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A RAT AND A RAT-FLEA SURVEY OF SHIPS AT THE PORT OF NEW YORK

A STUDY OF SHIPS' RATS AND FLEAS AS THEY ARE CONCERNED IN THE TRANSFER OF BUBONIC PLAGUE, WITH PARTICULAR REFERENCE TO MARITIME QUARANTINE¹

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New York, owing to the tremendous volume and variety of its shipping and the consequent large amount of interesting material, presents an excellent opportunity for the study of various quarantine problems. One of these was to obtain accurate information concerning the rat and rat flea infestation of ships and the factors which influence their prevalence. While conditions in New York have been favorable to securing reliable data as to rats, the cold climate in winter and certain local factors, preventing sufficient trapping of live rats on ships, have interfered with making a thoroughly reliable flea survey.

METHODS

For many years general records of the results of ship fumigations have been maintained at the New York quarantine station. These records have been utilized for some of the data analyzed and discussed herein. For a more accurate study, however, a separate set of especially detailed records, covering the 2-year period beginning September 1, 1925, and ending August 31, 1927, has been carefully maintained. It is only in this period that flea determinations have been made.

All ship fumigations at this port are accomplished with hydrocyanic acid, which is the most generally satisfactory fumigant as yet found adapted to this work. Only a few fumigations have been done in partially or fully loaded vessels, the great majority being performed when the ships are empty. Ships are carefully searched after fumigation for dead rats and all found are brought in bags to the laboratory for examination. At the laboratory the rats are first searched

¹ EDITORIAL NOTE.—In considering the data presented in this article, it should be borne in mind that the conditions obtaining at the port of New York are, to a great extent, not comparable with those at any other port of the United States; and that, while this article analyzes conditions at New York, the inferences and deductions can not be considered to be in all respects applicable to the other ports and do not represent the views in general of the Public Health Service.

for fleas, then they are autopsied and inspected for signs of plague, following which, if negative, confirmatory guinea-pig inoculations are made with emulsions of combined portions of the livers and spleens of rats taken from same vessel. The fleas are cleared in 10 per cent potassium hydroxide overnight and then washed in water and passed through alcohol to xylol, mounted in balsam, and identified under the microscope. A separate record is entered for each ship, giving the data for both rats and fleas.

In so far as rat data are concerned, these records are sufficiently accurate for their purpose and are relatively complete. It is seldom that a fumigation will kill all the rats on a ship, but this variable, for purposes of practical rat survey of ships, is not of great moment. The comparisons are the more important features, and these are not greatly affected by error in absolute numbers. It is believed that the number of rats reported recovered following fumigation is, in the aggregate, probably 20 to 30 per cent less than the actual numbers infesting these ships. Some escape death and some die in inaccessible parts of the vessel.

Concerning fleas, there is no conclusive evidence as to absolute numbers. These fleas are all found dead on fumigated rats. It has long been known that when rats are fumigated in a closed space with chloroform many of the fleas are found loose on the bottom of the container, having obviously left their hosts before dying. In our laboratory this has been found to be also true when using HCN as the fumigant, and furthermore, that the proportion of fleas leaving the host varies with the concentration and rate of diffusion of the fumigant, being much higher when the gas is liberated slowly than when it is liberated rapidly. Since the rate of diffusion must vary very considerably in the retired spaces in a ship and on different ships, it is felt that the numbers of fleas that have been secured is far short of the actual numbers usually infesting the rats. On the other hand, the fact that these fleas are practically confined to two species and that one of these has a very definite distribution, furnishes us with valuable information which will be discussed in its proper place.

INFORMATION CONCERNING SHIPS

Shipping arrives at New York from the entire world. The quarantine regulations providing for fumigation of all ships engaged in foreign trade, not less than once in six months has given the opportunity for a thorough sampling of this shipping, and our material has been obtained from ships from all the principal ports of the world and all climates, from Archangel in the north to the Falkland Islands in the south. Naturally certain trade routes are more favored than others, and on account of plague infection in certain parts of the world ships

from some ports are more frequently fumigated than those from others. We find our largest groups are ships from northern Europe, the Mediterranean, the Caribbean, and the east coast of South America. Many ships are on definite runs making repeated voyages to the same ports. A large proportion of the cargo vessels, however, are more or less wanderers and will arrive at New York at one time from one part of the world and at a later date from another. Cargoes vary according to ports visited.

TRADE ROUTES

The trade routes designated for the purposes of this study are shown in Table 8, wherein also is given the average or approximate distance (by water) from New York and a brief statement of the usual types of imports and exports to and from New York, together with other data. The Caribbean trade is largely represented by ships on regular runs, the same being true of the west coast of South America and Africa and to a lesser extent of the east coast of South America. On the other routes we find a larger proportion of wandering ships. From the extremes of the world the ships are few; for instance, there are only four from Archangel, while the Falkland Islands are represented by a single whaling vessel.

A comparative study of the different trade routes has been made; extended description of these, however, would serve no useful purpose, since conditions apparently do not differ sufficiently in different parts of the world to greatly influence rat infestation of ships, with the single exception of the west coast of South America. Here the almost total lack of harbors compels the loading of vessels at sea by means of lighters, while the cargoes secured consist nearly altogether of nitrates, ores, iodine, cotton, and other non-food materials, which are not attractive to rats; the nitrate is probably repellent.

GROSS RESULTS OF THE SURVEY

Reports from a total of 1,913 ships are included in the special 2-year record (that is to say, this number of fumigations). Many ships were fumigated two or more times, each fumigation counting as a ship in the tabulations presented in this paper, except where specifically stated otherwise. From these ships (fumigations) were recovered 18,265 rats, averaging about 9.6 rats per ship. From the rats were secured 7,886 fleas, which is an average of 0.43 fleas per rat. In addition to the rats, a total of 742 mice (*Mus musculus*) were recovered; these have not entered into our calculations, being too few on any one ship to be a factor of importance. The fleas secured were found to be 6,992 *Xenopsylla cheopis*, 786 *Ceratophyllus fasciatus*, 27 *X. astia*, 4 *X. brasiliensis*, 5 *Ceratophylli* other than

fasciatus, 63 *Leptopsylla musculi*, 7 *Ctenocephalus canis* (and *felis*), 1 *Pulex irritans*, and 1 unidentified (incomplete specimen). It will be observed at once that only *X. cheopis* and *C. fasciatus* were recovered in sufficient numbers to be of any real significance; other varieties are apparently only accidental passengers on shipboard and can hardly be an important factor in the common transmission of plague.

THE LITERATURE OF FLEA SURVEYS ON SHIPS

Before going further it may be well to summarize here what has heretofore been learned as to the prevalence of rat fleas on ships. The first recorded flea survey of ships of which the writer has knowledge was by Gauthier and Raybaud (1) at Marseille in 1903. These writers extended this work in 1910 (2). In the first survey they examined 250 fleas from ships of which 25.6 per cent were *X. cheopis*, 2.4 per cent *C. fasciatus*, 71.2 per cent *L. musculi*, and 0.8 per cent *P. irritans*. In 1910 they examined 2,276 fleas from ships, of which 92.7 per cent were *X. cheopis*, 6.7 per cent *C. fasciatus*, 0.5 per cent *L. musculi*, and 0.1 per cent *Ct. canis* (and *felis*). In 1904 Tiraboschi (3), at Genoa, examined 186 fleas from ships, all *X. cheopis*. In 1909 Fromme (4), at Hamburg, reports 212 fleas from 728 rats from ships; 199 *X. cheopis*, 11 *C. fasciatus*, 1 *Ctenopsylla*, 1 unidentified. In the same year Kitasato (5) reports 100 per cent of the fleas (number not given) taken from ships at Yokohama to have been *X. cheopis*. In 1910 Schastry (6) reports 397 *X. cheopis* from ships at Odessa. Newstead and Evans (7) in 1920 report in Liverpool 716 fleas taken from 469 rats caught on ships in the port. Of these fleas, 489 were *X. cheopis*, 219 *C. fasciatus* and 8 *L. musculi*.

The writer is not aware of any other published rat-flea survey of ships. The report last named is of particular interest; their rat-flea index (fleas per rat) is 1.5, the *X. cheopis* index being slightly above 1. Since our index is 0.43, comparison would suggest that we secure, with our method of searching fumigated rats, about 30 per cent of the number of fleas we might have expected from live rats. Rat-flea surveys, however, are so varied under different climatic conditions, being particularly affected by humidity and temperature, that results obtained in Liverpool can not safely or reasonably be used as a basis for computation of conditions at New York, even though the climate is in many respects similar. All of these reports agree in showing that *X. cheopis* is the predominant rat flea on ships. They demonstrate that this condition obtains in widely separated portions of the world.

Fromme secured all of his fleas from 7 ships, though rats were secured from 50 ships. Four of the flea-infested ships brought grain

from South America, two were from India, and one from Smyrna; these seven vessels yielded 297 of the total of 728 rats secured on the 50 ships.

RAT FLEAS AT DIFFERENT SEASONS

In Table 1 are given the rats and fleas taken in each month for the two years and in Chart 1 the *X. cheopis* and *C. fasciatus* indices for this period are compared with the temperature and relative humidity.

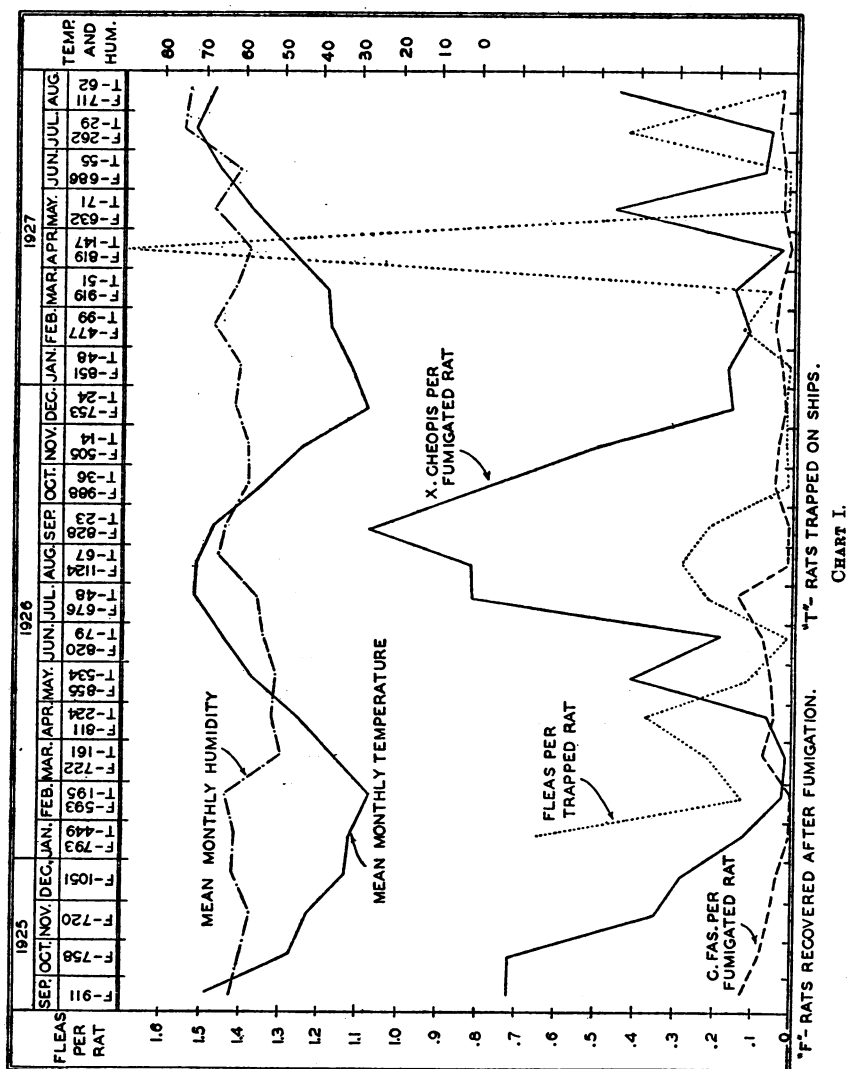
TABLE 1.—Rats and fleas fumigated on ships in each month from September 1, 1925, to August 31, 1927

