 |
| California: | | | | | | | | | | | |
| Los Angeles | 25 | 14 | 7 | 5 | 0 | 19 | 2 | 1 | 0 | 59 | 239 |
| Sacramento | 1 | 6 | 1 | 0 | 0 | 2 | 1 | 1 | 0 | 1 | 24 |
| San Francisco | 16 | 20 | 2 | 0 | 0 | 9 | 0 | 9 | 0 | 5 | 147 |

| Division, State, and city | Meningococcus meningitis | | Lethargic encephalitis | | Pellagra | | Poliomyelitis (infantile paralysis) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Cases | Deaths | Cases | Deaths | Cases | Deaths | Cases, estimated expectancy | Cases | Deaths |
| NEW ENGLAND | | | | | | | | | |
| Massachusetts: | | | | | | | | | |
| Boston | 1 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| Connecticut: | | | | | | | | | |
| Bridgeport | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| MIDDLE ATLANTIC | | | | | | | | | |
| New York: | | | | | | | | | |
| New York | 34 | 11 | 4 | 5 | 0 | 0 | 1 | 0 | 1 |
| New Jersey: | | | | | | | | | |
| Newark | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Pennsylvania: | | | | | | | | | |
| Philadelphia | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pittsburgh | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |

*City reports for week ended May 26, 1928*—Continued

| Division, State, and city | Meningococcus meningitis | | Lethargic encephalitis | | Pellagra | | Poliomyelitis (infantile paralysis) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Cases | Deaths | Cases | Deaths | Csaes | Deaths | Cases, estimated expectancy | Cases | Deaths |
| EAST NORTH CENTRAL | | | | | | | | | |
| Ohio: | | | | | | | | | |
| Cleveland | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Columbus | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| Illinois: | | | | | | | | | |
| Chicago | 11 | 9 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| Michigan: | | | | | | | | | |
| Detroit | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Grand Rapids | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wisconsin: | | | | | | | | | |
| Milwaukee | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| WEST NORTH CENTRAL | | | | | | | | | |
| Minnesota: | | | | | | | | | |
| Minneapolis | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| Missouri: | | | | | | | | | |
| Kansas City | 3 | 4 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| St. Louis | 10 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Nebraska: | | | | | | | | | |
| Omaha | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SOUTH ATLANTIC | | | | | | | | | |
| Maryland: | | | | | | | | | |
| Baltimore | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| District of Columbia: | | | | | | | | | |
| Washington | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| South Carolina: | | | | | | | | | |
| Charleston | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Columbia | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 |
| Georgia: | | | | | | | | | |
| Atlanta | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Savannah | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 0 | 0 |
| Florida: | | | | | | | | | |
| Tampa | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| EAST SOUTH CENTRAL | | | | | | | | | |
| Tennessee: | | | | | | | | | |
| Memphis | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Alabama: | | | | | | | | | |
| Birmingham | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 |
| Mobile | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 |
| WEST SOUTH CENTRAL | | | | | | | | | |
| Arkansas: | | | | | | | | | |
| Fort Smith | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Little Rock | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Louisiana: | | | | | | | | | |
| New Orleans | 2 | 0 | 0 | 1 | 5 | 0 | 0 | 0 | 0 |
| Texas: | | | | | | | | | |
| Dallas | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 1 | 0 |
| Utah: | | | | | | | | | |
| Salt Lake City | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Nevada: | | | | | | | | | |
| Reno | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PACIFIC | | | | | | | | | |
| California: | | | | | | | | | |
| Los Angeles | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Sacramento | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| San Francisco | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

The following table gives the rates per 100,000 population for 101 cities for the five-week period ended May 26, 1928, compared with those for a like period ended May 28, 1927. The population figures used in computing the rates are approximate estimates as of July 1, 1928 and 1927, respectively, authoritative figures for many of the cities not being available. The 101 cities reporting cases had estimated aggregate populations of approximately 31,657,000 in 1928 and 31,050,000 in 1927. The 95 cities reporting deaths had nearly 30,961,000 estimated population in 1928 and nearly 30,370,000 in 1927. The number of cities included in each group and the estimated aggregate populations are shown in a separate table below.

*Summary of weekly reports from cities, April 22 to May 26, 1928—Annual rates per 100,000 population compared with rates for the corresponding period of 1927* [1]

DIPHTHERIA CASE RATES

| | Week ended— | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Apr. 28, 1928 | Apr. 30, 1927 | May 5, 1928 | May 7, 1927 | May 12, 1928 | May 14, 1927 | May 19, 1928 | May 21, 1927 | May 26, 1928 | May 28, 1927 |
| 101 cities | 128 | 171 | 123 | 183 | 121 | 174 | 137 | 174 | [2] 129 | 171 |
| New England | 133 | 95 | 133 | 130 | 113 | 105 | 110 | 153 | 64 | 160 |
| Middle Atlantic | 172 | 242 | 170 | 272 | 177 | 282 | 204 | 267 | 213 | 233 |
| East North Central | 131 | 137 | 107 | 159 | 109 | 132 | 114 | 160 | 102 | 145 |
| West North Central | 84 | 158 | 78 | 131 | 55 | 135 | 95 | 105 | [2] 74 | 91 |
| South Atlantic | 86 | 105 | 88 | 119 | 82 | 115 | 103 | 110 | 109 | 144 |
| East South Central | 45 | 76 | 40 | 76 | 35 | 81 | 20 | 35 | 35 | 96 |
| West South Central | 100 | 178 | 80 | 141 | 92 | 112 | 64 | 50 | 28 | 83 |
| Mountain | 133 | 99 | 80 | 152 | 71 | 99 | 97 | 108 | 71 | 143 |
| Pacific | 56 | 188 | 125 | 110 | 102 | 94 | 120 | 104 | 92 | 196 |

MEASLES CASE RATES

| | Apr. 28, 1928 | Apr. 30, 1927 | May 5, 1928 | May 7, 1927 | May 12, 1928 | May 14, 1927 | May 19, 1928 | May 21, 1927 | May 26, 1928 | May 28, 1927 |
|---|---|---|---|---|---|---|---|---|---|---|
| 101 cities | 1,290 | 638 | 1,423 | 696 | 1,376 | 602 | 1,346 | 620 | [2] 1,308 | 548 |
| New England | 1,593 | 323 | 1,322 | 270 | 1,120 | 346 | 1,159 | 416 | 1,290 | 435 |
| Middle Atlantic | 1,862 | 231 | 2,236 | 212 | 2,254 | 297 | 2,274 | 323 | 2,185 | 365 |
| East North Central | 728 | 637 | 794 | 564 | 788 | 450 | 680 | 492 | 773 | 372 |
| West North Central | 1,017 | 1,225 | 888 | 1,522 | 937 | 932 | 1,116 | 952 | [2] 968 | 653 |
| South Atlantic | 1,767 | 1,017 | 2,109 | 1,577 | 1,704 | 1,546 | 1,436 | 1,537 | 1,219 | 1,358 |
| East South Central | 1,521 | 375 | 1,132 | 517 | 1,082 | 345 | 1,237 | 355 | 1,077 | 319 |
| West South Central | 396 | 922 | 392 | 877 | 336 | 567 | 268 | 620 | 250 | 459 |
| Mountain | 840 | 1,542 | 752 | 1,632 | 1,141 | 1,300 | 1,150 | 906 | 831 | 1,049 |
| Pacific | 386 | 1,528 | 266 | 1,601 | 327 | 1,259 | 263 | 1,215 | 304 | 1,060 |

SCARLET FEVER CASE RATES

| | Apr. 28, 1928 | Apr. 30, 1927 | May 5, 1928 | May 7, 1927 | May 12, 1928 | May 14, 1927 | May 19, 1928 | May 21, 1927 | May 26, 1928 | May 28, 1927 |
|---|---|---|---|---|---|---|---|---|---|---|
| 101 cities | 266 | 339 | 258 | 360 | 253 | 340 | 253 | 309 | [2] 234 | 294 |
| New England | 329 | 402 | 345 | 393 | 347 | 439 | 292 | 432 | 306 | 365 |
| Middle Atlantic | 312 | 446 | 303 | 540 | 285 | 474 | 279 | 415 | 267 | 363 |
| East North Central | 281 | 289 | 254 | 283 | 265 | 289 | 272 | 267 | 254 | 301 |
| West North Central | 275 | 333 | 218 | 271 | 242 | 319 | 279 | 289 | [2] 213 | 245 |
| South Atlantic | 214 | 191 | 175 | 128 | 167 | 148 | 195 | 101 | 163 | 121 |
| East South Central | 209 | 193 | 304 | 183 | 155 | 152 | 190 | 132 | 219 | 137 |
| West South Central | 108 | 33 | 148 | 58 | 184 | 21 | 216 | 33 | 204 | 25 |
| Mountain | 203 | 950 | 274 | 1,004 | 115 | 726 | 133 | 986 | 18 | 897 |
| Pacific | 110 | 198 | 153 | 212 | 204 | [illegible] | 143 | 167 | 130 | 209 |

SMALLPOX CASE RATES

| | Apr. 28, 1928 | Apr. 30, 1927 | May 5, 1928 | May 7, 1927 | May 12, 1928 | May 14, 1927 | May 19, 1928 | May 21, 1927 | May 26, 1928 | May 28, 1927 |
|---|---|---|---|---|---|---|---|---|---|---|
| 101 cities | 25 | 21 | 14 | 22 | 18 | 21 | 24 | 26 | [2] 17 | 29 |
| New England | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 0 |
| Middle Atlantic | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| East North Central | 28 | 33 | 15 | 28 | 20 | 20 | 22 | 37 | 16 | 49 |
| West North Central | 68 | 38 | 31 | 34 | 43 | 26 | 64 | 48 | [2] 28 | 42 |
| South Atlantic | 33 | 18 | 14 | 36 | 21 | 38 | 32 | 36 | 26 | 40 |
| East South Central | 70 | 66 | 15 | 56 | 45 | 56 | 30 | 76 | 60 | 61 |
| West South Central | 28 | 25 | 36 | 33 | 8 | 58 | 60 | 17 | 24 | 29 |
| Mountain | 150 | 9 | 106 | 36 | 159 | 9 | 159 | 45 | 133 | 27 |
| Pacific | 43 | 65 | 31 | 73 | 36 | 91 | 54 | 71 | 38 | 84 |

[1] The figures given in this table are rates per 100,000 population, annual basis, and not the number of cases reported. Populations used are estimated as of July 1, 1923 and 1927, respectively.

[2] Sioux City, Iowa, not included.