Month	Number of rats	Number of fleas	Fleas per rat
September.....	911	779	0.86
October.....	758	644	.85
November.....	720	310	.43
December.....	1,051	352	.33
January.....	793	109	.15
February.....	593	9	.02
March.....	722	125	.17
April.....	811	81	.10
May.....	855	385	.45
June.....	820	223	.27
July.....	676	688	1.02
August.....	1,124	949	.84
Total for first year.....	9,834		
September.....	828	1,136	1.37
October.....	968	523	.53
November.....	505	263	.52
December.....	753	131	.17
January.....	851	161	.19
February.....	477	75	.16
March.....	919	166	.18
April.....	819	36	.04
May.....	632	308	.49
June.....	686	68	.10
July.....	262	23	.09
August.....	711	341	.48
Total for second year.....	8,431		
Total for 2 years.....	18,265	7,885	.43

The low flea index for July and August of 1927 is, in our opinion, explained by the use of Zyklon B exclusively as a fumigant in these two months. In a separate section the three fumigating methods are compared and it is clearly shown that when Zyklon was used fewer fleas remained on the rats. This observation will be further discussed.

The outstanding feature of this tabulation is the way the flea catch varies with temperature changes, while the rat catch is apparently very little affected. Humidity does not appear to be an influence. The humidity varies little throughout the year at New York, although there are sometimes marked diurnal variations and some considerable drops and rises for one or two days at a time; these are not indicated on the chart, in which the mean humidity for each month is plotted. According to the recorded biological observations regarding rat fleas, breeding is the function most affected by humidity,

while length of life away from the host is next in importance. Since ships are seldom in port more than a few days before fumigation, we would not expect the humidity at New York to markedly influence the numbers of fleas on the rats on board. On the other hand, humidity plays a definite rôle in the rapidity of action of vaporized



hydrocyanic acid, and this might easily influence the numbers of fleas secured from fumigated rats. The extensive data necessary to properly evaluate this factor are not yet available.

There appears in each year a drop in the index during the month of June; the drop is much more marked in 1927 than in 1926. So far it has not been possible to ascertain a reasonable explanation of

this drop. In 1926 the index rises sharply in July, while in 1927 it remains very low during the same month; in the latter year the exclusive use of Zyklon was inaugurated in this month.¹ A serious fire on the New York quarantine station about the middle of July destroyed nearly all of the stock of fumigants on hand, together with much of the fumigating apparatus, and as a consequence only about one-half the usual number of ships was fumigated during this month. It is probably only a coincidence that most of these ships yielded only a few rats, the average of rats per ship for the month being less than half the general average for the year.

Apparently at temperatures below 50° F., or possibly 55°, the number of fleas found on fumigated rats drops to a low figure. The factors influencing this condition are probably multiple. On the face of it one would judge that there were fewer fleas on the rats in cold weather; this view is supported by the flea surveys in New York and Boston by Fox and Sullivan (8), in both these ports the winter index being far below that obtained in summer. It is believed, however, that the slower reaction rate of the fumigant is equally important. On several ships rats trapped in snap traps (which kill the rats) during cold weather yielded more fleas than were found on rats fumigated shortly afterwards on the same vessels, and, in general, during cold weather a higher index was secured from snap trapped rats than from fumigated rats; this is illustrated in Chart 1.

The fleas on these trapped rats were apparently dead when they reached the laboratory, but soon revived at room temperature and became very lively. The presumption is that when the fleas started to leave the cooling bodies of the dead trapped rats they encountered much colder conditions and returned to the relatively warm area in the depths of the fur, probably making several excursions back and forth until rendered dormant by the progressive chilling of their environment, some falling or jumping off but others remaining in the fur. On the other hand, fumigated fleas, presumably becoming irritated by the gas, promptly left their host in an endeavor to escape, regardless of environmental conditions.

One instance, when rats were trapped on a passenger ship in dry dock, is highly interesting. This ship went into dry dock for repairs in January, 1926 (mean temperature for month 31.8° F.), and, all heat being turned off of the greater part of the ship, the superstructure and holds became quite cold. On January 16 and 17 (shortly after going to dock) a total of 52 rats were caught in snap traps and on these rats were found 155 fleas, or an average of 3 per rat. On January 17 there were also caught alive in cage traps 4 rats, which were killed at the laboratory and from them were taken 39 fleas, or an average of 10 per rat. Between this date and February 13 there

¹ This is discussed in the section on fumigation methods, p. 451.

were trapped (in snap traps) a total of 61 rats, yielding 33 fleas, or an average of 0.5 per rat. On the next day the ship was fumigated and only 3 rats were recovered after fumigation, on which no fleas were found. After fumigation the ship was trapped for some days, up to February 26, with the result that 11 additional rats were caught (snap traps), on which were found 5 fleas. Securing only 3 rats by fumigation is not a reflection on the efficiency of this procedure, since most of the rats on the ship had already been removed by trapping, and the engine and fire rooms were omitted from the fumigation. The features of most interest are the occurrence of three times as many fleas on the rats trapped alive as on those killed by traps on the same day, the decrease in the flea index as the ship became cold, and the absence of fleas on the fumigated rats (the number of fumigated rats is unfortunately very small). This vessel, a relatively large passenger vessel, when in service is artificially heated throughout most of its interior.

DISCUSSION OF INFLUENCE OF TEMPERATURE ON FLEA INDEX

The numbers of fleas secured on ships at New York are obviously influenced by conditions obtaining at this port within short periods of time. These ships come from all parts of the world, and the climatic conditions to which they are subjected varies both greatly and rapidly; in addition, temperature and humidity vary on different ships and with different cargoes. With such a conglomerate existence of varying environmental influences, it is not surprising that the rat-flea infestation of ships is practically restricted to the two species that we already know to be of cosmopolitan distribution, each in its own zone, *Xenopsylla cheopis* in tropic and subtropic regions and *Ceratophyllus fasciatus* in temperate and cold climates.

Since a study of ships from different parts of the world shows that the fleas taken at New York from all of these are much fewer in winter than in summer, it follows that it is the cold weather here that causes the result, and not conditions elsewhere. For example, we should expect a vessel running between New York and Buenos Aires to have very much the same flea conditions in summer as in winter, the climates of the two ports being practically chronologically reversed, and presumably it has.

On such a ship we should in summer get fleas at New York and in winter (New York winter) get fleas at Buenos Aires, there being no reason to believe that the New York winter would prevent the securing of fleas in warmer Buenos Aires, when we know that their winter does not prevent our securing fleas in our summer. The probable factors appear to be lower flea infestation of the rats in cold weather and slower action of the fumigant in cold weather, the latter factor operating by causing a longer period between the time when prelimin-

ary irritation from the fumigant occurs and the time when paralysis is produced, thus giving the flea greater opportunity to leave its host.

In considering the apparent lower flea infestation on ships in cold weather, one can not directly apply the results of cold weather flea surveys on land, such as those in New York and Boston, for the reason that on land the influence of cold weather is continuous, while on ships it may be active only for a few days. The observations on the ship in dry dock, however, strongly suggest that the flea infestation of rats does decrease rapidly as they are brought into a cold environment. The observed facts, that rat fleas normally leave their hosts for considerable periods and that as temperature falls fleas exposed to the cold become progressively less active and finally dormant, suggests a theory that would account for a lowered infestation. Briefly it is that as a vessel passes into cold weather the fleas, after normally leaving their hosts, become chilled and less active, so that fewer of them find new hosts; when the weather becomes severe the fleas, away from the host, become dormant, none of them going to new hosts. Theoretically under such conditions the rats would soon become flealess, but it is probable that those relatively warm places on the ship and the rats nests keep active a sufficient number of fleas to maintain a much reduced infestation. It is also possible that when the weather becomes quite cold the fleas left on the rats are not so apt to get off.

The evidence supporting this theory, however, is only suggestive and by no means conclusive; in that case it may well be that slower action of the fumigant is the prime factor causing an apparently lowered flea infestation of ship rats during cold weather. This question needs further study, made with rats trapped alive on ships.

FUMIGATION METHODS

Comparison of fumigation methods is reserved for a separate report. Table 2, however, has been extracted from this report to show the variations in numbers of fleas secured. The only explanation that appears at all for the low flea yield from Zyklon B is that in the other two methods a mixture of 80 per cent HCN and 20 per cent cyanogen chloride is used while the active ingredient of Zyklon B is HCN, 100 per cent to which chloropicrin, to the amount of 3 to 5 per cent of the HCN, has been added as a warning gas.

TABLE 2.—*Ships fumigated by different methods from September 1, 1925, to August 31, 1927. Includes only ships from which rats were recovered*

Method	Number of ships	Number of rats	Rats per ship	Number of fleas	Fleas per rat
Generation, HCN 80 per cent, CNCL 20 per cent.....	420	8,510	20	4,678	0.55
Sprayed liquid, HCN 80 per cent, CNCL 20 per cent.	283	6,197	22	2,248	.36
Zyklon B, HCN 100 per cent + chloropicrin 3 per cent.	162	3,282	20	723	.21

These figures should not be construed to mean that Zyklon does not kill the fleas. Creel and Faget (9) have shown that HCN gas is very deadly to rat fleas, and practical experience bears this out. From some of the ships fumigated with Zyklon we have secured considerable flea yields. No live fleas have ever been found among these, though this has occurred in a few instances when one of the other two methods was used. As mentioned before, when rats are experimentally killed by gaseous fumigants, including HCN, many of the fleas leave the rats before dying. Evidently a higher proportion of fleas leave the rats when Zyklon is used than is the case with the other two methods, but there is no reason to believe they escape destruction. It is, of course, quite impractical to search the floors of ships' holds for such inconspicuous objects as dead fleas.

TRADE ROUTES AND FLEAS

While the subject of rats is necessarily bound up with any consideration of rat fleas, there are certain considerations in regard to fleas that deserve preferred attention, so that in this and the next section fleas will be emphasized, while in succeeding sections the data will be analyzed in regard to rats without reference to fleas.

In Table 3 is shown the relative flea prevalence by species (*X. cheopis* and *C. fasciatus*) for the various trade routes.

TABLE 3.—Relative flea prevalence on different trade routes. (Rats per ship to nearest whole number; fleas per rat to nearest hundredth.) Tankers and sugar-carrying ships omitted

Trade route	Number of ships	Rats per ship	<i>X. cheopis</i> per rat	<i>C. fasciatus</i> per rat	Remarks
Northern (north of 40° N. lat.).	245	7	0.02	0.21	Only route showing predominance of <i>C. fasciatus</i> .
Caribbean.....	380	15	.42	.02	Relatively high flea yield associated with high rat yield.
East coast, South America.	274	14	.63	.03	This route very similar to Caribbean.
West coast, South America. ¹	99	1	.04	0	Few rats with few fleas.
Mediterranean.....	352	8	.31	.08	<i>C. fasciatus</i> is predominant in some Mediterranean ports.
Far East ¹	237	13	.22	.005	While all tropic, cargoes differ from Caribbean and east South American routes.
Africa.....	102	8	.21	0	Covers a very wide field nearly all tropical.
Australia.....	13	4	.02	0	Distance to New York, 10,000 miles.
Whaling ships.....	4	2.5	0	0	Cruise 3 months to over a year.

¹ Two ships of Peruvian nationality that had been engaged exclusively in coastwise traffic between Peruvian ports for several years prior to visiting New York and had no record of fumigation are omitted from this tabulation. From one were secured 43 rats and 7 fleas; from the other, 57 rats and 265 fleas; all fleas *X. cheopis*.

² Crude rubber in cargo may be detrimental to fleas.

A glance at this table shows conclusively that *X. cheopis* is the predominant rat flea on ships. This is in agreement with all flea surveys on ships made to date.

Next we note that on ships plying only between northern ports (New York itself being such a port) the predominant rat flea is *C. fasciatus*, which is in agreement with the known distribution of this flea. The presence of some *X. cheopis* on these ships is probably due to the occurrence of this flea, to some extent, in some of the northern ports (also in New York) during the summer, and partly due to some of the ships concerned having touched at tropical or Mediterranean ports shortly prior to entering on the northern route. The occurrence of *C. fasciatus* in some numbers on ships from the Mediterranean is readily explicable on the basis of the known presence, even predominance, of this flea at certain ports along the north shore of the Mediterranean and probably in Black Sea ports. The *C. fasciatus* recorded from the Caribbean, east coast of South America, and the Far East probably went aboard these ships at New York or at some other northern port touched at by some ships prior to entering on this run.

On the basis of fleas alone it appears from this table that vessels exclusively running to northern ports, west coast of South America, or Australia are a relatively slight menace as regards plague. When rats also are considered the danger from the west coast of South America becomes apparently negligible, even though ships from there touch at known plague-infected ports. It would seem that the combination of off-shore loading, by means of lighters, with bulk, non-rat-food cargoes (much of it nitrate) practically eliminates rats and fleas.

It is interesting here to compare ships running to Africa, where loading is also mainly done off shore. Ships on this latter route, however, carry a more varied cargo, often mixed, including some rat food. There is the suggestion that the type of cargo is of more importance than the failure to go to dock. This appears again when we consider the few Australian ships, which carry nearly altogether non-rat-food cargoes and have few rats and fleas despite the fact that they do go to dock. The cargo factor will receive further consideration.

Whaling ships may be mentioned only to eliminate them; their numbers at New York are few. One, of four fumigated, yielded 10 rats and no fleas. More data are needed to determine their status.

The Caribbean and east coast of South America send us the most rats and the most fleas. Cargoes carried on ships trading with these localities are largely rat food both ways; the ships touch at many ports and generally go to dock, and throughout the greater part of their trip they are in tropical and subtropical climates.

Next considered are ships with large numbers of rats or fleas, or both. Table 4 shows the vessels from which 50 or more rats were taken and lists exceptional rat and flea ships in the various groups.

TABLE 4.—*Ships with over 50 rats. Only X. cheopis and C. fasciatus are included among the fleas tabulated. (Tankers, whalers, sugar ships, and Peruvian vessels omitted)*

Trade route	Number of ships in group	Number of ships with over 50 rats	Per cent of ships with over 50 rats	Rats per ship with over 50 rats	Fleas per rat, ships over 50 rats	Remarks
Northern.....	245	10	4.1	71	0.22	1 ship, 62 rats, 65 fleas; 1 ship, 95 rats, 34 fleas; 1 ship, 91 rats, 22 fleas; 1 ship, 62 rats, 21 fleas. Only 11 fleas on other 6 ships.
Caribbean.....	380	34	8.9	89	.52	Most rats, 164; most fleas, 361. 1 ship, 128 rats, 0 fleas; 1 ship, 59 rats, 258 fleas.
East coast of South America.	274	17	6.27	86	.66	1 ship, 61 rats, 562 fleas. Ships below 50 rats included 5 with total of 178 rats, 593 fleas.
West coast of South America.	99	0	0	0	0	2 Peruvian ships never before at New York are omitted. From 1 came 43 rats, 7 fleas; from other, 87 rats, 265 fleas.
Mediterranean.....	352	13	3.7	75	.26	1 ship, 69 rats, 70 fleas; others fewer fleas than rats. Ships with less than 50 rats show 1 with 42 rats, 178 fleas.
Far East.....	237	19	8.0	100	.12	1 ship, 67 rats, 114 fleas; other 8 ships, 774 rats, 22 fleas.
Africa.....	102	4	3.9	59	.11	1 ship, 67 rats, 9 fleas; 1 ship, 52 rats, 2 fleas; 1 ship, 74 rats, 10 fleas; 1 ship, 65 rats, 15 fleas.
Australia.....	13	0	0	0	0	

The first feature of this table to attract notice is the small number of heavily rat-infested ships. Next, is the unexpected observation that these ships with many rats did not produce any relative increase in fleas. This latter observation needs to be checked as regards the season of the year, since, the numbers of ships being small and the number of rats large, the occurrence of a preponderance during the cold months would produce a large error in their flea index. On tabulation it is checked by finding that between the months of May and November, heavily rat-infested ships yielded 0.577 fleas per rat, while less heavily infested ships produced 0.662 fleas per rat.

FLEAS ON SUGAR-CARRYING SHIPS

The sugar trade is, to a large extent, engaged in by a limited number of smaller cargo ships, which frequently make several trips a season carrying the same cargo. As a class they have few rats and almost no fleas. On any individual ship there may be a great many rats, but we have found but one flea on them. Table 5 lists these ships and their rats and fleas.

TABLE 5.—*Sugar-carrying vessels. Rat and flea data, September 1, 1925, to August 31, 1927 (calculated to nearest whole number)*

Number of ships	Number of rats	Rats per ship	Number of fleas (X. cheopis)	Number of ships with rats	Rats per ship	Number of ships with no rats	Per cent of ships with no rats
93	344	4	1	23	15	70	75

¹ 1 ship, 66 rats; one, 45; one, 44; 3 each with 38; 6 ships carried 263 of the 344 rats.

Many of the sugar ships that had rats aboard had only recently entered on this trade. One vessel with 66 rats went from the east coast of South American run to Cuba for a load of sugar. On the others the rats were generally in the storerooms and not in the holds. These vessels carry raw sugar, which is slightly moist; some fermentation takes place, and in the holds there is an accumulation of more or less irritant and lethal gases. The sugar itself is pretty generally sprinkled about so that it is not unusual to find rats from these ships with their fur caked with sugar. Furthermore, sugar is not a preferred rat food, certainly not as a steady and sole diet. In view of the lack of fleas and few rats, these ships would appear to be of very little danger as regards transference of plague.

FLEAS RARELY FOUND ON SHIPS

The rat fleas, other than *X. cheopis* and *C. fasciatus*, found on ships have already been stated to be *Leptopsylla musculi*, 63; *Xenopsylla astia*, 27; *Xenopsylla brasiliensis*, 4; *Ctenocephalus canis* (and *felis*), 7; *Ceratophylli* other than *fasciatus*, 5; *Pulex irritans*, 1; not identified (broken specimen), 1. All of these total 107, which compares with 6,992 *X. cheopis* and 786 *C. fasciatus*.

L. musculi is one of the widely distributed rat fleas; that it should constitute the bulk of these unusual specimens is therefore not surprising. Also it is expected, as is the case, that it would be distributed over a number of ships from various parts of the world; in fact, the 63 specimens came from 18 ships representing every trade route except Australia. From one vessel on the Mediterranean route were secured 34 specimens, one ship from Africa furnished 7, one from northern ports 4, other ships 1 or 2 each.

Ctenocephalus canis (or *felis*), another widely distributed flea, commonly on dogs and cats but not infrequently found on rats, was found, one each on seven ships sailing from the Mediterranean, the Far East, and Bermuda.

Ceratophylli other than *fasciatus* were secured from three ships from the Far East, two Japanese vessels giving us four specimens, the fifth coming from a round-the-world vessel. Two specimens, one from a Japanese vessel, are believed to be *C. anisus*, though not in complete agreement with descriptions available to the writer. The other three are all females of one species taken from the same ship, one in October, 1925, the other two in May, 1926. The first of these has been identified by Dr. Karl Jordan as *C. argus*.

Pulex irritans, the human flea, appears as a single specimen from a rat taken on a ship from the Caribbean.

The unidentified specimen, from a Japanese vessel in the Far East trade, may have been anything; only a part of the abdomen is present and that so mutilated that not even a guess may be hazarded as to identity.

X. ASTIA AND X. BRASILIENSIS

The researches of Hirst and Cragg have focussed a good deal of attention on the species of *Xenopsylla* other than *cheopis*. Their results indicate that *X. cheopis* is the plague carrier, while other species of the same genus are of lesser importance, being relatively ineffective vectors. Hirst stresses the fact that very slight differences in bionomics may have marked effect in determining the distribution, ability as a vector, and other characteristics of closely related species. In view of this, it is quite interesting to note that on ships, while *Xenopsylla cheopis* is widely distributed, only two other species of the genus *Xenopsylla* have been found at all, and these (in this series) on only four ships.

X. astia was taken from two vessels; one, a Japanese ship from far eastern ports, furnished 24, while the other 3 came from a British vessel which had been engaged in trade between Mediterranean and north European ports for months prior to sailing for New York, but had visited Bassein in Burma five months before and Karachi in India eight months before coming to New York.

X. brasiliensis was secured from two vessels in the South American trade, three specimens from one and a single specimen from the other.