*Summary of weekly reports from cities, April 22 to May 26, 1928—Annual rates per 100,000 population compared with rates for the corresponding period of 1927*—Continued

TYPHOID FEVER CASE RATES

| | Week ended— | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Apr. 28, 1928 | Apr. 30, 1927 | May 5, 1928 | May 7, 1927 | May 12, 1928 | May 14, 1927 | May 19, 1928 | May 21, 1927 | May 26, 1928 | May 28, 1927 |
| 101 cities | 4 | 8 | 6 | 10 | 8 | 8 | 6 | 10 | [1] 8 | 9 |
| New England | 5 | 5 | 2 | 2 | 5 | 5 | 7 | 5 | 11 | 9 |
| Middle Atlantic | 3 | 5 | 4 | 10 | 2 | 5 | 4 | 6 | 6 | 6 |
| East North Central | 2 | 6 | 3 | 7 | 3 | 3 | 2 | 5 | 5 | 7 |
| West North Central | 6 | 4 | 2 | 2 | 8 | 2 | 2 | 6 | [1] 4 | 4 |
| South Atlantic | 7 | 16 | 18 | 18 | 19 | 9 | 7 | 13 | 7 | 18 |
| East South Central | 5 | 30 | 0 | 15 | 20 | 66 | 20 | 56 | 10 | 30 |
| West South Central | 24 | 12 | 28 | 37 | 16 | 25 | 4 | 45 | 12 | 25 |
| Mountain | 0 | 9 | 0 | 18 | 18 | 9 | 0 | 9 | 0 | 18 |
| Pacific | 0 | 18 | 15 | 3 | 31 | 10 | 23 | 10 | 36 | 8 |

INFLUENZA DEATH RATES

| | Apr. 28, 1928 | Apr. 30, 1927 | May 5, 1928 | May 7, 1927 | May 12, 1928 | May 14, 1927 | May 19, 1928 | May 21, 1927 | May 26, 1928 | May 28, 1927 |
|---|---|---|---|---|---|---|---|---|---|---|
| 95 cities | 32 | 18 | 32 | 13 | 33 | 13 | 29 | 12 | 25 | 9 |
| New England | 14 | 7 | 21 | 5 | 16 | 14 | 41 | 14 | 18 | 9 |
| Middle Atlantic | 34 | 21 | 28 | 15 | 31 | 14 | 28 | 10 | 21 | 8 |
| East North Central | 35 | 10 | 36 | 7 | 43 | 10 | 36 | 12 | 33 | 4 |
| West North Central | 31 | 12 | 53 | 8 | 43 | 4 | 18 | 8 | 12 | 12 |
| South Atlantic | 30 | 29 | 21 | 16 | 9 | 25 | 16 | 11 | 11 | 13 |
| East South Central | 37 | 37 | 84 | 43 | 73 | 32 | 63 | 43 | 89 | 27 |
| West South Central | 37 | 47 | 25 | 13 | 37 | 13 | 16 | 25 | 33 | 25 |
| Mountain | 44 | 9 | 35 | 9 | 27 | 9 | 27 | 9 | 53 | 9 |
| Pacific | 17 | 21 | 7 | 21 | 17 | 7 | 10 | 0 | 7 | 3 |

PNEUMONIA DEATH RATES

| | Apr. 28, 1928 | Apr. 30, 1927 | May 5, 1928 | May 7, 1927 | May 12, 1928 | May 14, 1927 | May 19, 1928 | May 21, 1927 | May 26, 1928 | May 28, 1927 |
|---|---|---|---|---|---|---|---|---|---|---|
| 95 cities | 196 | 143 | 206 | 131 | 210 | 123 | 189 | 110 | 176 | 100 |
| New England | 138 | 184 | 189 | 140 | 257 | 144 | 207 | 100 | 253 | 144 |
| Middle Atlantic | 246 | 168 | 264 | 166 | 267 | 151 | 218 | 119 | 211 | 116 |
| East North Central | 215 | 128 | 211 | 121 | 232 | 97 | 222 | 104 | 175 | 85 |
| West North Central | 90 | 56 | 128 | 68 | 120 | 70 | 88 | 58 | 84 | 87 |
| South Atlantic | 172 | 153 | 184 | 114 | 89 | 128 | 146 | 148 | 119 | 85 |
| East South Central | 178 | 133 | 214 | 149 | 193 | 128 | 240 | 112 | 230 | 64 |
| West South Central | 189 | 123 | 90 | 115 | 164 | 140 | 123 | 106 | 144 | 89 |
| Mountain | 106 | 188 | 159 | 99 | 133 | 54 | 97 | 63 | 124 | 36 |
| Pacific | 125 | 117 | 74 | 79 | 98 | 114 | 105 | 121 | 91 | 100 |

[1] Sioux City, Iowa, not included.

*Number of cities included in summary of weekly reports, and aggregate population of cities in each group, approximated as of July 1, 1928 and 1927, respectively*

| Group of cities | Number of cities reporting cases | Number of cities reporting deaths | Aggregate population of cities reporting cases | | Aggregate population of cities reporting deaths | |
|---|---|---|---|---|---|---|
| | | | 1928 | 1927 | 1928 | 1927 |
| Total | 101 | 95 | 31,657,000 | 31,050,300 | 30,960,700 | 30,369,500 |
| New England | 12 | 12 | 2,274,400 | 2,242,700 | 2,274,400 | 2,242,700 |
| Middle Atlantic | 10 | 10 | 10,732,400 | 10,594,700 | 10,732,400 | 10,594,700 |
| East North Central | 16 | 16 | 7,991,400 | 7,820,700 | 7,991,400 | 7,820,700 |
| West North Central | 12 | 10 | 2,683,500 | 2,634,500 | 2,566,400 | 2,518,500 |
| South Atlantic | 21 | 21 | 2,981,900 | 2,890,700 | 2,981,900 | 2,890,700 |
| East South Central | 7 | 6 | 1,048,300 | 1,028,300 | 1,000,100 | 980,700 |
| West South Central | 8 | 7 | 1,307,600 | 1,260,700 | 1,274,100 | 1,227,800 |
| Mountain | 9 | 9 | 591,100 | 581,600 | 591,100 | 581,600 |
| Pacific | 6 | 4 | 2,046,400 | 1,996,400 | 1,548,900 | 1,512,100 |

# FOREIGN AND INSULAR

## THE FAR EAST

*Report for the week ended May 19, 1928.*—The following report for the week ended May 19, 1928, was transmitted by the Eastern Bureau of the Health Section of the Secretariat of the League of Nations, located at Singapore, to the headquarters at Geneva:

Plague, cholera, or smallpox was reported present in the following ports:

PLAGUE

*Egypt.*—Suez.
*Aden Protectorate.*—Aden.
*India.*—Bassein, Bombay, Rangoon.
*Ceylon.*—Colombo.
*China.*—Amoy.

CHOLERA

*India.*—Bassein, Calcutta, Moulmein.
*Siam.*—Bangkok.
*French Indo-China.*—Haiphong, Saigon.

SMALLPOX

*Iraq.*—Basra.
*India.*—Bombay, Calcutta, Madras, Moulmein, Negapatam, Rangoon.
*French India.*—Pondicherry.
*Dutch East Indies.*—Belawan-Deli.
*China.*—Shanghai, Hong Kong.
*Japan.*—Kobe, Shimonoseki.
*Kwantung.*—Dairen.

Returns for the week ended May 19 were not received from Vizagapatam or Tuticorin, India.

## CANADA

*Provinces—Communicable diseases—Week ended May 19, 1928.*—The Canadian Ministry of Health reports cases of certain communicable diseases from seven Provinces of Canada for the week ended May 19, 1928, as follows:

| Disease | Nova Scotia | New Brunswick | Quebec | Ontario | Manitoba | Saskatchewan | Alberta | Total |
|---|---|---|---|---|---|---|---|---|
| Cerebrospinal fever | | | | 2 | | | | 2 |
| Influenza | 10 | | | 8 | | | | 18 |
| Lethargic encephalitis | | | | 1 | | | | 1 |
| Poliomyelitis | | | | | | | 1 | 1 |
| Smallpox | | 2 | | 12 | 1 | 13 | 10 | 38 |
| Typhoid fever | | 2 | 16 | 7 | | | | 25 |

*Quebec Province—Communicable diseases—Week ended May 26, 1928.*—The Bureau of Health of the Province of Quebec reports cases of certain communicable diseases for the week ended May 26, 1928, as follows:

| Disease | Cases | Disease | Cases |
|---|---|---|---|
| Chicken pox | 18 | Scarlet fever | 80 |
| Diphtheria | 46 | Smallpox | 15 |
| German measles | 11 | Tuberculosis | 62 |
| Influenza | 7 | Typhoid fever | 10 |
| Measles | 158 | Whooping cough | 10 |

## DENMARK

*Communicable diseases—March, 1928.*—During the month of March, 1928, communicable diseases were reported in Denmark as follows:

| Disease | Cases | Disease | Cases |
|---|---|---|---|
| Bronchopneumonia | 3,362 | Paratyphoid fever | 5 |
| Cerebrospinal meningitis | 8 | Pneumonia | 691 |
| Chicken pox | 62 | Poliomyelitis | 3 |
| Diphtheria | 590 | Puerperal fever | 21 |
| Erysipelas | 257 | Scarlet fever | 219 |
| Influenza | 5,587 | Tetanus | 1 |
| Jaundice | 113 | Tuberculosis | 272 |
| Lethargic encephalitis | 12 | Typhoid fever | 10 |
| Measles | 5,728 | Undulant (Malta) fever | [1] 37 |
| Mumps | 657 | Whooping cough | 1,757 |

[1] Reported from State Serum Institute.

Population: 3,493,000.

## PERU

*Arequipa—Mortality, March–April, 1928.*—Mortality from all causes was reported at Arequipa, Peru, during the months of March and April, 1928, as follows: March, 1928, deaths, 70; April, 1928, deaths, 59. Deaths from certain causes were distributed as follows: Gastroenteritis—March, 17; April, 4; tuberculosis—March, 14; April, 16; typhoid fever—one death each in March and April; typhus fever—one death in April.

## SPAIN

*Mortality from all causes and from certain diseases—July–September, 1927.*—During the three-month period July to September, 1927, inclusive, the total number of deaths occurring in Spain from all causes was as follows: July, 36,596; August, 33,717; September, 29,279. Population, 22,290,162. Deaths from certain diseases were reported as follows:

*Deaths, 1927*

| Disease | July | August | September | Disease | July | August | September |
|---|---|---|---|---|---|---|---|
| Bronchitis: | | | | Pneumonia | 519 | 484 | 462 |
| Acute | 837 | 745 | 722 | Puerperal fever | 104 | 114 | 114 |
| Chronic | 492 | 476 | 480 | Scarlet fever | 58 | 51 | 50 |
| Cancer | 1,355 | 1,313 | 1,329 | Smallpox | 3 | 8 | 18 |
| Diarrhea (under 2 years) | 8,199 | 6,869 | 4,552 | Tuberculosis: | | | |
| Diphtheria | 81 | 89 | 118 | Meningeal | 235 | 243 | 156 |
| Heart disease | 2,484 | 2,441 | 2,233 | Pulmonary | 2,122 | 1,969 | 1,853 |
| Influenza | 102 | 83 | 102 | Other forms | 374 | 366 | 318 |
| Malaria | 95 | 120 | 117 | Typhoid fever | 456 | 594 | 561 |
| Measles | 357 | 289 | 160 | Typhus fever | 4 | 2 | -------- |
| Nephritis | 873 | 899 | 884 | | | | |

*Madrid—Mortality, April, 1928.*—During the month of April, 1928, 1,282 deaths were reported at Madrid, Spain, including diphtheria, 5; measles, 36; scarlet fever, 1; tuberculosis, 150; typhoid fever, 3. Population, estimated, 766,552.

# CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From medical officers of the Public Health Service, American consuls, health section of the League of Nations, and other sources. The reports contained in the following tables must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

## CHOLERA

[C, indicates cases; D, deaths; P, present]

| Place | | Sept. 25–Oct. 22, 1927 | Oct. 23–Nov. 19, 1927 | Nov. 20–Dec. 17, 1927 | Dec. 18, 1927–Jan. 14, 1928 | Jan. 15–Feb. 11, 1928 | Feb. 12–Mar. 10, 1928 | Week ended— March, 1928 | | | April, 1928 | | | | May, 1928 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 17 | 24 | 31 | 7 | 14 | 21 | 28 | 5 | 12 | 19 |
| China: | | | | | | | | | | | | | | | | | |
| Amoy | C | 16 | | | | | | | | | | | | | | | |
| Canton | C | 14 | 12 | 1 | | | | | 1 | 1 | | | | | | | |
| | D | 14 | 11 | 1 | | | | | 1 | 1 | | | | | | | |
| Foochow | C | P | | | | | | | | | | | | | | | |
| Hong Kong | C | P | | | | | | | | | | | | | | | |
| Shanghai (settlement and concession)— | | | | | | | | | | | | | | | | | |
| Foreigners only | C | 3 | | | | | | | | | | | | | | | |
| Including natives | D | 7 | | | | | | | | | | | | | | | |
| Swatow | C | P | P | | | | | | | | | | | | | | |
| | D | P | P | | | | | | | | | | | | | | |
| Tientsin | C | 2 | P | 1 | | | | | | | | | | | | | |
| Dutch East Indies: Java—Batavia | C | | 28 | 3 | | | | | | | | | | | | | |
| | D | | 18 | 3 | | | | | | | | | | | | | |
| India | C | 20,160 | 23,047 | 25,139 | 15,377 | 12,391 | 13,236 | 4,546 | 5,384 | 5,856 | 5,529 | 7,746 | | | | | |
| | D | 10,371 | 12,863 | 15,026 | 8,863 | 6,750 | 7,282 | 2,605 | 2,931 | 3,182 | 3,159 | 4,920 | | | | | |
| Bassein | D | | | | | 1 | 2 | | 4 | 25 | 22 | 20 | 6 | 6 | 9 | 9 | 16 |
| Bombay | C | | 2 | | | 1 | 1 | 1 | 1 | 1 | | | | | | | |
| | D | | 2 | | | | 1 | 1 | | 1 | 1 | | | | | | |
| Calcutta | C | 101 | 199 | 428 | 176 | 203 | 341 | 164 | 190 | 148 | 162 | 163 | 131 | | | | |
| | D | 64 | 138 | 281 | 125 | 112 | 241 | 94 | 122 | 114 | 112 | 111 | 97 | 105 | 115 | 126 | 102 |
| Madras | C | 14 | 13 | 1 | 1 | 2 | 14 | | 7 | 1 | 2 | 5 | 5 | 5 | | | |
| | D | 8 | 7 | 2 | 1 | 4 | 18 | | 2 | 1 | 1 | 4 | 5 | 4 | 5 | 3 | |
| Madras Presidency | C | 2,050 | 3,073 | 3,702 | 1,864 | 4,681 | 2,961 | 510 | 455 | 243 | 275 | | | | | | |
| | D | 1,055 | 1,736 | 2,104 | 984 | 2,660 | 1,618 | 280 | 244 | 131 | 157 | | | | | | |
| Negapatam | C | | | | | 4 | | | | | | | | | | | |
| | D | | | | | 6 | 4 | | | | | 1 | | | 1 | | |
| Rangoon | C | 6 | 2 | 8 | 4 | 6 | 29 | 4 | 7 | 8 | 3 | 5 | 10 | | | | |
| | D | 5 | 5 | 6 | 3 | 2 | 18 | 2 | 3 | 6 | 5 | 2 | 7 | 6 | 1 | | |
| Tuticorin | C | 1 | | 8 | | | | | | | 10 | 43 | 45 | 19 | 3 | | |
| | D | 1 | 37 | 14 | | | | 1 | | | 8 | 26 | 32 | 10 | 3 | | |

## CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

### CHOLERA—Continued

[C, indicates cases; D, deaths; P, present]

| Place | | Sept. 25–Oct. 22, 1927 | Oct. 23–Nov. 19, 1927 | Nov. 20–Dec. 17, 1927 | Dec. 18, 1927–Jan. 14, 1928 | Jan. 15–Feb. 11, 1928 | Feb. 12–Mar. 10, 1928 | Week ended— March, 1928 | | | April, 1928 | | | | May, 1928 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 17 | 24 | 31 | 7 | 14 | 21 | 28 | 5 | 12 | 19 |
| India (French): | | | | | | | | | | | | | | | | | |
| Chandernagor | C | | 6 | 10 | 14 | 6 | 5 | 2 | 1 | | 4 | | | | | | |
| | D | | 6 | 10 | 9 | 1 | 5 | 1 | 1 | | 4 | | | | | | |
| Karikal | C | | 1 | 1 | 8 | 32 | 6 | | | | | 1 | | | | | |
| | D | | 1 | 1 | 4 | 19 | 5 | | | | | 1 | | | | | |
| Pondicherry | C | | 1 | 25 | 11 | 12 | 33 | | | | 1 | 2 | 3 | 2 | 1 | | |
| | D | | 1 | 21 | 12 | 10 | 19 | | | | 1 | 2 | 3 | 2 | 1 | | |
| Indo-China (see also table below): | | | | | | | | | | | | | | | | | |
| Saigon | C | 1 | | | 3 | 4 | 16 | 27 | 13 | 21 | 35 | 50 | 28 | 23 | 15 | 10 | |
| | D | | | | 1 | 1 | 8 | 19 | 8 | 12 | 20 | 37 | 17 | 12 | 10 | 7 | |
| Iraq [1] | | | | | | | | | | | | | | | | | |
| Kwangchow-wan (see table below) | | | | | | | | | | | | | | | | | |
| Siam | C | 18 | 110 | 88 | 110 | 200 | 295 | 53 | 88 | 70 | 80 | 120 | 85 | | | | |
| | D | 11 | 76 | 64 | 80 | 139 | 214 | 39 | 67 | 54 | 58 | 84 | 61 | | | | |
| Bangkok | C | 5 | 4 | 3 | 21 | 101 | 60 | 8 | 12 | 16 | 24 | | 30 | 24 | 20 | 17 | 14 |
| | D | 3 | 2 | 2 | 11 | 66 | 36 | 5 | 5 | 12 | 11 | | 13 | 14 | 8 | 6 | 9 |
| Straits Settlements: Singapore | C | | 7 | 5 | 23 | 3 | | 1 | 1 | | | | | 1 | | | |
| | D | | 5 | 4 | 12 | 1 | | 1 | 1 | | | | | 1 | | | |
| On vessel: | | | | | | | | | | | | | | | | | |
| S. S. Hawaii Maru at Singapore from Saigon, French Indo-China | C | | | | | | | | | | P | | | | | | |
| S. S. Tabaristan: At Basra, Iraq | C | 1 | | | | | | | | | | | | | | | |

[1] From July 19 to Dec. 26, 1927, 1,479 cases of cholera were reported in Iraq, with 1,063 deaths, as follows: Amarah Liwa, 261 cases, 205 deaths; Baghdad Liwa, 80 cases, 60 deaths; Basra Liwa, 421 cases, 330 deaths; Diwaniah Liwa, 122 cases, 72 deaths; Diyalah Liwa, 1 case, 1 death; Duliam Liwa, 100 cases, 69 deaths; Hillah Liwa, 105 cases, 71 deaths; Kerbalah Liwa, 79 cases, 60 deaths; Kut Liwa, 66 cases, 44 deaths; Muntafiq Liwa, 244 cases, 151 deaths.

| Place | | July-September, 1927 | October, 1927 | November, 1927 | December, 1927 | January, 1928 | February, 1928 | | | March, 1928 | | | April, 1928 | | | May, 1928 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 1-10 | 11-20 | 21-29 | 1-10 | 11-20 | 21-31 | 1-10 | 11-20 | 21-30 | 1-10 |
| Indo-China (French) (see also table above): | | | | | | | | | | | | | | | | |
| Annam | C | 3,179 | 226 | 126 | 18 | 267 | 23 | 36 | 14 | 18 | 18 | 23 | 17 | 11 | 18 | 4 |
| Cambodia | C | 251 | 180 | 85 | 72 | 54 | 38 | 22 | 51 | 33 | 22 | 92 | 43 | 102 | 51 | 34 |
| Cochin-China | C | 469 | 178 | 100 | 113 | 295 | 178 | 113 | 153 | 206 | 217 | 245 | 277 | 316 | 240 | 140 |
| Laos | C | 246 | 67 | 10 | | | | | | | | | | | | |
| Tonkin | C | 1,297 | 1 | | 2 | 1 | | | | | | | 1 | 4 | 1 | 9 |
| Kwangchow-Wan | C | 16 | | | | | | | | | | | | | | |

## PLAGUE

[C indicates cases; D, deaths; P, present]

| Place | | Sept. 25-Oct. 22, 1927 | Oct. 23-Nov. 19, 1927 | Nov. 20-Dec. 17, 1927 | Dec. 18, 1927-Jan. 14, 1928 | Jan. 15-Feb. 11, 1928 | Feb. 12-Mar. 10, 1928 | Week ended— March, 1928 | | | April, 1928 | | | | May, 1928 | | | | June 2, 1928 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 17 | 24 | 31 | 7 | 14 | 21 | 28 | 5 | 12 | 19 | 26 | |
| Algeria (see also table below): | | | | | | | | | | | | | | | | | | | |
| Algiers | C | | | | | | | | | | | | | | 1 | | | | |
| Oran | C | | 2 | | | | | | | | | | | | | | | | |
| Arabia: Aden | C | | | | 19 | 178 | 343 | 189 | 148 | 151 | 163 | 108 | 59 | 53 | 13 | 5 | 1 | | |
| | D | | | | 7 | 104 | 206 | 134 | 135 | 134 | 126 | 97 | 48 | 16 | 16 | 7 | 1 | | |
| Plague-infected rats | | | | | | P | P | | | | | | | | | | | | |
| Argentina: | | | | | | | | | | | | | | | | | | | |
| Bahia Blanca district | C | | | 3 | | | | | | | | | | | | | | | |
| Buenos Aires [1] | C | | | | | 2 | | | | | | | | | | (1) | 6 | | |
| | D | | | | | | | | | | | | | | | | 3 | | |
| Cordoba Province | C | P | P | 10 | 2 | | | | | | | 5 | | | | | | | |
| Firmat | C | | | 1 | | | | | | | | | | | | | | | |
| Loreto | C | | | | | | | | | | | | | | | | | | 3 |
| Quilino | C | | | 3 | | | | | | | | | | | | | | | |
| Rosario | C | | | 4 | 5 | 4 | 1 | | | | | | | | | | | | |
| Santiago Province | | | | | | | 1 | | | | | | | | | | | | |
| Suardi | C | | | | | | | | | | | | | | | | | | 2 |
| Ucacha | C | | | 1 | | | | | | | | | | | | | | | |

[1] Six cases of plague reported in Buenos Aires, Argentina, before May 14, 1928.

## CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

### PLAGUE—Continued

[C indicates cases; D, deaths; P, present]

| Place | | Sept. 25–Oct. 22, 1927 | Oct. 23–Nov. 19, 1927 | Nov. 20–Dec. 17, 1927 | Dec. 18, 1927–Jan. 14, 1928 | Jan. 15–Feb. 11, 1928 | Feb. 12–Mar. 10, 1928 | Week ended— March, 1928: 17 | 24 | 31 | April, 1928: 7 | 14 | 21 | 28 | May, 1928: 5 | 12 | 19 | 26 | June 2, 1928 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Azores: St. Michaels Island | C | 3 | 3 | 3 | 2 | 8 | 3 | 1 | 1 | | 1 | | 2 | | | | | | |
| | D | 1 | | 1 | 1 | 4 | 1 | 1 | | | 1 | | 1 | | | | | | |
| Brazil: | | | | | | | | | | | | | | | | | | | |
| Bahia | C | | | | 4 | 5 | 8 | | | P | 2 | 1 | | | | | | | |
| | D | | | | 4 | 4 | 5 | | | | | | | | | | | | |
| Porto Alegre | C | | | | | | 2 | | | | | | | | | | | | |
| Rio de Janeiro | C | | | | | 4 | 3 | 2 | 1 | | | | | | | | | | |
| | D | | | | | 1 | 2 | 2 | 1 | | | | | | | | | | |
| Plague-infected rats | | | | | | 1 | | | | | | | | | | | | | |
| British East Africa (see also table below): | | | | | | | | | | | | | | | | | | | |
| Tanganyiki | C | P | P | P | P | 2 | 3 | | | | | | | | | | | | |
| | D | | | | | 2 | 3 | | | | | 5 | | | | | | | |
| Uganda | C | 99 | 99 | 67 | 79 | 23 | 13 | | | | | | | | | | | | |
| | D | 88 | 96 | 61 | 64 | 18 | 10 | | | | | | | | | | | | |
| Canary Islands: | | | | | | | | | | | | | | | | | | | |
| Arrecife | C | | | | | | | | | | | | | | | | 1 | | |
| | D | | | | | | | | | | | | | | | | 1 | | |
| Las Palmas | C | 9 | | 3 | 3 | 1 | 1 | 2 | | 2 | | | | | | | | | |
| | D | | | 1 | 1 | 1 | 1 | | | | | | | | | | | | |
| Teneriffe | C | | | | | | 10 | | | | | | | | | | | | |
| | D | | | | | | 4 | | | | | | | | | | | | |
| Ceylon: Colombo | C | 1 | | 6 | 7 | 3 | 11 | 3 | | 4 | | | | | 1 | 1 | 2 | | |
| | D | | | 6 | 6 | 2 | 6 | 3 | | 2 | | | | | 1 | 1 | 1 | | |
| Plague-infected rats | | | 3 | | 2 | 5 | 6 | | | | | | | | | | | | |
| China: | | | | | | | | | | | | | | | | | | | |
| Hong Kong | C | | | | | | | | | | | | | | 1 | | | | |
| Tungliao | D | 95 | | | | | | | | | | | | | | | | | |
| Dutch East Indies: | | | | | | | | | | | | | | | | | | | |
| Balik-Papan | C | | | | 1 | | | | | | | | | | | | | | |
| | D | | | | 1 | | | | | | | | | | | | | | |
| Celebes—Makassar | C | | 6 | 2 | 6 | 5 | 1 | | | | | | | | | | | | |
| | D | | 6 | 2 | 5 | 5 | 1 | | | | | | | | | | | | |
| Java | D | 779 | 829 | 1,017 | 754 | 737 | 454 | | | | | | | | | | | | |
| Batavia and West Java | C | 130 | 132 | 154 | 128 | 137 | 103 | 19 | 18 | 17 | 26 | 13 | | | | | | | |
| | D | 129 | 132 | 152 | 128 | 135 | 103 | 19 | 18 | 17 | 26 | 13 | | | | | | | |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cheribon | C | | | 1 | | | | | | | | | | | | | | | |
| | D | | | 1 | | | | | | | | | | | | | | | |
| Plague-infected rats | | | | | | | | 1 | | 1 | 1 | 1 | 3 | 2 | 1 | 1 | 1 | | |
| East Java and Madura | C | 17 | 10 | 8 | 7 | 7 | | 1 | 1 | 2 | | | | | | | | | |
| | D | 17 | 10 | 8 | 7 | 7 | | 1 | 1 | 2 | | | | | | | | | |
| Pasoeroean Residency | C | | | P | | | | | | | | | | | | | | | |
| Surabaya Residency | C | | | P | | | | | | 1 | | | | | 1 | | | | |
| | D | | | | | | | | | 1 | | | | | 1 | | | | |
| Surakarta Residency | C | | P | P | | | | | | | | | | | | | | | |
| Ecuador: Guayaquil (see table below). | | | | | | | | | | | | | | | | | | | |
| Egypt: | | | | | | | | | | | | | | | | | | | |
| Alexandria | C | | | 12 | 5 | 2 | 1 | | | | | | | | | | | | |
| | D | | | 7 | 2 | 2 | 1 | | | | | | | | | | | | |
| Beni-Souef | C | | | | | | | | | | | | | 4 | 8 | 4 | 14 | 34 | 17 |
| | D | | | | | | | | | | | | | 1 | 2 | 4 | 6 | 8 | 5 |
| Cairo | C | | | | 2 | | | | | | | | | | | | | | |
| | D | | | | 2 | | | | | | | | | | | | | | |
| Maghagha District | C | | | | | | | | | | | | 1 | | | | | | |
| | D | | | | | | | | | | | | 1 | | | | | | |
| Menufia | C | | | | | | | | | | | | | | | | | 6 | 5 |
| | D | | | | | | | | | | | | | | | | | | 2 |
| Minieh Province | C | | | | | | | | | | | | 32 | 9 | 7 | 13 | 15 | 36 | 12 |
| | D | | | | | | | | | | | | 5 | 4 | | 5 | 2 | 9 | 1 |
| Suez | C | | | | 1 | 4 | 13 | | 4 | 7 | 3 | | 3 | 2 | | | 1 | 2 | |
| | D | | | | 1 | 2 | 9 | | 2 | 3 | 4 | | 2 | 2 | | | 1 | | |
| Plague-infected rats | | | | | | | | | 2 | | | | | | | | | | |
| Tanta | C | | | | | | | | | | | | | | | | 1 | | |
| | D | | | | | | | | | | | | | | | | 1 | | |
| Greece: | | | | | | | | | | | | | | | | | | | |
| Athens and Piræus | C | 1 | | | 3 | | | | | | | | | | | | | | |
| | D | 1 | | | 1 | | | | | | | | | | | | | | |
| Mitylene | C | 1 | 3 | 3 | | | | | | | | | | | | | | | |
| Patras | C | 1 | 1 | | | | | | | | | | | | | | | | |
| | D | 1 | 1 | | | | | | | | | | | | | | | | |
| Hawaii Territory: Hawaii | D | | | | | | 1 | | | | | | | | | | | | |
| India | C | 3,246 | 3,600 | 5,518 | 7,097 | 12,652 | 23,174 | 7,517 | 6,077 | 6,634 | 5,851 | 6,690 | | | | | | | |
| | D | 1,792 | 2,065 | 3,269 | 4,925 | 8,521 | 16,998 | 6,031 | 4,724 | 5,372 | 4,780 | 5,911 | | | | | | | |
| Bassein | D | 8 | 4 | 4 | 17 | 8 | 12 | 5 | 5 | 7 | 5 | 4 | 5 | 1 | 3 | 2 | 1 | | |
| Bombay | C | 4 | | | 3 | 14 | 33 | 4 | 16 | 28 | 21 | 17 | | | | | | | |
| | D | 3 | | | 3 | 9 | 33 | 4 | 11 | 25 | 21 | 15 | 14 | 19 | 21 | 17 | 14 | | |
| Calcutta | C | | | | 2 | | | | | | | | | | | | | | |
| | D | | | | | 1 | | | | | 2 | | | | | | | | |
| Madras Presidency | C | 583 | 470 | 791 | 550 | 452 | 271 | 25 | 19 | 13 | 5 | | | | | | | | |
| | D | 298 | 282 | 359 | 206 | 256 | 212 | 18 | 16 | 9 | 5 | | | | | | | | |
| Rangoon | C | 11 | 11 | 15 | 17 | 35 | 48 | 5 | 11 | 3 | 11 | 5 | 2 | | | | | | |
| | D | 11 | 11 | 15 | 16 | 30 | 43 | 4 | 9 | 5 | 8 | 5 | 1 | 3 | 5 | 3 | | | |
| Indo-China (see also table below): | | | | | | | | | | | | | | | | | | | |
| Saigon | C | | 1 | | | | | | | | | | | | | | | | |
| Iraq: | | | | | | | | | | | | | | | | | | | |
| Baghdad | C | | | | | 4 | 2 | 2 | 2 | 1 | | 1 | 4 | 4 | 2 | 4 | 3 | 4 | 2 |
| | D | | | | | 2 | 2 | 2 | 2 | 1 | | 1 | | 4 | 1 | | 1 | 1 | 1 |
| Dulaim Liwa | C | | | | | 1 | | | | | | 1 | | | | | | | |

# CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

## PLAGUE—Continued

[C indicates cases; D, deaths; P, present]

| Place | | Sept. 25–Oct. 22, 1927 | Oct. 23–Nov. 19, 1927 | Nov. 20–Dec. 17, 1927 | Dec. 18, 1927–Jan. 14, 1928 | Jan. 15–Feb. 11, 1928 | Feb. 12–Mar. 10, 1928 | Week ended— March, 1928 17 | March, 1928 24 | March, 1928 31 | April, 1928 7 | April, 1928 14 | April, 1928 21 | April, 1928 28 | May, 1928 5 | May, 1928 12 | May, 1928 19 | May, 1928 26 | June 2, 1928 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Kwangchow-Wan (see table below) | | | | | | | | | | | | | | | | | | | |
| Madagascar (see table below) | | | | | | | | | | | | | | | | | | | |
| Mauritius (see table below) | | | | | | | | | | | | | | | | | | | |
| Nigeria (see also table below): | | | | | | | | | | | | | | | | | | | |
| Lagos | C | | 17 | 13 | 10 | 10 | 8 | 2 | | 2 | 3 | 2 | 6 | 7 | 2 | | | | |
| | D | | 17 | 13 | 8 | 11 | 8 | 2 | | 2 | 3 | 1 | 7 | 7 | 2 | | | | |
| Peru (see table below) | | | | | | | | | | | | | | | | | | | |
| Senegal (see table below): | | | | | | | | | | | | | | | | | | | |
| Baol | C | 95 | P | P | | | | | | | | | | | | | | | |
| | D | 40 | | | | | | | | | | | | | | | | | |
| Cayor | C | 176 | 48 | | | | | | | | | | | | | | | | |
| | D | 88 | 28 | | | | | | | | | | | | | | | | |
| Dakar | C | 1 | | | | | | | | | | | | | | | | | |
| Louga | C | 8 | | | | | | | | | | | | | | | | | |
| Thies and vicinity | C | 1 | 1 | | | | | | | 8 | | | | | | | | | |
| | D | | | | | | | | | 4 | | | | | | | | | |
| Siam | C | 13 | 1 | 3 | 16 | 20 | 42 | 7 | 8 | 13 | 5 | 6 | 11 | 5 | | | | | |
| | D | 9 | | 2 | 11 | 12 | 36 | 6 | 9 | 10 | 5 | 4 | | 5 | | | | | |
| Bangkok | C | 2 | | | 1 | 2 | 1 | | | 1 | | | 3 | 1 | | | | | |
| | D | | 1 | | 1 | 2 | 1 | | | 1 | | | 2 | | | | | | |
| Straits Settlements: Singapore | C | | 1 | | | 1 | 3 | | 1 | | | | | | | | | | |
| | D | | 1 | | | 1 | 2 | | 1 | | | | | | | | | | |
| Syria (see table below) | | | | | | | | | | | | | | | | | | | |
| Tunisia [2] | | | | | | | | | | | | | | | | | | | |
| Turkey: Constantinople | C | 1 | | 2 | | | | | | | | | | | | | | | |
| | D | 1 | | 1 | | | | | | | | | | | | | | | |
| Union of South Africa: | | | | | | | | | | | | | | | | | | | |
| Cape Province | C | | 2 | 2 | | 1 | | | | | | | | | | | | | |
| | D | | 2 | 1 | | 1 | | | | | | | | | | | | | |
| Orange Free State | C | | 1 | 8 | | 5 | 5 | 3 | 2 | | | | | | | | | | |
| | D | | 1 | 6 | | 4 | 1 | 3 | 2 | | | | | | | | | | |
| Union of Soviet Socialist Republics: | | | | | | | | | | | | | | | | | | | |
| Chita district | C | 1 | | | | | | | | | | | | | | | | | |
| | D | 1 | | | | | | | | | | | | | | | | | |
| Northern Caucasus | C | 1 | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Venezuela: State of Miranda—Tacata and Cua | C | ... | ... | ... | ... | ... | P | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| On vessel: | | | | | | | | | | | | | | | | | | | |
| S. S. Cadwallen, at La Plata, from Rosario, Argentina | C | ... | ... | ... | 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| S. S. Aghios Gerasimos, at Vigo, Spain | C | ... | 3 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |

| Place | | July-September, 1927 | October-December, 1927 | January, 1928 | February, 1928 | March, 1928 | April, 1928 | May, 1928 |
|---|---|---|---|---|---|---|---|---|
| Algeria (see also table above): | | | | | | | | |
| Algiers | C | ... | 2 | ... | ... | ... | ... | 1 |
| Angola | C | ... | 3 | ... | ... | ... | ... | ... |
| British East Africa (see also table above): | | | | | | | | |
| Kenya | C | 95 | 62 | 26 | 24 | 19 | ... | ... |
| Ecuador: Guayaquil | C | 15 | 18 | 4 | 6 | 10 | ... | ... |
| | D | ... | 5 | 4 | 3 | 1 | ... | ... |
| Plague-infected rats | | 34 | 31 | 23 | 31 | 21 | ... | ... |
| Indo-China (French) (see also table above) | C | 14 | 10 | 7 | ... | 5 | 9 | ... |
| Kwangchow-Wan | C | ... | ... | ... | ... | 18 | 17 | ... |
| Madagascar | C | 314 | 692 | 427 | 342 | 171 | ... | ... |
| | D | 286 | 605 | 388 | 317 | 159 | ... | ... |
| Ambositra Province | C | 7 | 25 | 105 | 67 | 30 | ... | ... |
| | D | 7 | 17 | 96 | 66 | 29 | ... | ... |
| Antsirabe Province | C | 39 | 109 | 117 | 108 | 56 | ... | ... |
| | D | 38 | 108 | 117 | 108 | 54 | ... | ... |

| Place | | July-September, 1927 | October-December, 1927 | January, 1928 | February, 1928 | March, 1928 | April, 1928 | May, 1928 |
|---|---|---|---|---|---|---|---|---|
| Madagascar—Continued. | | | | | | | | |
| Itasy Province | C | 36 | 104 | 33 | 19 | 3 | ... | ... |
| | D | 41 | 94 | 29 | 17 | 3 | ... | ... |
| Moramanga Province | C | 12 | 95 | 19 | 25 | 12 | ... | ... |
| | D | 12 | 83 | 19 | 24 | 12 | ... | ... |
| Tananarive Province | C | 211 | 408 | 155 | 123 | 70 | ... | ... |
| | D | 189 | 354 | 129 | 102 | 61 | ... | ... |
| Mauritius | C | 1 | ... | ... | ... | ... | ... | ... |
| Nigeria (see also table above) | C | 32 | 63 | 16 | 16 | ... | ... | ... |
| | D | 29 | 61 | 16 | 16 | ... | ... | ... |
| Peru | C | 34 | 34 | ... | 41 | 52 | ... | ... |
| | D | 19 | 11 | ... | 14 | 9 | ... | ... |
| Callao | D | 3 | 3 | ... | ... | ... | ... | ... |
| Lima | C | ... | 7 | 6 | ... | ... | ... | ... |
| | D | ... | 3 | ... | ... | ... | ... | ... |
| Senegal (see also table above) | C | ... | ... | 5 | 17 | 8 | 81 | 14 |
| | D | ... | ... | ... | 13 | 4 | 40 | 5 |
| Syria: Beirut | C | ... | 2 | ... | ... | ... | ... | ... |

## PLAGUE RATS ON VESSELS

S. S. *Modemi* at Goteborg, Sweden, from Bahia and Buenos Aires via Cape Verde Islands, Dec. 22, 1927.
S. S. *Gydavore* at Landskrona, Sweden, from Rosario via Canary Islands, Jan. 22, 1928.
S. S. *Dryden* at Liverpool from La Plata River ports, Jan. 20, 1928.

[9] 8 cases of plague with 6 deaths were reported in Bengardane region, Tunisia, Mar. 17 to 27, 1928.

## CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

### SMALLPOX

[C indicates cases; D, deaths; P, present]

| Place | | Sept. 25–Oct. 22, 1927 | Oct. 23–Nov. 19, 1927 | Nov. 20–Dec. 17, 1927 | Dec. 18, 1927–Jan. 14, 1928 | Jan. 15–Feb. 11, 1928 | Feb. 12–Mar. 10, 1928 | Week ended— March, 1928 17 | March 24 | March 31 | April, 1928 7 | April 14 | April 21 | April 28 | May, 1928 5 | May 12 | May 19 | May 26 | June 2, 1928 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Algeria (see also table below) | C | 683 | 661 | 170 | 129 | 71 | 72 | 3 | | | | 12 | | | | | | | |
| Algiers | C | | | 3 | 9 | 15 | 10 | | 2 | 2 | 1 | | 2 | | 2 | | | | |
| Oran | C | 11 | 20 | 39 | 29 | 11 | 5 | | 2 | 10 | | 3 | 1 | 2 | 11 | | | | |
| Angola (see table below). | | | | | | | | | | | | | | | | | | | |
| Arabia: Aden | C | | 1 | 3 | 1 | | 1 | | | | | | | | | | | | |
| Brazil (see also table below): | | | | | | | | | | | | | | | | | | | |
| Rio de Janeiro | C | | 1 | | | | | 1 | | | | | | | | | | | |
| | D | | 1 | | | | | 1 | | | | | | | | | | | |
| British East Africa (see also table below): | | | | | | | | | | | | | | | | | | | |
| Kenya—Mombasa | C | | | | | | | | 1 | | 1 | | | | | | | | |
| Tanganyiki | D | P | P | P | 8 | 5 | | | | | | | | | | | | | |
| British South Africa: | | | | | | | | | | | | | | | | | | | |
| Northern Rhodesia | C | 164 | 185 | 252 | 236 | 233 | 297 | | 54 | 8 | 5 | 26 | 7 | 4 | | | | | |
| | D | 11 | 64 | 62 | 31 | 23 | 42 | | 9 | | | 1 | 1 | 1 | | | | | |
| Southern Rhodesia | C | | 3 | 2 | 1 | 3 | 7 | 4 | 1 | 2 | | 21 | 3 | | | | | | |
| | D | | | | | | 1 | | | | | 10 | | | | | | | |
| Canada: | | | | | | | | | | | | | | | | | | | |
| Alberta | C | 23 | 10 | 10 | 11 | 27 | 10 | 7 | 20 | 7 | 13 | 4 | 2 | 3 | 3 | 13 | | 5 | |
| Calgary | C | | | | | | | 1 | | | | | | | | | | | |
| Edmonton | C | 1 | 1 | 8 | 5 | 3 | 13 | 1 | 11 | 1 | 7 | 2 | | | 1 | 12 | 10 | | |
| British Columbia—Vancouver | C | | | 4 | 8 | 26 | 10 | 2 | 5 | 6 | 4 | 11 | 6 | 1 | 6 | 4 | 2 | | |
| Manitoba | C | 7 | 19 | 7 | 11 | 1 | | | | | | | | | 7 | | | | |
| Winnipeg | C | 2 | 2 | 2 | 2 | 2 | | | | | | | | | | | | | |
| New Brunswick | C | | | | 1 | | 1 | | | | | | | | | | 1 | | |
| Nova Scotia: | | | | | | | | | | | | | | | | | | | |
| Halifax | C | 1 | | | | | | | | | | | | | | | | | |
| Ontario | C | 96 | 264 | 347 | 212 | 243 | 147 | 19 | 35 | 20 | 9 | 6 | 18 | 18 | 8 | 15 | | | |
| Hamilton | C | | | 2 | | | | | | | | | | | | | | | |
| Kingston | C | | 1 | | 1 | 1 | | | | | | 2 | | 1 | | | | | |
| Ottawa | C | 67 | 134 | 63 | 60 | 68 | 22 | 6 | 8 | 10 | 2 | | 3 | 1 | | 4 | 2 | | |
| Toronto | C | 10 | 34 | 39 | 28 | 20 | 14 | 2 | 3 | 3 | 1 | 2 | 4 | 4 | 1 | 2 | 7 | | |
| Windsor | C | 9 | | | | | | | | | | | | | | | | | |
| Quebec | C | 8 | 25 | 16 | 44 | 26 | 42 | 22 | 40 | 35 | 15 | 20 | 25 | 4 | 33 | 13 | 25 | 15 | |
| Montreal | C | | 1 | | 8 | 8 | 9 | 6 | 3 | | | | 6 | 2 | 1 | | | | |
| Quebec | C | | | 4 | 5 | 5 | 11 | 3 | 4 | 4 | 5 | 4 | | | 9 | 6 | 17 | | |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Riviere du Loup | C | | 3 | | | | | | | | | | | | | | | | |
| Sherbrooke | C | | | | | | | | | 3 | | | | | | | | | |
| Saskatchewan | C | 31 | 34 | 58 | 52 | 97 | 22 | 14 | 7 | | 12 | 2 | 23 | 15 | 12 | 12 | | | |
| Moose Jaw | C | 3 | | 1 | 4 | 11 | 13 | 2 | 5 | | | 3 | | | | | 1 | | |
| Regina | C | 5 | 1 | 1 | | | | | | 1 | 2 | 3 | 2 | | 3 | 1 | | | |
| Saskatoon | C | | | 2 | 4 | 15 | 2 | | | | | | | | | | | | |
| Ceylon: Colombo | C | | 1 | 2 | | 4 | 6 | | | | 1 | | | | | | | | |
| | D | | | 1 | | 1 | | | 1 | | | | | | | | | | |
| China: | | | | | | | | | | | | | | | | | | | |
| Amoy | C | | | | | | 1 | 1 | 2 | 1 | 2 | 3 | 2 | 1 | | 1 | | | |
| Antung | C | | | | 1 | | | | | | | | 1 | | 2 | | | | |
| Canton | C | | | | | | 2 | 3 | 2 | | 2 | 1 | | | | 1 | | 1 | |
| Chefoo | C | P | | P | | | | P | | | | | | | | | | | |
| | D | | | | | | 1 | | | | | | | | | | | | |
| Foochow | C | P | P | P | P | P | P | | | | P | P | P | P | P | | | | |
| Hong Kong | C | | | | 1 | 2 | 7 | 5 | 7 | 10 | 10 | 4 | 4 | 9 | 8 | 8 | 10 | | |
| | D | | | | 1 | 2 | 4 | | 2 | 5 | 12 | 7 | 2 | 10 | 7 | 11 | 5 | | |
| Manchuria— | | | | | | | | | | | | | | | | | | | |
| Changchun | C | | | 1 | | 4 | | | | | | 2 | | 1 | 1 | 3 | | | |
| Dairen | C | 1 | 2 | 1 | 5 | 15 | 13 | 1 | 3 | 5 | 6 | 7 | 3 | 6 | | 12 | 10 | | |
| | D | 1 | | | | 8 | 7 | | 3 | 5 | | | | | | | | | |
| Fushun | C | | 1 | | | | | | | | | | | | | | | | |
| Harbin | C | | | 2 | 1 | 5 | 7 | 2 | 3 | | 2 | 2 | 3 | 2 | | | | | |
| Mukden | C | 2 | 1 | | | 4 | 21 | | | 1 | | | 3 | 1 | | | | | |
| Pensihu | C | 1 | | | | | | | | | | | | | | | | | |
| Shanghai— | | | | | | | | | | | | | | | | | | | |
| Foreigners only | C | | | | | 5 | 6 | 1 | 1 | 3 | 2 | | 1 | 1 | 1 | | | | |
| Including natives | D | | | | | 11 | 19 | 2 | 1 | 3 | 3 | 3 | 1 | 3 | 2 | 1 | 7 | | |
| Tientsin | C | 13 | 8 | 9 | 8 | 48 | 20 | 4 | 3 | 3 | 3 | 9 | 1 | | | | | | |
| Chosen (see table below) | | | | | | | | | | | | | | | | | | | |
| Curacao (alastrim) | C | | | | | 2 | 3 | | | | | | | | | | | | |
| Dominican Republic: Santo Domingo | C | | | | | | | 2 | | | | | | 1 | | | | | |
| Dutch East Indies: | | | | | | | | | | | | | | | | | | | |
| Borneo— | | | | | | | | | | | | | | | | | | | |
| Pontianak | C | | | | | | 1 | | | | | | | | | | | | |
| Samarinda district | C | | P | | | | | | | | | | | | | | | | |
| Java— | | | | | | | | | | | | | | | | | | | |
| Batavia and West Java | C | 4 | 25 | | | 4 | 2 | 4 | | | 1 | 1 | | | | | | | |
| | D | | 15 | | | | | | | | | | | | | | | | |
| East Java and Madura | C | 8 | 9 | 9 | 5 | 2 | 9 | | | | | | | | | | | | |
| | D | 1 | | | | | 1 | | | | | | | | | | | | |
| Sumatra—Medan | C | | | 3 | 9 | 23 | 14 | 6 | | | 1 | 2 | | | | | | | |
| | D | | | 2 | 3 | 11 | 2 | 4 | | | 1 | 2 | | | | | | | |
| | D | 1 | | 1 | | | | | | | 33 | 6 | | | | | | | |
| Ecuador (see table below) | | | | | | | | | | | | | | | | | | | |
| Egypt | C | | | 4 | 4 | 1 | 2 | | | | 52 | 11 | | | | | | | |
| | D | 1 | | 1 | | | | | | | 33 | 6 | | | | | | | |
| Cairo | C | | | 2 | | 1 | | | | | | | | | | | | | |
| France (see table below) | | | | | | | | | | | | | | | | | | | |
| Gold Coast (see table below) | | | | | | | | | | | | | | | | | | | |

## CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

### SMALLPOX—Continued

[C indicates cases; D, deaths; P, present]

| Place | | Sept. 25–Oct. 22, 1927 | Oct. 23–Nov. 19, 1927 | Nov. 20–Dec. 17, 1927 | Dec. 18, 1927–Jan. 14, 1928 | Jan. 15–Feb. 11, 1928 | Feb. 12–Mar. 10, 1928 | Week ended— March, 1928 17 | 24 | 31 | April, 1928 7 | 14 | 21 | 28 | May, 1928 5 | 12 | 19 | 26 | June 2, 1928 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Great Britain: | | | | | | | | | | | | | | | | | | | |
| England and Wales | C | 473 | 902 | 1,041 | 1,175 | 1,530 | 1,473 | 359 | 342 | 322 | 318 | 321 | 326 | 376 | 321 | | 336 | | |
| Birmingham | C | 1 | | | | 44 | 3 | 1 | | | | 1 | | | | | | | |
| Bradford | C | | 11 | 19 | 32 | 24 | 12 | 9 | | 5 | 5 | 3 | 2 | 7 | 2 | 2 | 7 | | |
| Bristol | C | 6 | 4 | 8 | | 3 | 4 | | 2 | 8 | 2 | 1 | 10 | 1 | 5 | 4 | 1 | | |
| Cardiff | C | | 1 | | 1 | | | | | 5 | | | | 1 | 2 | | 1 | | |
| Castleford | C | | | | | | 4 | 2 | 16 | 7 | 11 | 27 | 11 | 20 | 11 | | 6 | | |
| Leeds | C | 7 | 5 | 16 | 11 | 3 | 9 | 3 | 5 | 3 | 3 | 2 | 2 | 1 | 1 | | | | |
| Liverpool | C | | | | 1 | | 1 | | | | | | | | | | | | |
| London | C | | | | | 4 | 14 | 10 | 5 | 1 | 1 | 7 | 5 | 3 | 27 | | 10 | | |
| Manchester | C | 3 | 6 | 25 | 5 | 25 | 8 | 4 | 3 | 3 | 4 | 2 | 4 | 2 | | 1 | 1 | | |
| Newcastle on Tyne | C | 6 | 9 | 55 | 22 | 27 | 12 | 3 | 4 | | 2 | | | 4 | | 1 | 6 | | |
| Nottingham | C | | | | 13 | 27 | 11 | 5 | 1 | 6 | 1 | 4 | 4 | 6 | 3 | | 10 | | |
| Sheffield | C | 10 | 6 | 9 | 14 | 8 | 6 | | | | 1 | | 10 | 2 | 2 | 2 | | | |
| Stoke on Trent | C | | | | 4 | 1 | 15 | 11 | | | 1 | 4 | 10 | 5 | 13 | 9 | 8 | | |
| Greece (see table below) | | | | | | | | | | | | | | | | | | | |
| India | C | 3,153 | 4,052 | 6,731 | 10,676 | 17,777 | 18,850 | 6,004 | 6,169 | 8,101 | 7,760 | 8,789 | | | | | | | |
| | D | 715 | 927 | 1,650 | 2,429 | 3,709 | 3,826 | 1,212 | 1,207 | 1,500 | 1,621 | 1,988 | | | | | | | |
| Bassein | C | | | | | 1 | | | | | | | | | 1 | | | | |
| Bombay | C | 10 | 4 | 9 | 14 | 61 | 149 | 49 | 58 | 62 | 49 | 56 | 57 | 54 | 33 | 46 | 37 | | |
| | D | 2 | 3 | 2 | | 24 | 73 | 24 | 33 | 36 | 27 | 32 | 34 | 27 | 25 | 25 | 22 | | |
| Calcutta | C | 5 | 5 | 25 | 36 | 58 | 71 | 20 | 29 | 45 | 40 | 49 | 51 | 31 | 40 | 41 | 29 | | |
| | D | 6 | 2 | 11 | 27 | 34 | 50 | 15 | 21 | 33 | 35 | 32 | 42 | 21 | 35 | 30 | 26 | | |
| Karachi | C | | | | | | 1 | 1 | | | | | | | | | | | |
| | D | | | | | | 1 | | | | | | | | | | | | |
| Madras | C | 8 | 7 | 11 | 21 | 74 | 100 | 30 | 27 | 45 | 81 | 49 | 36 | 60 | 24 | 17 | 22 | | |
| | D | | 2 | 3 | 6 | 8 | 19 | 5 | 3 | 6 | 15 | 16 | 8 | 7 | 7 | 5 | 5 | | |
| Negapatam | C | | | | 5 | 8 | 3 | | | | | 1 | | 5 | 1 | 3 | 4 | | |
| | D | | | | 3 | 3 | | | | | | 1 | | 2 | | | 1 | | |
| Rangoon | C | 17 | 6 | 14 | 136 | 275 | 377 | 96 | 82 | 92 | 50 | 62 | 45 | 37 | 23 | 15 | 2 | | |
| | D | 3 | 1 | 4 | 31 | 64 | 104 | 28 | 17 | 34 | 23 | 24 | 17 | 12 | 16 | 4 | 2 | | |
| Vizagapatam | C | | | | 3 | 10 | 2 | | | 3 | | | 2 | | | | | | |
| | D | | | | | 8 | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| India (French): | | | | | | | | | | | | | | | | | | | |
| Karikal | C | 2 | P | | | | | | | | | | | | | | | | |
| | D | 2 | | | | | | | | | | | | | | | | | |
| Pondicherry | C | 38 | 42 | 41 | 65 | 47 | 9 | | 6 | 5 | 7 | 12 | | 15 | 9 | 16 | | | |
| | D | 38 | 42 | 41 | 50 | 47 | 9 | | 6 | 5 | 7 | 12 | | 15 | 9 | 16 | | | |
| Indo-China (see also table below): | | | | | | | | | | | | | | | | | | | |
| Saigon | C | | | 1 | 3 | | 3 | | | | | | | | | | | | |
| Iraq: | | | | | | | | | | | | | | | | | | | |
| Baghdad | C | 7 | 5 | 25 | 23 | 19 | 7 | 3 | 1 | | 1 | 1 | 3 | | 1 | 6 | | | |
| | D | 4 | 4 | 14 | 12 | 11 | 4 | 3 | 1 | | | 1 | 1 | | 1 | 1 | | | |
| Basra | C | 2 | 3 | 4 | 2 | 1 | 7 | 4 | 1 | | | | | 1 | | | 1 | | |
| | D | 2 | 1 | 3 | 1 | | | 1 | 1 | | | | | 1 | | | 1 | | |
| Italy: | | | | | | | | | | | | | | | | | | | |
| Leghorn | C | | | | | | 1 | 1 | | | | | | | | | | | |
| Palermo | C | | | | | | | | | 3 | 2 | 1 | 3 | 3 | | | | | |
| Rome and vicinity | C | | | | | 3 | | | | | | | | | | | | | |
| Jamaica (outside Kingston) (alastrim) | C | 9 | 7 | 3 | 2 | 5 | 10 | 3 | 2 | 1 | 7 | | 1 | 2 | 1 | | | | |
| Kingston (alastrim) | C | 2 | | | | | | | | | | | | | | | | | |
| Japan: | | | | | | | | | | | | | | | | | | | |
| Kobe | C | | | | | | | | | | | | | | | | 6 | | |
| Tokyo | C | | | | | 4 | 4 | 1 | 3 | 1 | 10 | 8 | | | | | | | |
| | D | | | | | 1 | 2 | | | | 1 | 1 | | | | | | | |
| Tokyo Prefecture | C | | | | | | | | 17 | 5 | 2 | 1 | | | | | | | |
| | D | | | | | | | | | | 1 | 1 | 1 | | | | | | |
| Yokohama | C | | | | | | | | | | | | | 1 | | | | | |
| Latvia (see table below) | | | | | | | | | | | | | | | | | | | |
| Mauretania | C | | | | | | P | | | | | | | | | | | | |
| Mexico (see also table below): | | | | | | | | | | | | | | | | | | | |
| Acapulco | C | | 1 | | | | | | | | | | | | | | | | |
| | D | | 1 | | | | | | | | | | | | | | | | |
| Chihuahua | D | | | | 1 | | | | | | | | | | | | | | |
| Jalisco (State) | C | | | | | | P | P | P | P | P | P | P | P | | | | | |
| Guadalajara | D | | | 2 | | | 1 | | | | 2 | 2 | 1 | 4 | 5 | 7 | 4 | | |
| Manzanillo | D | | | | 1 | | | 1 | | | | | | | | | | | |
| Mazatlan | D | | | | | | | | | | | | | | | | 2 | | |
| Mexico City and surrounding territory | C | | | 4 | | 2 | 2 | | | | | | | 1 | | 1 | | | |
| Saltillo | D | | | | | | | | | | | | | | | 1 | 1 | | |
| Tampico | C | | | | | | 1 | | | | | | | | | | | | |
| Torreon | D | 2 | | | | | | | | | | | | | | | | | |
| Morocco (see table below) | | | | | | | | | | | | | | | | | | | |
| Nigeria (see also table below): | | | | | | | | | | | | | | | | | | | |
| Lagos | C | | | | | | | | | | 1 | | | | | | | | |
| Southern Provinces | C | | | | | | 7 | | 40 | 26 | 27 | | | | | | | | |
| | D | | | | | | | | 28 | 1 | 6 | | | | | | | | |
| Palestine: Jerusalem | C | | | 1 | | 1 | | | | | | | | | | | | | |
| | D | | | | | 1 | | | | | | | | | | | | | |
| Persia (see table below). | | | | | | | | | | | | | | | | | | | |
| Poland | C | | | 1 | 6 | 3 | 1 | 1 | | | | | 5 | 2 | | | | | |
| | D | | | | | | | | | | | | 1 | | | | | | |
| Portugal (see also table below): | | | | | | | | | | | | | | | | | | | |
| Lisbon | C | 8 | 4 | 10 | 12 | 12 | 20 | | | 2 | 3 | | 3 | 2 | 1 | | | | |
| | D | | | 1 | | | 1 | | | | | | | | | | | | |
| Oporto | C | | | | | | | | | | | | | 1 | | | | | |

## CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

### SMALLPOX—Continued

[C indicates cases; D, deaths; P, present]

| Place | | Sept. 25–Oct. 22, 1927 | Oct. 23–Nov. 19, 1927 | Nov. 20–Dec. 17, 1927 | Dec. 18, 1927–Jan. 14, 1928 | Jan. 15–Feb. 11, 1928 | Feb. 12–Mar. 10, 1928 | Week ended— March, 1928 17 | 24 | 31 | April, 1928 7 | 14 | 21 | 28 | May, 1928 5 | 12 | 19 | 26 | June 2, 1928 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Senegal (see also table below): | | | | | | | | | | | | | | | | | | | |
| Dakar | C | | | | | | 34 | 17 | | | 12 | 5 | 11 | | | 12 | | | |
| | D | | | | | | | 12 | | | 8 | | 8 | | | 4 | | | |
| Siam | C | 6 | 1 | 9 | 23 | 35 | 12 | | 2 | 14 | 12 | 1 | | | | | | | |
| | D | | | 1 | 2 | 4 | 3 | | | | | | | | | | | | |
| Bangkok | C | | 1 | 1 | 3 | | | | | | | | | | | | | | |
| | D | | | | 1 | | | | | | | | | | | | | | |
| Spain (see also table below): | | | | | | | | | | | | | | | | | | | |
| Malaga | D | | 1 | 1 | | | | | | | | | | | | | | | |
| Seville | C | | | | 1 | | | | | | | | | | | | | | |
| Valencia | C | 1 | | | 2 | | 1 | | 1 | 1 | | | | | | | | | |
| Straits Settlements: Singapore | C | | 1 | | | 1 | 1 | 1 | | | | | 1 | | | | | | |
| Sudan (Anglo-Egyptian) | C | | | | 4 | 85 | 109 | 10 | 28 | 250 | 54 | 29 | 18 | | 35 | 39 | 7 | | |
| | D | | | | 4 | 48 | 27 | 7 | 8 | 75 | 10 | 6 | 8 | | 14 | 4 | 1 | | |
| Sudan (French) (see table below). | | | | | | | | | | | | | | | | | | | |
| Switzerland | C | | | | 2 | | | | | | | | | | | | | | |
| Syria (see table below). | | | | | | | | | | | | | | | | | | | |
| Tunisia: Tunis | C | | | | 4 | 3 | 14 | 1 | | 1 | 2 | | 4 | | 2 | | | | |
| Union of South Africa: | | | | | | | | | | | | | | | | | | | |
| Cape Province | C | P | | | | P | | | | | | | | | | | | | |
| Natal | C | | | | | P | P | P | P | P | | | | | | | | | |
| Orange Free State | C | | P | P | P | P | | | | P | | | | | | | | | |
| Transvaal | C | P | 7 | | | | | | | | | | | | | | | | |
| Union of Soviet Socialist Republics (see table below). | | | | | | | | | | | | | | | | | | | |
| Upper Volta | C | | | | | | 5 | | 2 | | | P | | | | 5 | | | |
| Venezuela: | | | | | | | | | | | | | | | | | | | |
| Maracaibo | D | 1 | | | | 1 | 1 | | | | | | | | | | | | |
| On vessel: | | | | | | | | | | | | | | | | | | | |
| S. S. Arendskerk at Singapore, from Amoy, China | C | | | | | | | | | P | | | | | | | | | |
| S. S. Kashgar at Kobe, from Shanghai | C | | | | | | | | | | | | | | P | | | | |
| S. S. Tjileboct at Hong Kong, from Shanghai | C | | | | | | | | | | | | | | P | | | | |
| S. S. Yarmouth at Kingston, Jamaica, from Habana, Cuba | C | | | | | | | | | | 1 | | | | | | | | |

| Place | | July, 1927 | August, 1927 | September, 1927 | October, 1927 | November, 1927 | December, 1927 | January, 1928 | February, 1928 | | | March, 1928 | | | April, 1928 | | | May, 1928 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 1-10 | 11-20 | 21-29 | 1-10 | 11-20 | 21-31 | 1-10 | 11-20 | 21-30 | 1-10 |
| Algeria (see also table above) | C | 376 | 459 | 382 | 682 | | | | | | | | | | | | | |
| Oran | C | 14 | 10 | 16 | 11 | | | | | | | | | | | | | |
| Indo-China (French) (see also table above) | C | 19 | 3 | 21 | 25 | 38 | 34 | 58 | 50 | 31 | 90 | 57 | 71 | 69 | | 35 | | 36 |
| Senegal (see also table above) | C | | | | | | | | | | | | | | | 51 | | |
| | D | | | | | | | | | | | | | | | 7 | | |
| Sudan (French) | C | | | | | | | 4 | | 5 | 1 | P. | 5 | | | 4 | | 30 |
| | D | | | | | | | | | | | | | | | | | 6 |
| Syria: | | | | | | | | | | | | | | | | | | |
| Aleppo | C | | | | | | 1 | 1 | | | | | | | | | | |
| Beirut | C | | | | | | 2 | 15 | 11 | 26 | | 12 | 7 | 4 | 3 | 5 | 1 | 2 |
| | D | | | | | | | | | | | | | 2 | 1 | | | |
| Damascus | C | | 3 | 5 | 22 | 13 | 12 | 13 | | | | | 1 | | | | | |

| Place | | July-September, 1927 | October-December, 1927 | January, 1928 | February, 1928 | March, 1928 | April, 1928 |
|---|---|---|---|---|---|---|---|
| Angola | C | 51 | 151 | 10 | 36 | | |
| | D | | 2 | | | | |
| Congo | C | 5 | 77 | | 36 | | |
| Cuanza-Norte | C | 1 | | | | | |
| Cuanza-Sul | C | | 9 | 10 | | | |
| Loanda | C | 1 | | | | | |
| Zaire | C | 3 | 5 | | | | |
| Brazil (see also table above): | | | | | | | |
| Porto Alegre | C | 11 | 5 | | 1 | | |
| British East Africa (see also table above): | | | | | | | |
| Zanzibar | C | | 2 | | | | |
| | D | | 1 | | | | |
| Chosen | C | 21 | 4 | 4 | 21 | 23 | |
| | D | 6 | 1 | 2 | 8 | 6 | |
| Seoul | C | | | | | 1 | |
| Ecuador: Guayaquil | C | 4 | 6 | 2 | 9 | | |
| | D | | | | | | |
| France | C | 37 | 25 | 11 | 10 | 13 | |
| Gold Coast | C | 7 | 4 | | 1 | 3 | |

| Place | | July-September, 1927 | October-December, 1927 | January, 1928 | February, 1928 | March, 1928 | April, 1928 |
|---|---|---|---|---|---|---|---|
| Greece | C | 10 | 9 | 6 | 11 | 19 | |
| | D | | | | 2 | 2 | |
| Latvia | C | | 2 | | 1 | | |
| Mexico (see also table above) | D | 221 | 346 | 256 | | | |
| Morocco | C | 180 | 622 | 55 | 47 | 80 | 19 |
| Nigeria (see also table above) | C | 820 | 316 | 275 | 217 | | |
| | D | 173 | 81 | 39 | 45 | | |
| Persia | D | | 2 | 7 | | | |
| Portugal (see also table above) | C | | | 143 | 215 | | |
| | D | | | 22 | 8 | | |
| Spain (see also table above): | | | | | | | |
| Madrid | D | | 1 | | | | |
| U. S. S. R.: | | | | | | | |
| Railways, etc | C | 23 | 33 | 18 | | | |
| Other territories in Europe | C | 366 | 1,256 | | | | |
| Transcaucasus, Siberia, and Central Asia | C | 80 | 81 | | | | |
| Ukraine | C | 27 | 48 | 6 | | | |

## CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

### TYPHUS FEVER

[C indicates cases; D, deaths; P, present]