It is interesting to note that four Japanese vessels furnished 34 of the 107 unusual rat fleas, probably because all Japanese vessels seen at New York follow a very broad itinerary.

SUMMARY OF FLEA CONDITIONS

It is shown that *Xenopsylla cheopis* is almost the only rat flea found on ships at New York, except those ships running between this port and ports north of 40° north latitude; on these latter vessels *Ceratophyllus fasciatus* is almost the only rat flea found.

The most heavily infested rats are on ships from the ports of the Caribbean Sea and adjacent localities and on ships from the east coast of South America; the least infestation of rats occurs on ships from the west coast of South America and from (only 13 ships observed) Australia.

Only 1 flea was found on 344 rats taken from 93 sugar-carrying vessels.

Fleas on rats killed by hydrocyanic acid gas are much fewer in cold weather than in warm weather. The material used in fumigation is a large factor influencing the number of fleas secured; with Zyklon B

less than half and less than two-thirds as many fleas per rat were secured as were found on rats killed with generated gases and sprayed liquid, respectively. The difference in the character of the warning gas used may be the determining factor.

Increase in the numbers of rats on a ship does not in general appear to increase the relative flea infestation, but rats on individual ships may or may not be heavily infested; for example, contrast 562 fleas from 61 rats on one ship and 0 fleas from 128 rats on another.

The constant occurrence of *X. cheopis* and *C. fasciatus* on ships presents a completely adequate explanation of the world-wide distribution of these two species. Basically, of course, it must be the inherent ability of these species to adapt themselves to a great variety of environmental conditions that accounts for their persistence where introduced, and indeed for their persistence on ships. These two fleas are worthy parasites of one of the most adaptable of all animals, the rat.

RATS ON SHIPS

Leaving the subject of fleas, this paper will now be confined to the consideration of ship rats. It has already been stated that on the 1,913 ships included in the 2-year survey were found 18,265 rats, an average of about 9.6 rats per ship. Excluding tankers, whaling vessels, sugar-carrying ships, and 2 exceptional Peruvian vessels, there are 1,702 vessels with 17,756 rats, or an average of 10.4 rats per ship.

The biological data will be presented in a separate section, but it may be observed here that the ship rat is almost exclusively the black rat (*Rattus rattus rattus*) and his very close relation (probably only a color variant) the Alexandrian roof rat (*Rattus rattus alexandrinus*). The two varieties of this species constitute 99.65 per cent of all rats (mice are not considered) taken from these ships. The only other rat recovered (64 rats, or 0.35 per cent) has been the brown or Norway rat (*Rattus norvegicus*). The black rat is a natural climber and well fitted for life under conditions aboard ship; its natural home is in man-made harborages. The brown rat prefers to live in the ground underneath some protective covering, a home it fails to find on a ship. While a good-enough climber, the brown rat is not in the same class as the black rat, whose agility is truly remarkable; indeed it must be seen to be believed. On account of its climbing habits the black rat is more often an inhabitant of docks, where it lives in the superstructures, more often gets into cargo, and more often climbs aboard ships than does the brown rat. Once aboard ship it finds a home to its liking and remains, while the brown rat does not find its preferred habitat on shipboard. It appears to be these factors that have made the black rat (and its Alexandrian cousin) the ship rat, although the

brown rat must be sufficiently often a passenger to account for its world-wide distribution in seaports.

On one ship only *R. norvegicus*, 35 in number, were found. A few similar instances during former years are on record.

CARGO AS A RAT-INFESTATION FACTOR

For convenience the various data are presented in short tables in this and succeeding sections. In these tabulations tankers, whaling vessels, ships carrying sugar, and two Peruvian vessels are omitted except where specifically mentioned.

TABLE 6.—*Rats on ships as affected by cargo*

	Number of ships	Number of rats	Rats per ship	Number of ships with no rats	Per cent of ships with no rats
Rat-food cargo.....	1, 011	13, 407	13	455	45
Non-rat-food cargo.....	691	4, 349	6	421	61

On the gross figures presented in Table 6, ships with rat-food cargo carry more than twice as many rats as those with nonrat-food cargo, and a much smaller proportion of such ships are free of rats. Reference is suggested to Table 5, which lists sugar ships. Since tankers present structure of the vessel as a major factor, they will be taken up in a separate section. There are only four whaling ships in the series; from one were secured 10 rats, the other three being rat free.

HARBORAGE IN CARGO AS A RAT-INFESTATION FACTOR

Table 7 does not show any evidence that harborage in the cargo itself is a material factor. It is probable that cargo remains in a ship too short a time for harborage therein to exert any material influence on the numbers of rats. Rat harborage in the cargo may be, and probably is, a factor in the entrance of rats to a ship and removal to the shore. One instance of such transfer is cited on page 468.

TABLE 7.—*Rats on ships as affected by harborage in cargo*

Type of cargo	Harborage in cargo	Number of ships	Rats per ship	Number of ships with no rats	Per cent of ships with no rats
Rat food.....	Rat harborage.....	583	14	251	43
	No rat harborage.....	428	12	204	48
Non-rat food.....	Rat harborage.....	132	6	82	63
	No rat harborage.....	559	6	339	61

TRADE ROUTE AS A RAT-INFESTATION FACTOR

In Table 8 the distribution of rats on the various trade routes is set forth. In this table the approximate average distances from New York have been entered. This factor is probably insusceptible of accurate analysis at this port, for the reason that none of these routes is short. There appears no suggestion that distance has any material influence on the numbers of rats that can not be more plausibly accounted for on the basis of cargo.

TABLE 8.—*Ships fumigated at New York, September 1 to August 31, 1927, tabulated according to trade routes (two Peruvian vessels omitted)*

Trade route	Approximate distance to New York	Number of ships	Rats per ship	Per cent of ships with no rats	General type of cargoes carried and remarks
Northern ports.....	3,000 miles.....	245	7	65	Export cargo varied, grain predominating. Import cargo mostly non-rat food.
Caribbean ports.....	2,000 miles.....	380	15	47	Export cargo very varied. Import cargo mostly rat food.
East coast of South America ports.	5,000 miles.....	274	14	34	Export cargo very varied. Import cargo, linseed, coffee, hides, and rat-food commodities.
West coast of South America ports.	.....do.....	99	1	79	Cargo mostly nonrat food both ways. Nitrates and ores load from lighters.
Mediterranean ports....	4,000 miles.....	352	8	52	Export cargo, grain and various. Import cargo, varied rat food, cork, and marble.
Far East ports.....	From nearest ports; 7,000 miles.	237	13	51	Export cargo, partly rat food. Import cargo, rubber, hemp, tin, tapioca, rice, and flour.
African ports.....	From nearest ports; 6,000 miles.	102	8	55	Export cargo varied. Import cargo ores, and various, some rat food. Ships on regular run.
Australian ports.....	10,000 miles.....	13	4	77	Export cargo, various. Import cargo, wool, hides, and nonrat food.
Sugar-carrying ships ¹ ..	2,000 to 10,000 miles (Cuba and Manila).	93	4	75	Mostly from Cuba. Some from Philippines. Only 1 flea (<i>X. cheopis</i>) secured from the 344 rats on these vessels.
Tankers ¹	2,000 to 10,000 miles ..	112	.2	97	Only rat food on tankers is in storeroom. One vessel 23 rats; two, 1 rat each.
Whaling vessels ¹	20,000 miles or more....	4	2.5	75	1 of 4 ships had 10 rats. These vessels touch at various ports for provisions, but seldom dock.
Total except sugar ships, tankers, and whalers.	.....	1,702	10	52	
Sugar ships, tankers, and whalers.	.....	209	1.3	87	

¹ Not included in total.

Two Peruvian vessels from the west coast of South America, already mentioned as omitted from the tabulation of this route, were exceptional. These ships had been engaged exclusively in coastwise traffic along the west coast, carrying a very different (very varied) cargo from the ships in foreign trade on this route, and had no record of fumigation or other rat-eradication measures; they regularly went to dock at Callao. As already stated, 43 rats were secured from one and 87 rats from the other.

DISCUSSION OF CARGOES AND TRADE ROUTES

A careful study of Table 9 below will repay the effort. It is practically conclusive evidence that, on the great majority of ships, the cargo carried is a major rat-influencing factor. In separating rat-food and non-rat-food cargoes personal judgment can not be eliminated; this particular tabulation being made entirely by the writer, however, only one judgment is here presented. Since all mixed cargoes are carried as rat food, non-rat food applying only to those in which there was no food for these rodents recorded, the figures for rat-food cargoes are conservative. Sugar is the one foodstuff considered as non-rat food; being separately listed, it does not enter into the various groups, but serves to strengthen the position of cargo as a major influence.

It is realized that, since these cargoes are the ones carried on the last trip before fumigation, they often fail to show true conditions; a vessel concerned may have been engaged for months in a grain-carrying trade and then shifted to run one trip to New York with coal or other non-rat-food cargo, being then listed in that group when it more properly belonged with the rat-food ships. The error, however, is conservative, since it should tend to lessen the gap between the two groups. As a check, careful inquiries as to ports visited and cargoes carried for four months prior to entry into New York were made on 128 ships. These are tabulated in Table 10 and serve to corroborate the grosser figures.

TABLE 9.—*Ships and rats arranged according to cargoes and trade routes*

[Reference to Table 8 will show the essential figures for the total number of ships under each trade route]

Trade route	Variety of cargo	Number of ships	Number of ships with no rats	Per cent of ships with no rats	Rats per ship (all ships in group)	Rats per ship (only ships with rats)
Northern.....	Rat food.....	19	11	58	18	43
	Non-rat food.....	226	149	65	6	16
Caribbean.....	Rat food.....	326	143	44	17	29
	Non-rat food.....	54	34	63	4	11
East Coast of South America.....	Rat food.....	249	89	36	14	21
	Non-rat food.....	25	4	16	13	16
West coast of South America.....	Rat food.....	35	27	77	1	6
	Non-rat food.....	64	51	80	1	7
Mediterranean.....	Rat food.....	235	127	54	7	16
	Non-rat food.....	117	55	47	9	17
Far East.....	Rat food.....	108	43	40	19	31
	Non-rat food.....	129	77	60	8	19
Africa.....	Rat food.....	39	15	38	12	19
	Non-rat food.....	63	41	65	6	16
Australia.....	do.....	13	10	77	4	16
Sugar-carrying vessels.....	do.....	93	70	75	4	15
Whaling vessels.....	do.....	4	3	75	2.5	10
Tankers.....	do.....	112	109	97	.2	8
Total figures for all ships except sugar vessels, whalers, and tankers.	Rat food.....	1, 011	455	45	13	24
	Non-rat food.....	691	421	61	6	16

TABLE 10.—*Rats recovered after fumigation of 128 ships, accurately recorded as to cargoes carried for four months prior to fumigation*

	Number of ships	Rats per ship	Number of ships with no rats	Per cent of ships with no rats
Rat-food cargoes, all voyages.....	11	14.3	7	64
Rat-food cargo, some voyages; others, various.....	24	8.5	14	57
Mixed cargo, part rat food.....	66	9.6	35	53
Total figures, above three classes.....	101	9.9	36	55
Non-rat food, all voyages.....	27	3.8	17	63

In Table 10 the proportion of ships on which no rats were found is rather high, and the numbers of ships are small for definite conclusions. It is corroborative of Table 9, however, and valuable for this reason. The evidence is carried further in Table 11, which lists the vessels in the fruit trade. These ships have mostly been in this trade for years, the great majority being owned or chartered by four fruit companies, and their cargoes are largely rat food both ways. They might well be contrasted with the sugar-carrying vessels (the latter as non-rat-food cargoes), Table 5, since they run in the same waters and visit similar ports.