| Place | | July 31–Aug. 27, 1927 | Aug. 28–Sept. 24, 1927 | Sept. 25–Oct. 22, 1927 | Oct. 23–Nov. 19, 1927 | Nov. 20–Dec. 17, 1927 | Dec. 18, 1927–Jan. 14, 1928 | Jan. 15–Feb. 11, 1928 | Feb. 12–Mar. 10, 1928 | Week ended— March, 1928 17 | March, 1928 24 | March, 1928 31 | April, 1928 7 | April, 1928 14 | April, 1928 21 | April, 1928 28 | May, 1928 5 | May, 1928 12 | May, 1928 19 | May, 1928 26 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Algeria (see also table below): | | | | | | | | | | | | | | | | | | | | |
| Algiers | C | | | | | | | 1 | 3 | 1 | 1 | 2 | 5 | 1 | 3 | | | | | |
| | D | | | | | | | | 1 | | | | | | 2 | | | | | |
| Oran | C | | | | | | 4 | 2 | 10 | 1 | | 2 | 1 | 1 | 6 | 2 | 2 | 1 | | |
| | D | | | | | | | | | | | | | | 1 | | | | | |
| Austria: Vienna | C | | | | | | | 1 | | | | | | | | | | | | |
| Bulgaria (see also table below): | | | | | | | | | | | | | | | | | | | | |
| Sofia | C | | | 17 | 6 | 1 | 6 | 1 | | 3 | | 3 | 14 | | | | 1 | 1 | | |
| | D | | | | 1 | | | | | | | | | | | | | | | |
| Chile: | | | | | | | | | | | | | | | | | | | | |
| Antofagasta | D | | | 1 | | | | | | | | | | | | | | | | |
| Talcahuano | D | | 1 | | | | | | | | 1 | | | | | | | | | |
| Valparaiso | C | | 1 | | 1 | 2 | 1 | | 1 | | | | | | | | | | | |
| | D | 2 | 1 | | 2 | | | | | | | | | | | | | | | |
| China (see also table below): | | | | | | | | | | | | | | | | | | | | |
| Manchuria— | | | | | | | | | | | | | | | | | | | | |
| Dairen | C | | | | | | | | | | | | | 7 | | 3 | | | | |
| Harbin | C | 2 | | | 1 | | | | | | | | | | 1 | 1 | | | | |
| Tientsin | C | | 2 | | | | | | | | | | | | | | | | | |
| Chosen (see table below) | | | | | | | | | | | | | | | | | | | | |
| Czechoslovakia (see table below) | | | | | | | | | | | | | | | | | | | | |
| Egypt | C | 2 | | 12 | 4 | 14 | 8 | 9 | 17 | | 1 | 1 | | 2 | 1 | | | | | |
| | D | 3 | | 5 | | 8 | 4 | 2 | 8 | | 1 | | | | | | | | | |
| Cairo | C | | | | | 3 | | | | | | | 2 | 3 | | | | | | |
| | D | | | | | 3 | | | | | | | 1 | 3 | | | | | | |
| Port Said | C | | | 1 | | 1 | | | | | | | | | | | | | | |
| Behera Province | C | | | | | | | | | | | | 29 | 23 | | | | | | |
| | D | | | | | | | | | | | | | 4 | | | | | | |
| Gharbieh Province | C | | | | | | | | | | | | 23 | 5 | | | | | | |
| Keneh Province | C | | | | | | | | | | | | 5 | 29 | | | | | | |
| | D | | | | | | | | | | | | | 1 | | | | | | |
| Greece (see table below) | | | | | | | | | | | | | | | | | | | | |
| Ireland (Irish Free State)[1] | C | | | | | | | 1 | | | | | | 1 | | | | | | |
| Cork County | C | | | | | 3 | 1 | | | | | | | | | | | | | |
| Donegal County, Letterkenny | C | | | 4 | | | | | | | | | | | | | | | | |
| Japan (see table below) | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Latvia (see table below) | | | | | | | | | | | | | | | | | | | | |
| Lithuania (see table below) | | | | | | | | | | | | | | | | | | | | |
| Mexico (see also table below): | | | | | | | | | | | | | | | | | | | | |
| Guadalajara | D | | | | | 1 | | | | | | | | | | | | | | |
| Mexico City, including municipalities in Federal District | C | 17 | 19 | 18 | 28 | 17 | 15 | 5 | 8 | 6 | 6 | | | 4 | | 4 | | | | |
| | D | | | | 2 | 1 | 5 | | 4 | | 3 | | | | | 1 | | | | |
| Monterey | D | | | | | | | | | | 1 | | | | | | | | | |
| Morocco (see also table below) | C | | | | | | 342 | 1,051 | 316 | 172 | 167 | 219 | 190 | 186 | 167 | 136 | 102 | 62 | | |
| Palestine | C | 11 | 1 | 5 | 3 | 9 | 8 | 5 | 10 | 5 | | | 2 | 3 | | 1 | 2 | 2 | 1 | 1 |
| Peru (see table below) | | | | | | | | | | | | | | | | | | | | |
| Poland | C | 50 | 35 | 19 | 64 | 93 | 195 | 346 | 265 | 90 | 90 | 125 | 77 | 93 | | 71 | | | | |
| | D | 6 | 2 | 4 | 11 | 10 | 16 | 19 | 26 | 5 | 6 | 7 | 7 | 8 | | 2 | | | | |
| Portugal (see also table below): Oporto | C | 1 | | | 1 | | | 1 | | | | | | | | | | | | |
| Rumania | C | 36 | 16 | 17 | 22 | 35 | 68 | 39 | 68 | 29 | 34 | 33 | 45 | 36 | 38 | 30 | | | | |
| | D | 1 | | 2 | | | 3 | 9 | 5 | 2 | 2 | 3 | 4 | | 6 | 5 | | | | |
| Syria (see also table below): Aleppo | C | | 2 | | | | 2 | | | | | | | | | | | | | |
| Tunisia | C | 14 | | 3 | 1 | 1 | 6 | 4 | 1 | 13 | | 5 | | | 2 | 16 | 1 | 3 | | |
| Union of South Africa: | | | | | | | | | | | | | | | | | | | | |
| Cape Province | C | P | P | P | P | P | 1 | 1 | P | | P | P | P | P | | | | | | |
| Natal | C | P | P | P | P | 2 | 3 | 1 | 2 | P | P | P | | P | | | | | | |
| Orange Free State | C | | | P | | P | | P | | | P | P | | | | | | | | |
| Transvaal | C | 1 | | 5 | P | P | | | | | P | P | | | | | | | | |
| Union of Soviet Socialist Republics (see table below) | | | | | | | | | | | | | | | | | | | | |
| Yugoslavia (see table below) | | | | | | | | | | | | | | | | | | | | |
| On vessel: S. S. Gaika at Durban, Natal, from Mauritius | C | | | | | | | | 1 | | | | | | | | | | | |

| Place | | 1927 | | | | November, 1927 | | | December, 1927 | | | January, 1928 | | | February, 1928 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | July | August | September | October | 1-10 | 11-20 | 21-30 | 1-10 | 11-20 | 21-31 | 1-10 | 11-20 | 21-31 | 1-10 | 11-20 | 21-29 |
| Algeria (see also table above) | C | 67 | 33 | 10 | 12 | | | | | | | | | | | | |
| | D | 13 | | | 1 | | | | | | | | | | | | |
| Algiers | C | 2 | 2 | 6 | 2 | | | | | | | | | | | | |
| Bulgaria (see also table above) | C | 12 | 24 | 7 | 2 | | | | | | 2 | 7 | 6 | | 8 | 12 | 6 |
| | D | | 1 | 2 | 1 | | | | | | 1 | | 1 | | 1 | 2 | 2 |
| Morocco (see also table above) | C | 148 | 76 | 7 | 11 | 5 | 14 | 7 | 5 | 6 | 75 | | | | | | |

[1] 4 cases of typhus fever reported June 5, 1928, from Irish Free State.

## CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

### TYPHUS FEVER—Continued

[C indicates cases; D, deaths; P, present]

| Place | | July-September, 1927 | October-December, 1927 | January, 1928 | February, 1928 | March, 1928 | April, 1928 |
|---|---|---|---|---|---|---|---|
| China (see also table above): | | | | | | | |
| Shanghai | D | | 1 | | | | |
| Chosen | C | 90 | 80 | 183 | 400 | 313 | |
| | D | 8 | 6 | 19 | 44 | 25 | |
| Chemulpo | C | 3 | | 1 | | 1 | |
| Gensan | C | 2 | | 1 | | | |
| | D | | | 1 | | | |
| Seoul | C | 5 | 2 | | | 10 | |
| | D | 1 | 1 | | | 1 | |
| Czechoslovakia | C | 12 | 7 | | | 25 | |
| Greece: Athens | C | 3 | 1 | 2 | 2 | | 13 |
| | D | | | | | | 2 |
| Japan | C | 1 | 1 | | | | |
| Latvia | C | 6 | | | 1 | 26 | |
| Lithuania | C | 69 | 54 | 86 | 137 | | |
| | D | 14 | 3 | 10 | 12 | | |

| Place | | July-September, 1927 | October-December, 1927 | January, 1928 | February, 1928 | March, 1928 | April, 1928 |
|---|---|---|---|---|---|---|---|
| Mexico (see also table above) | D | 64 | 98 | 46 | | | |
| Peru: | | | | | | | |
| Arequipa | D | 3 | 3 | 2 | | | 1 |
| La Oroya | C | | | P | P | P | |
| Lima | C | 8 | | | | | |
| Turkey | C | | | | 17 | | |
| | D | | | | 1 | | |
| Union of Soviet Socialist Republics: | | | | | | | |
| Railways, etc | C | 77 | 102 | 41 | | | |
| Transcaucasus, Siberia, and Central Asia | C | 208 | 190 | 7 | | | |
| Ukraine | C | 295 | 631 | 533 | | | |
| Other territories in Europe | C | 1,839 | 1,924 | | | | |
| Yugoslavia | C | 20 | 2 | 7 | 24 | 3 | 10 |
| | D | 5 | | 3 | | | 1 |

### YELLOW FEVER

[C, indicates cases; D, deaths; P, present]

| Place | | July 3-30, 1927 | July 31-Aug. 27, 1927 | Aug. 28-Sept. 24, 1927 | Sept. 25-Oct. 22, 1927 | Oct. 23-Nov. 19, 1927 | Week ended— Nov. 26, 1927 | December, 1927: 3 | 10 | 17 | 24 | 31 | January, 1928: 7 | 14 | 21 | 28 | February, 1928: 4 | 11 | 18 | 25 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Belgian Congo: | | | | | | | | | | | | | | | | | | | | |
| Boma | C | | | | | | | | | | | 3 | | | | | | | | |
| | D | | | | | | | | | | | 2 | | | | | | | | |
| Matadi | C | | | | | | | | | | | 6 | 12 | 11 | 1 | 5 | 8 | | | 1 |
| | D | | | | | | | | | | | 2 | 6 | 8 | 2 | 5 | 6 | | | |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Brazil: | | | | | | | | | | | | | | | | | | | | |
| Estancia [1] | | | | | | | | | | | | | | | | | | | | |
| Rio de Janeiro [1] | C | | | | | | | | | | | | | | | | | | | |
| Dahomey: | | | | | | | | | | | | | | | | | | | | |
| Grand Popo | C | | | | | | 1 | | | | | | | | | | | | | |
| | D | | | | | | 1 | | | | | | | | | | | | | |
| Porto Novo | C | 1 | | | | | | | | | | | | | | | | | | |
| | D | 1 | | | | | | | | | | | | | | | | | | |
| Gold Coast (see also table below): | | | | | | | | | | | | | | | | | | | | |
| Ashanti— | | | | | | | | | | | | | | | | | | | | |
| Obuasi | C | | 1 | | | | | | | | | | | | | | | | | |
| | D | | 1 | | | | | | | | | | | | | | | | | |
| Ivory Coast | C | 1 | | | | | | | | | 1 | | | | | | | | | |
| | D | 1 | | | | | | | | | 1 | | | | | | | | | |
| Liberia: Monrovia | C | | | 1 | | | | | | | | | | | | | | | | |
| Nigeria | C | | | 2 | | | | | | | | | | | | | | | | |
| | D | | | 2 | | | | | | | | | | | | | | | | |
| Senegal | C | 3 | 10 | 21 | 31 | 38 | | | | | | | | | | | | | | |
| | D | 3 | 9 | 21 | 31 | 28 | | | | | | | | | | | | | | |
| Dakar | C | 1 | | | 12 | 14 | 2 | 1 | 4 | | | 1 | 1 | | | | | | | |
| | D | | | | 7 | 10 | 2 | 1 | 4 | | | 1 | 1 | | | | | | | |
| Togoland | C | | 1 | | | | | | | | | | | | | | | | | |
| | D | | 1 | | | | | | | | | | | | | | | | | |

| Place | | July | August | September | October | November | December | January | February | March | April | May |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gold Coast (see also table above) | C | 15 | 2 | 6 | 1 | | | | | | | [2] |
| | D | 4 | 2 | 4 | 1 | | | | | | | |

[1] A case of yellow fever was reported near Estancia, State of Sergipe, Brazil, Mar. 4, 1928; also 2 deaths from yellow fever and 2 suspected cases at Rio de Janeiro were reported on June 4, which were said to be imported from the North.

[2] 1 case of yellow fever at Accra, Gold Coast; probably laboratory infection, reported May 18, 1928.