TABLE 11.—*Rats found after fumigation on ships in the fruit trade*

Number of ships	Rats per ship	Number of ships with rats	Rats per rat ship	Number of ships with no rats	Per cent of ships with no rats
166	11	81	22	85	51

THE INFLUENCE OF NATIONALITY

It has been suggested that ships of some nationalities are more heavily infested with rats than others. Table 12 is a tabulation of ships of various nationalities and the rats found on them.

TABLE 12.—*Rats recovered after fumigation on ships of different nationalities. Figures to nearest whole number except when below 2. Includes all ships in our 2-year survey*

Nationality	Number of ships	Number of rats	Rats per ship	Ships with 20 to 49 rats		Ships with 50 or more rats	
				Number	Per cent	Number	Per cent
Peruvian.....	2	130	65	1	50	1	50
Honduran ¹	23	874	38	10	43	6	26
Japanese.....	44	749	17	5	11	6	14
Brazilian.....	26	333	13	6	23	1	4
French.....	57	742	13	8	14	5	9
Portuguese.....	8	94	12	0	0	1	12
Greek ²	14	137	10	2	14	1	7
American.....	681	7,131	10	68	10	43	6
Dutch.....	79	697	9	7	9	4	5
British.....	603	5,039	8	51	8	24	4
Norwegian.....	134	1,025	8	15	11	2	2
Italian.....	93	760	8	5	5	4	4
Swedish.....	35	172	5	1	3	1	3
Danish.....	36	181	5	4	11	0	0
Spanish.....	41	169	4	3	7	0	0
German.....	19	29	1.5	0	0	0	0
Canadian ³	4	3	.75	0	0	0	0
Chilean.....	9	0	0	0	0	0	0
Argentine ⁴	5	0	0	0	0	0	0

¹ All small, old, fruit ships.² Includes 7 fumigations on 1 ship.³ All lumber schooners.⁴ 1 ship fumigated 5 times.

On the face of it, this table appears to need little comment. There are certain interesting features, however, that develop under careful study. First, the great mass of ships lies between 8 rats per ship and 10 rats per ship, with 6 nationalities within the group. The ships of these six nationalities, except the Greek and Italian vessels, which run to the Mediterranean, represent the most widespread and variegated conditions, literally the shipping of the world as it appears at New York. Above and below these median figures are reflected, mostly, conditions of trade and not nationality. Above the median the two Peruvian vessels are coastwise traders (in Peru), never fumigated (so far as known) before their visit to New York; the Honduran ships are all in the fruit trade; the Japanese vessels mostly resemble the round-the-world vessels in route of travel, cargoes carried, and the fact that they are seldom sufficiently empty at American ports for effective fumigation; the French ships are, for the most part, engaged regularly in the Mediterranean trade, carrying rat-food cargo both ways; the Brazilian vessels are regularly on the east coast of South America run. The Portuguese vessels nearly all carry cork from Portugal and Spain and should show a lower rat yield. The position of American ships, at the top of the intermediate group, is probably due to the high proportion of ships in the east coast of South America and Caribbean trades. Below the median the low figures for Spanish vessels are unexplained; these ships run to the Mediterranean, carry a large porportion of rat-food cargoes, but have few rats. The Swedish and Danish vessels are nearly all listed with non-rat-food cargoes, largely coal, ore, and wood pulp. The German vessels are the real bottom of the list; it is the writer's opinion that their low rat yield is due to the strict discipline on these vessels and the good order and clean condition in which they are maintained. The four Canadian vessels are lumber schooners. The nine Chilean vessels represent actually that many fumigations of two ships regularly running between New York and Chilean ports, carrying mostly nitrate. The five Argentine vessels represent five fumigations of one ship, which in freedom from rats is rather exceptional for the east coast of South America trade.

TANKERS

The cause for the common immunity to rat infestation enjoyed by tankers is not far to seek. All factors are unfavorable to rats. Cargo is at all times nonrat food; harborage is reduced to a minimum; contact with the shore is for short periods only, at docks (often skeleton) devoid of rat food. Occasionally a colony of rats is found on a tanker (one in our survey yielded 23 rats). In such cases they have made their way into space over or under a wooden cold-storage

compartment or similar structure and have ready access to the pantry or storeroom. Since available harborage is confined to narrow limits, the presence or absence of rats may be determined very quickly by inspection.

ROUND-THE-WORLD SHIPS

Eight ships, all of one line, running on a permanent round-the-world schedule, are remarkable in several respects. Here are eight ships, built from similar plans, operated by one company, on the same route and carrying the same type of cargoes, yet differing radically in rat infestation. From the general run of ships they differ in that they are never entirely empty at American or any other ports, a condition which interferes with satisfactory fumigation. They differ (in common with many other ships) from the general run of cargo vessels in each having a refrigerated hold.

Their rat history during the past four years is recorded at the New York quarantine station. There are 2 ships on which no rats have been found after any fumigation, 4 ships on which have seldom been secured more than 20 rats after any fumigation (only six times in 47 fumigations have rats run over this figure), and 2 ships on which more than 20 rats have been regularly found (24 fumigations on these two vessels yielded 1,216 rats, just over 50 rats per fumigation; one fumigation yielded no rat and one 250 rats, these being the extremes). Careful comparative inspections have been made on these eight ships without finding any conclusive reason for the variations in numbers of rats. Of the two vessels with a negative rat history both have relatively less rat harborage than the other vessels. One is kept in beautiful order, showing careful attention to details of maintenance on the part of the personnel of the vessel; the other has an arrangement of structural details particularly favoring efficient fumigation in all the holds. The other ships exhibit no particular reason why one should carry more rats than another, all containing more or less rat-harborage space impenetrable to fumigating gases. In two ships rats have made their way into the insulation of the cold-storage holds. During the past two years removal of temporary ballast in their holds has been followed by a marked reduction in the numbers of rats.

INFLUENCE OF RAT PROOFING

Rat proofing of the ships operating regularly into New York has gained considerable headway, particularly on the larger passenger vessels. As yet no definite tests have been made of the efficacy of this procedure, but repeated inspections indicate that the ships on which this work is in progress carry fewer rats than before; some

instances have occurred in which notorious rat ships have become practically free of rats following rat proofing. This will be referred to hereafter.

INFLUENCE OF INSPECTION

While under the quarantine regulations fumigation of ships from plague-infected ports is compulsory, it is not necessarily required of other ships, which when found free of rats may be exempted from periodic 6-month fumigations. Such vessels, during the second year of our survey and thereafter, have been inspected carefully for evidences of rat infestation, and only when this has been found has fumigation been required. Since absence of rats means avoidance of fumigation in such cases, shipowners are beginning to take measures to keep vessels free of rats. The effect of this is believed to be apparent in the numbers of rats secured after fumigation. (Since many ships free of rats are not fumigated, the average number of rats secured per fumigation at the New York quarantine station has increased.) This can be seen in Table 1, where it is noted that in the second year 1,403 fewer rats were secured than in the first. About 300 to 400 of this discrepancy is explained by the drop in fumigation during July, 1927, following the fire in the fumigation-material warehouse already referred to.

FUMIGATION RECORDS

For the data presented in the succeeding sections recourse was had to the station files covering the period from January 1, 1923, to December 31, 1927, a total of five years. From these files we have taken the records of 229 separate ships, each fumigated six or more times at New York during this period, and the great majority of them fumigated only at New York during the time we have record, in each case. The total number of fumigations on these ships is 2,072. This data possesses the feature of connected rat histories for each voyage of ships over a considerable period. This is taken advantage of in Tables 15 and 16, wherein the ships are tabulated as to their individual records instead of showing the collected results of isolated fumigations, as in the other tables.

THE INFLUENCE OF FUMIGATION

In Table 13 is set forth the effect of varying time between fumigations.

TABLE 13.—Effect on rat yields of varying periods between fumigations. Data from record of ships fumigated six or more times at New York from January 1, 1923, to December 31, 1927 (tankers omitted)

Time since previous fumigation	Number of ships (fumigations)	Number of rats	Rats per ship	Ships with rats		Ships with no rats	
				Number	Rats per ship	Number	Proportion of group
Less than 2 months.....	10	58	6	6	10	4	<i>Per cent</i> 40
2 to 3 months.....	231	1,053	5	112	9	119	52
3 to 4 months.....	280	1,936	7	149	13	131	47
4 to 5 months.....	350	3,255	9	165	20	185	53
5 to 6 months.....	257	3,229	13	131	24	126	50
Over 6 months.....	857	13,104	15	504	26	353	41
No record.....	56	352	7	31	11	25	45
Total.....	2,041	22,985	12	1,998	21	943	46

The above table is strong evidence that rats do not increase rapidly on the great majority of ships, for if they did the differences between the groups would be much greater. It will be noted that the largest jump is across the 4 and 5 month groups, which about represents the time required for young rats to be born and reach a free running size.

In Table 14, where we tabulate the proportions of ships according to size of rat yields, the influence of time between fumigations is better seen.

TABLE 14.—Effect of time between fumigations on the numbers of rats secured (figures to nearest whole number unless below 1 per cent)

Time since previous fumigation	Number of ships with rats	Per cent with 20 to 49 rats	Per cent with 50 to 74 rats	Per cent with 75 to 99 rats	Per cent with 100 to 149 rats	Per cent with 150 to 199 rats	Per cent with 200 to 299 rats	Per cent with 300 to 399 rats	Per cent with 400 to 499 rats	Per cent with 20 or more rats
Less than 2 months.....	6	17	0	0	0	0	0	0	0	17
2 to 3 months.....	112	10	3	0	0	0	0	0	0	13
3 to 4 months.....	149	19	3	0	10.7	0	0	0	0	22
4 to 5 months.....	165	19	4	2	2	1.6	1.6	0	0	28
5 to 6 months.....	131	22	8	2	4	1.8	0	0	0	37
Over 6 months.....	504	21	8	3	2	1.8	1.2	0	10.2	36
No record.....	31	23	3	0	0	0	0	0	0	26
Total.....	1,098	20	6	2	2	.5	.2	0	10.1	30

1 ship with 20 rats.

1 ship.

Here again the main jump is across the four and five month groups. This suggests that the majority of rat-infested ships return to their normal rat-population status following fumigation in about five months. It will be seen also that the really large rat colonies appear to be in ships fumigated at intervals greater than four months. The table illustrates the quite small proportions of ships that harbor any considerable number of rats.

In Table 13 it will be noted that the proportion of ships fumigated on which no rats were found does not vary greatly throughout the groups. This is taken to indicate that ships once free of rats tend to remain so. In other words, a ship found free of rats on one fumigation will usually be found still free of rats on the next fumigation, whether this be performed in two, three, or six months. Conversely, ships from which rats are secured will generally be found still infested when fumigated again; in this case, as shown in Table 14, the amount of infestation varies in proportion to the time period between fumigation. These tendencies are borne out by a study of the rat-infestation histories of individual ships.

INDIVIDUAL SHIP HISTORIES

It is well known among quarantine personnel that certain ships are nearly always free of rats, while others are constantly heavily infested. Between these extremes is a large group of vessels that constantly yield few rats or that vary considerably. In Table 15 are shown, in groups according to their status, ships fumigated six or more times at New York during the period January 1, 1923, to December 31, 1927. In this table the average number of rats for each ship has been determined and the ships grouped according to these averages.

TABLE 15.—*Ships fumigated six or more times at New York between the dates January 1, 1923, to December 31, 1927, grouped according to comparative rat yields (average number of rats per fumigation)*

Group	Number of ships	Number of fumigations	Number of rats recovered	Average number of rats per fumigation	Maximum number of rats on one fumigation	Per cent of fumigations on which no rats were recovered
Ships on which no rats were found.....	128	1246	0	0	0	100
Ships averaging 1 to 5 rats per fumigation..	87	822	1,869	2	33	62
Ships averaging 6 to 10 rats per fumigation..	34	321	2,637	8	75	37
Ships averaging 11 to 30 rats per fumigation	59	521	9,967	19	164	17
Ships averaging 31 to 50 rats per fumigation..	13	100	1,253	42	164	7
Ships averaging over 50 rats per fumigation..	8	62	4,265	68	440	8
All ships.....	229	2,072	22,985	11	440	55

¹ Includes 5 tankers fumigated 31 times.

The real status of these ships is better shown in Table 16, where the groupings are reduced to three; these are ships rat free or slightly infested, ships moderately infested, and ships badly infested.

TABLE 16.—*Same as Table 15 except groups reduced to three*

Group	Number of ships	Number of fumigations	Number of rats recovered	Average number of rats per fumigation	Maximum number of rats on 1 fumigation	Per cent of fumigations on which no rats were recovered
Ships averaging 0 to 5 rats per fumigation..	115	1,068	1,869	1.7	33	71
Ships averaging 6 to 30 rats per fumigation..	93	842	12,598	14.7	164	24
Ships averaging over 30 rats per fumigation..	21	162	8,518	51.7	440	7

The outstanding conclusion to be drawn from the above tabulation is that the majority of vessels are relatively free of rats at all times and hence are of little importance as plague carriers. The last column shows clearly that heavily infested ships remain so, only 7 per cent of fumigations on them being negative, as contrasted with 71 per cent negative on ships which were slightly infested. These figures are regarded as practically conclusive evidence that the great majority of ship rats are born on the ships they infest. Other evidence has been cited and more is stated under the section on biological data. With such a condition, it would appear illogical to spend the large sums required for fumigation measures on all ships in order to reach the few that are a menace. Obviously, if rat eradication measures could be concentrated on the few infested vessels, time, money, and labor would be conserved, and probably better results would be obtained on the infested vessels.

Since the demonstration of the tendency to remain rat free is a very important point, Table 17 has been prepared to bring this out from another viewpoint. In this table ships have been segregated according to the number of rats secured on the first fumigation after January 1, 1923. For each group there is then shown the results of fumigations performed on the same ships approximately 6 months, 1 year, and 2 years later. In Table 17 there is clearly seen the progressive swing of the figures toward the higher numbers of rats as we pass down the groups from the rat-free to the badly infested ships. It will also be noted that if a fumigation produces less than 5 rats the chances are 3 to 1 that fumigations of the same ship 6 months, 1 year, and 2 years later will also produce less than 5 rats; if a fumigation produces 20 or more rats the chances are about 2 to 3 that subsequent fumigations will produce 20 or more rats; if a fumigation produces 50 or more rats, the chances are about 2 to 5 that this number will be found subsequently, and nearly 2 to 1 that at least 20 rats will be regularly secured from the same ships.

The figures show that while there is no real tendency for badly infested ships to become rat free there is a distinct tendency toward reduction in numbers of rats. This is a natural result of eradication efforts on these ships and the operation of such factors as change in type of cargo, removal of harborages, etc. Similar reductions for the relatively rat-free ships of course can not be noted; and since 0 is a limit, variations only appear, comparatively, in one direction—that is, upward—to the extent of about 25 per cent. In the case of rat-infested ships these variations upward also occur, but are greatly overbalanced by the variations downward. It should be borne in mind that in segregating ships by such a cross-section method we secure in our uninfested group not only the persistently rat-free ships but a number of vessels usually infested but enjoying for the moment

a rat-free interval; similarly, among the infested vessels are some usually rat free suffering, for some reason, from an infested interval. Comparisons should be made with Tables 15 and 16.

TABLE 17.—*Ships segregated according to rats found on first fumigation, January 1, 1923, in each case and further recorded to show fumigation results on the same vessels 6 months, 1 year, and 2 years later (percentages to nearest whole number)*

Ships on first fumigation yielding—	Ships in group	Fumigated 6 months later, ships yielding—				Fumigated 1 year later, ¹ ships yielding—				Fumigated 2 years later, ¹ ships yielding—			
		4 or less rats	5 to 19 rats	20 to 49 rats	50 or more rats	4 or less rats	5 to 19 rats	20 to 49 rats	50 or more rats	4 or less rats	5 to 19 rats	20 to 49 rats	50 or more rats
4 or less rats:													
Number	157	121	20	10	6	108	30	15	4	118	22	14	3
Per cent	100	77	13	6	4	69	19	10	3	75	14	9	2
5 to 19 rats:													
Number	39	19	13	4	3	17	8	10	4	21	7	8	3
Per cent	100	49	33	10	8	44	21	26	10	54	18	21	8
20 or more rats:													
Number	33	9	11	10	3	9	7	11	6	8	12	5	8
Per cent	100	27	33	30	9	27	21	33	18	24	36	15	24
50 or more rats: ²													
Number	25	4	4	7	10	2	6	11	6	5	6	7	7
Per cent	100	16	16	28	40	8	24	44	24	20	24	28	28

¹ That is 1 year (2 years) after first fumigation.

² Part of these are included in the "20 or more" group, the rest being taken from records of ships fumigated less than 6 times at New York but often enough to present the data herein.

The individual histories of ships are often highly interesting. While in general a ship stays in its rat-infestation class, there are numerous exceptions. In some cases badly infested vessels have become almost or quite rat free, often, but not always, following the elimination of rat harborage; on the other hand, rat-free ships have become infested, sometimes gradually and again suddenly. Sometimes these changes can be explained, though often no adequate reason can be advanced. One very interesting case is that of a vessel regularly running between New York and the east coast of South America which was fumigated, on the average, every three months. The first 13 fumigations yielded a total of 7 rats, while the fourteenth produced 143 rats; on the fifteenth fumigation, 35 rats were secured and on the sixteenth, 57 rats. The testimony of the ship's officers is to the effect that the rats all came aboard in a single cargo of potatoes in sacks. The colony has not been eradicated by the three subsequent fumigations. Opposed to this is another similarly constructed ship of the same line and on a similar run which, with an average of 2.6 rats per fumigation for the first 12 fumigations, yielded 20 and 63 on the next two, followed by 0 and 8 on the latest two fumigations; in this case the colony was eliminated.

Another vessel, with fumigations averaging about every eight months, shows the first yielding no rats, followed by two yielding

20 rats and 72 rats, followed by two negative fumigations, after which the three latest gave 6 rats, 164 rats, and 78 rats. A ship, running regularly in the African trade, after yielding an average of 35 rats on the first seven fumigations, dropped to 4 and 1 on the next two and to 0 on the two latest.

One of the "round-the-world" ships has a remarkable rat history; after averaging 17 rats on the first 7 fumigations, it yielded 185, 250, and 118 on the next three, followed by 8 and 3 on the two latest. Extensive rat harborage was eliminated on this vessel by removing the temporary ballast in the holds and closing a few rat openings into the insulation of the refrigerated holds.

Some of the rat-free ships show quite as remarkable records; for instance, the steamship *Alvarado* fumigated fifteen times in 52 months without finding a single rat, and the steamship *President Adams* fumigated thirteen times in 62 months with entirely negative results.

Probably the most noteworthy success that can be attributed to rat proofing is the case of the New York quarantine's prize rat ship, a vessel engaged in the West Indies trade, with a record average of 177 rats for six fumigations. Rat proofing was instituted on this vessel; after the elimination of the major harborages, fumigation yielded 11 rats, and another fumigation, after completion of rat proofing, was entirely negative; since then, for a period of over a year, no fumigations have been performed for the reason that repeated inspections have failed to show any evidence of rats.

In Table 18 are given a number of typical fumigation histories, together with several unusual ones. It will be noted that the generalized conclusions of Table 15 can not be too literally applied in determining the status, for the moment, of an individual ship from its rat history alone.

TABLE 18.—*Some typical and some unusual ship-rat histories extracted from records of ships fumigated six or more times at New York*

[The lower figure in each space is the time in months since previous fumigation, while the upper is the number of rats secured]

Ship No.	First fumigation	Second fumigation	Third fumigation	Fourth fumigation	Fifth fumigation	Sixth fumigation	Seventh fumigation	Eighth fumigation	Ninth fumigation	Tenth fumigation	Eleventh fumigation	Twelfth fumigation	Thirteenth fumigation	Fourteenth fumigation	Fifteenth fumigation
2	0 4	0 6	0 10	0 6	0 2	2 4	4 17	2 7	14 3						
3	0 N. R.	0 4	0 10	0 3	0 2	0 5	0 2	0 3	0 3	1 3	0 3	0 3			
5	15 N. R.	7 2	4 3	12 2	0 3	0 3	0 3	0 2	0 8	0 6	0 5				
6	5 3	0 4	5 11	5 5	1 4	7 3	2 4	31 6	7 4	31 7	59 7	42 4	14 4	59 6	
8	0 4	0 4	0 0	0 0	5 9	44 8	36 9	23 5	10 7	0 4					
9	1 3	0 2	21 14	12 3	5 4	6 9	4 6	1 12							

TABLE 18.—Some typical and some unusual ship-rat histories extracted from records of ships fumigated six or more times at New York—Continued

Ship No.	First fumigation	Second fumigation	Third fumigation	Fourth fumigation	Fifth fumigation	Sixth fumigation	Seventh fumigation	Eighth fumigation	Ninth fumigation	Tenth fumigation	Eleventh fumigation	Twelfth fumigation	Thirteenth fumigation	Fourteenth fumigation	Fifteenth fumigation
14.....	0	0	7	9	3	27	0	11	3	1	2	0	1	8	-----
	2	2	5	2	2	2	3	2	2	2	2				
22.....	15	14	12	8	17	102	74	86							
	8	6	7	7	6	6	5	11							
51.....	16	82	83	51	34	54	28	141	26						
	7	9	7	6	7	7	6	6	6						
58.....	28	34	45	1	75	70	25	104	41						
	6	6	10	6	7	8	5	7	5						
68.....	N. R.	0	0	0	23	35	0	0	0	0	29				
		3	5	3	8	4	3	3	2	2	13				
59.....	0	0	1	2	2	0	14	2	14	20	42	127	38		
	3	4	4	3	7	3	5	4	3	5	6	7	7		
60.....	0	5	0	0	0	0	3	6	4	42	79	52	48	4	
	4	4	4	5	3	4	4	4	3	4	5	12	4	3	
53.....	0	0	0	3	3	0	0	0	0	0	0	5	55	34	
	3	3	3	12	2	6	2	2	3	3	3	3	8	5	3
61.....	1	31	2	5	2	4	103	0	6	7	19				
	3	6	7	6	4	3	3	3	4	3	3				
74.....	0	21	0	0	0	0	65	23	42	79					
	6	11	5	6	6	6	4	5	5	5					
141.....	28	3	20	10	8	30	16	25	17	11					
	6	7	7	4	7	7	7	5	7	6					
142.....	29	43	32	13	13	19	7								
	13	13	5	6	6	13	6								
154.....	58	0	26	72	32	8	0	0							
	5	4	6	4	5	8	4	4							
160.....	21	29	46	20	8	16	39								
	16	11	9	16	5	5	4								
171.....	2	2	8	0	4	17	164								
	6	8	6	4	4	4	6								
172.....	45	42	50	45	21	73	22	41							
	7	8	5	4	6	7	6	8							
204.....	7	8	16	0	5	2	109	70	21	0	15	31	0		
	4	4	4	4	3	4	4	4	4	6	4	4	4		
216.....	0	8	16	2	3	0	0	0	0	0	0	0	5		
	3	4	4	3	11	4	3	4	3	4	4	4	7		
220.....	25	0	56	95	62	39	20	2							
	8	7	9	7	7	7	6	6							

BIOLOGICAL DATA

The biological data presented is confined to rats secured in the 2-year survey.

In Table 19 are given the gross figures for rats secured by fumigation, according to species.

TABLE 19.—Rats secured by fumigation, tabulated by species

	<i>Rattus norvegicus</i>	<i>Rattus rattus</i>	<i>Rattus rattus alexandrinus</i>	Total	<i>Mus musculus</i> (mice)
Number.....	64	7,245	10,956	18,265	742
Per cent of total (excluding mice).....	0.35	39.65	60		

The significant feature of this table is the very small proportion of *R. norvegicus*. The preponderance of *R. r. alexandrinus* over *R. r. rattus* is, in part, apparently due to the fact that mixtures of these

two varieties present, more or less, the *alexandrinus* marking. The proportions are better brought out in Table 20, which records observation of variants over a period of one year. Purely marked *rattus* and *alexandrinus* were recorded as such, while the mixtures were divided into three classes according to whether they were closer to one or the other or indeterminate. The even distribution is interesting. The preponderance of those purely marked—2 to 1 greater than all mixed individuals—suggests that the two varieties prefer to breed to themselves.

Some writers refer to another variety of ship rats under the name of *R. r. frugivorus*; distinguished by a sharply marked white or lemon colored belly. We have not made this distinction, including rats with this coloring under *R. r. alexandrinus*.

TABLE 20.—Proportions of purely marked *rattus* and *alexandrinus* and intermediate types, observed over a period of one year

	Pure alexandrinus marking	Approaching alexandrinus marking	Indeterminate	Approaching rattus marking	Pure rattus marking	Total
Number of rats.....	3,861	992	1,071	989	2,864	9,777
Per cent of total.....	39.5	10.1	11.0	10.1	29.3	-----

In Table 21 are presented the monthly proportions of pregnant rats and the average number of embryos.

TABLE 21.—The proportion of pregnant rats (based on the total number of rats—males and females—of each variety) and the average number of embryos, by months, from May, 1926, to August, 1927

Month	Rattus		Alexandrinus	
	Per cent pregnant	Average number embryos	Per cent pregnant	Average number embryos
1926				
May.....	13.9	6.6	18	6.4
June.....	12	6.9	10	6.4
July.....	11.6	7.7	14.2	7.5
August.....	8.4	6	10	6.5
September.....	13.8	6.3	12.1	7.7
October.....	12.4	8.2	14.2	7.1
November.....	14	7	15	7
December.....	7.6	10	14.7	7.3
1927				
January.....	14.3	6.4	13.5	8.6
February.....	11.8	6.5	12.8	7.7
March.....	11.8	7.4	14.2	6.2
April.....	14.2	6.6	16.2	6.1
May.....	22.3	7.3	20.4	7.2
June.....	17	6.2	17.1	7.1
July.....	14.4	6.3	13.1	7.2
August.....	13.6	6.5	10.2	7
Average.....	13.3	6.9	14.1	7

As compared with figures presented for *rattus* and *alexandrinus* in India, these figures are high. The proportion pregnant is also higher than the similar figure for *R. norvegicus*, gathered by the Public Health Service in New Orleans. The indication is that multiplication is more rapid on ships. On the basis of these figures, if there were no deaths or stillbirths, an average 100 rats would increase to about 1,200 in six months. The replenishment rate per 100 rats per day is the proportion pregnant times the number of embryos, divided by the number of days pregnancy is grossly visible (about 16 days). This gives, approximately, $\frac{14 \times 7}{16} = 6.1 = 6.1$ per cent.

Table 22 gives the proportions of males and females.

TABLE 22.—Proportions of males and females, May, 1926, to August, 1927

	R. r. rattus			R. r. alexandrinus		
	Males	Females	Total	Males	Females	Total
Number.....	3, 470	3, 899	7, 369	2, 142	2, 385	4, 527
Per cent of total.....	47	53		47	53	

The preponderance of the females is approximately in the proportion noted by various observers in different parts of the world.

The proportion of young rats as it varies with the total numbers on different ships, was observed during the second year of the survey. The results are presented in Table 23, which speaks for itself. The young were separated on the basis of general appearance and not by weight and measurement, so that these figures are not scientifically accurate; the separation was all done by one technician, however, who has dissected rats in this laboratory for years and who is qualified to pass judgment.

TABLE 23.—Proportions of young rats on ships yielding varying numbers of rats, September 1, 1926, to August 31, 1927

	Ships with 1 to 5 rats	Ships with 6 to 10 rats	Ships with 11 to 20 rats	Ships with 21 to 50 rats	Ships with 51 to 100 rats	Ships with over 100 rats
Total rats.....	275	542	1, 204	2, 772	2, 090	1, 558
Young rats.....	25	138	336	669	527	422
Per cent young.....	9	25	28	24	25	27

It will be seen that the proportion of young rats is quite constant at about 25 per cent on all ships, except those with 5 or less rats. It seems probable that the low figure for this latter group is an expression of the reduced chance of impregnation.

COMMENT

There are three outstanding features of this investigation. Most important is that the majority of rats are carried by relatively few ships and that, conversely, the majority of ships carry few rats. From a quarantine standpoint at New York about 50 per cent of arriving ships constitute about 90 per cent of the potential plague menace. Only about 10 per cent of these ships are heavily rat infested (over 30 rats), and these are really the potentially dangerous vessels.

Next in importance is the observation that at New York only two varieties of rat flea are found on ships in sufficient numbers to be of importance in the transmission of plague. These are *X. cheopis* and *C. fasciatus*. The failure to find any but occasional specimens of other species is interesting evidence of their lack of adaptability to conditions on shipboard. The observations largely account both for the restrictive localization of some rat-flea species and the widespread dissemination of *X. cheopis* and *C. fasciatus*.

The third important observation is that, while *X. cheopis* is markedly predominant on the great majority of ships, *C. fasciatus* is markedly predominant on vessels plying between New York and northern Europe. This condition helps materially to place these latter ships in a separate and distinct class of lower potential plague menace than vessels from other ports.

It will be noted throughout the tables in this report that heavily rat infested ships are the exception and that vessels with over 100 rats are quite exceptional. In view of the evidences of rapid multiplication of rats on shipboard, it must be evident that factors other than fumigation limit their numbers. This is quite in accord with experience ashore, where it is known that the numbers of rats do not usually increase beyond a definite normal limit for any given locality. Apparently the same is true on ships. The normal limit varies greatly on different ships and is probably dependent on several factors, of which the most important are the amount and continuity of the food supply, the available harborage, and the extent of human eradivative efforts. On shipboard any one of these factors when carried to extremes may be decisive.

The two Peruvian ships, which have been omitted from the tabulation of ships from the west coast of South America, present a striking example of the influence on the presence of rats, of conditions aboard ship. Ships running between New York and the west coast of South America carry non-rat-food cargoes, mostly nitrate, to New York and are practically free of rats. These two Peruvian vessels, however, had been for a long period engaged in traffic confined to the west coast of South America, where they carried very varied cargo,

much of it rat food. They were relatively heavily rat infested. Senior Surg. S. B. Grubbs, of the Public Health Service, informs the writer that some of the most heavily rat-infested ships he has ever seen ran regularly between Panama Canal ports and west South American ports. It would appear that the conditions of trade, conditions on the ship, and probably cargoes particularly, are far more important influences than the ports visited.

The ship rat data would suggest that more effective methods be developed for dealing with this problem. Of late years considerable progress has been made in this direction. For a number of years the English health authorities have been searching ships for signs of rat infestation as a preliminary and guide to more intensive measures. In Australia similar measures are at present in use. In 1925 and 1926 such inspection was tested by Akin and Sherrard (10) at the New York quarantine station, with the result that they demonstrated that rat infestation could be judged with a high degree of accuracy, even to foretelling, within reasonably close limits, the numbers of rats that would be secured by fumigation. Since then this system has been applied to certain classes of ships arriving at the New York quarantine station, with a consequent material reduction in the numbers of fumigations.

The fact that heavily rat-infested ships usually remain in this category, despite repeated fumigation, is taken to be good evidence that they carry a well-intrenched colony that can not be entirely eliminated by this means, the survivors renewing the rat population between fumigations. This is supported by observations in the laboratory that lots of rats from individual ships generally contain many young ones, and further by the trapping of rats on some of these vessels immediately after fumigation. That rats could be trapped on ships after fumigation has been demonstrated by numerous observers.

The maintenance of such colonies must be due to structural peculiarities that offer retreats, accessible to the rats, but too remote for the lethal gases to penetrate within the two hours' exposure allotted for fumigation. That this is the true status is amply borne out by careful inspections that have been made on many relatively heavily infested vessels, on every one of them being found various extensive and remote rat harborages.

To combat this condition, elimination of such harborages is essential. The elimination of harborages, however, has progressed further than this, and at present the Public Health Service advocates the rat proofing of vessels, with the view of rendering it practically impossible for rats to maintain existence on board.

Even if rat proofing is not successful in eliminating rat infestation, it will, in view of already attained results, certainly eliminate the

large rat colonies and will render the rats on a ship much more vulnerable to fumigation, thereby increasing the chance of entirely ridding a vessel of rats by fumigation.

Once a ship is entirely freed of rats it seems clear, from the figures presented in Tables 13 to 18, that it will ordinarily take considerable time to build a new colony on board. Rats go aboard ships in various ways, but they do not, as a rule, go aboard in numbers. The occasional invaders, here and there, form a nucleus, from which the colony is built. Judging from our figures for the proportion of pregnancies, numbers of embryos, and time of gestation, the potential rate of increase of a colony of rats is 6.1 per cent per day, so that a nucleus of 5 rats (Table 15 shows a majority of ships yield less than 5 rats on fumigation), if entirely unmolested and no deaths occur, might grow to 32 rats in three months and 60 rats in six months. As a matter of fact, however, colonies of 5 rats or less increase slowly, as is indicated in Table 23. Further, the potential rate of increase is, practically, never actually realized; it is probable that, even under conditions ideally favorable to rats, it is only approached. The rat histories of many ships suggest that rats invade ships from outside very irregularly, so that sometimes a vessel cleared of these rodents may go for many months or even years without becoming reinfested. By keeping check, by means of rat-infestation inspections on these ships, fumigation need be applied only when infestation actually occurs.

Rats going aboard ships that are rat proof will find living conditions much harder than on ships with good harborage, and they will increase more slowly. This would permit longer periods between fumigations. Numbers of vessels that have been rat proofed at New York have, at present writing, been entirely free of any sign of rat infestation for more than a year.

It would seem then that the following procedures are logical and would be fully justified.

1. To require the removal or protective closure of extensive rat harborages and obvious rat harborages.

2. To require, instead of the specified two hours' exposure to a standard concentration of fumigant, a complete rat eradication whereby the ship would be placed in the hands of the health officers for such time as this might require for fumigation, with such amount of gas, and for such period, and as many times, as was necessary in each individual case; and for such other treatment as became necessary completely to free the vessel of rats.

3. Rat-infestation inspections to be made and ships fumigated on the basis of observed rat infestation, after giving due consideration to the potentialities presented for plague infection in each case.

It is essential that these rat-infestation inspections be made only by specially trained and highly efficient, conscientious, skillful employees, in order to obtain reliable and dependable results. The period of special training required must be lengthy in order to develop the requisite judgment of the significance of the various indications of rat infestation.

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CURRENT WORLD PREVALENCE OF COMMUNICABLE DISEASES¹

The United States, January 6–February 2, 1929

The prevalence of certain important communicable diseases, as indicated by weekly telegraphic reports from State health departments² to the Public Health Service, from January 6 to February 2, 1929, is summarized below.

Meningococcus meningitis.—The reported incidence of meningococcus meningitis for January represented the highest attack rate for that disease since 1918. The current outbreak began in December, and the number of cases rose from 562 during the four weeks ended

¹ From the Office of Statistical Investigations, United States Public Health Service.

² The number of States reporting for the various diseases were as follows: Typhoid fever, 41; poliomyelitis, 43; meningococcus meningitis, 42; smallpox, 42; measles, 38; diphtheria, 42; scarlet fever, 41; influenza, 31.

December 29 to 885 cases for the four weeks ended February 2, 1929. The greatest increases appeared in Arizona, Iowa, Oklahoma, Alabama, Georgia, and Arkansas. On the other hand, significant decreases occurred in Illinois and Missouri. However, the general tendency was toward an increase in all sections of the country.

Influenza.—Detailed weekly reports on the influenza epidemic have appeared in recent issues of the PUBLIC HEALTH REPORTS. By the end of January the disease had closely approached the normal in all regions except the Atlantic coast, and even there the peak had apparently been passed in all sections, including the New England States.

Smallpox.—The greatest increases in the incidence of smallpox during the month of January were recorded in the Western and West North Central States, Illinois, North Carolina, and Alabama. In Maine, the outbreak which began in October had apparently terminated early in January, but four cases were reported again during the week ended February 2. Although the disease was experiencing the usual seasonal increase, the number of cases (3,011) reported for the four weeks ended February 2 was about 1,800 less than the number reported during the same period in 1928, and 650 less than in 1927.

Poliomyelitis.—The incidence of poliomyelitis remained at a low level during January, and the rate compared very favorably with that for the corresponding month of 1927. During the 4-week period ended February 2 the number of cases totaled 58, of which 7 occurred in California, 8 in Illinois, 5 in Michigan, and 6 in New York State.

Diphtheria.—A decrease in the prevalence of diphtheria was noted in nearly all of the States during the month of January. Preliminary reports indicated that the usual seasonal decline commenced perhaps a month earlier than in either of the two preceding years. The cases reported for the 4-week period ended February 2 totaled 6,230, as against 9,807 and 8,074 for the years 1928 and 1927, respectively.

Scarlet fever.—The scarlet fever rate for January maintained the relatively low level which characterized it throughout most of the preceding year. For the four weeks ended February 2, the cases of scarlet fever totaled 15,300, as compared with approximately 19,000 in 1928 and 23,000 in 1927.

Typhoid fever.—Approximately 400 cases of typhoid fever were reported during the four weeks ended February 2, which was 400 less than occurred during the corresponding period in 1928, and 500 less than in 1927. A slight increase in the incidence of the disease was noted in a few of the States, but the tendency in all sections of the country was toward the usual seasonal decline.

Measles.—Reports for January indicated only a slight increase in measles over the preceding month. A widespread seasonal prevalence slightly below normal prevailed. For the four weeks ended February

2 the cases totaled 21,633, as against 44,343 for the corresponding period in 1928 and 39,779 in 1927.

Mortality from all causes.—The mortality rate from all causes in large cities, as shown by the weekly health index of the Bureau of the Census, rose sharply from the early part of December, when the outbreak of influenza was spreading rapidly over the country. The maximum was reached during the week ended January 12, when the mortality rate for 65 large cities was 20.5 (annual basis) per 1,000 population. With the decrease in the prevalence of influenza and pneumonia, the general mortality rate also declined. The rate for the week ended February 2 was 16.7, which, however, was considerably in excess of the rates of 13.4 and 14.0 for the corresponding periods of the years 1928 and 1927, respectively.

Brief notes on the excess mortality from influenza and pneumonia have appeared in recent issues of the PUBLIC HEALTH REPORTS.

Foreign Countries¹

The prevalence of certain communicable diseases in most foreign countries during October, November, and part of December is summarized below.

Influenza.—Up to the middle of December there was no indication of an influenza epidemic in Europe. Later reports, however, from the health section of the League of Nations stated that the disease had appeared in Germany, England, Wales, Northern Ireland, Scotland, and the Irish Free State.

In Germany a large sickness insurance society reported daily maximum incidence rates among its members as follows: In Breslau, 3 cases per 1,000 members on December 28; in Bremen, 2 cases per 1,000 on January 7, 1929; in Berlin, 3.5 on January 15, and in Leipzig from 1.5 to 2.5 per 1,000 members per day.

During the week ended January 12 the general death rate in Belfast, Ireland, rose to 22.7 per 1,000 population, and in Dublin, Irish Free State, the rate was 22.7, as compared with 19 for the preceding week, but only a few of the deaths were attributed to influenza. In England and Wales, 107 large towns reported 122 deaths from influenza during the same week. The number was not abnormal.

In Scotland, 151 deaths from influenza were reported at Glasgow and 28 deaths in 15 other towns during the week ended January 19. During the preceding week 50 deaths were reported in Glasgow and 6 in the other towns.

The Canadian Health Service stated that a mild type of influenza was prevalent in Canada. Later reports showed that the highest incidence of the disease occurred in the Provinces of Ontario (4,125

¹ Data from the Monthly Epidemiological Report of the Health Section of the League of Nations' Secretariat, December 15, 1928, supplemented by information published in the PUBLIC HEALTH REPORTS.

cases) and Quebec (4,077 cases) during the weeks ended December 29 and December 22, 1928, respectively.

Plague.—In India the outbreak of plague in the Bombay Presidency, mention of which was made in a previous issue, was the most severe in that area since 1923. The highest incidence of the disease occurred in the Satara district, southeast of Bombay, where several plague epidemics have occurred since the disease was introduced into India. The number of cases continued to increase also in the district of Dharwar, situated farther to the south and east of Goa, and in Nasik, northeast of Bombay. From July 1 to November 3 the number of deaths from plague for the entire Bombay Presidency totaled 5,191. Of this number 3,441 occurred in the Satara district, 966 in the Dharwar district, 411 in Nasik, 118 in Belgaum (between Dharwar and Satara), 62 in Ratnagiri, and 59 in the Surat district. The remaining deaths were distributed over 11 other districts.

Due to this outbreak in the Bombay Presidency, the number of cases of plague reported in India in October was nearly twice the number reported for the corresponding period in the preceding year. Outside of the Bombay Presidency, the incidence of the disease was about normal for a favorable year. For the four weeks ended November 3 only 956 deaths were reported in all the remainder of India, as compared with 1,352 deaths during the corresponding period of the preceding year. Only 14 plague deaths were reported in the Punjab, including Delhi and the native States, during the months July to October, inclusive. From the middle of October to the middle of December human cases of plague were reported only twice at Rangoon. In previous years Rangoon has rarely been free from plague during any week of the year.

The incidence of plague decreased in Egypt during the month of December as it frequently does at that time of the year. However, the number of cases reported since the beginning of the year up to December 15 was 517, as compared with 77 during the same period in 1927. The increase, which was the highest since 1923, was largely due to one limited outbreak which occurred, during the early spring and summer months, in Beni Suef and Minieh, neighboring provinces along the Nile River in northern Egypt.

A slight improvement was noted in the plague situation at Lagos (Nigeria), Africa, where 50 plague cases were reported during the four weeks ended December 8, as compared with 85 during the preceding four weeks. One case of plague was reported in Beirut (Syria) during the week ended November 24. This was the only case occurring in any Mediterranean port from the middle of November to the middle of December. Three plague cases were reported in Cape Province, Union of South Africa in November. With the exception of 2 cases

in August, these were the first human plague cases occurring in the Union since March.

In Argentina, South America, only inland districts were plague-infected in November. During the four weeks ended December 8, cases of bubonic plague were reported in Argentina as follows: 13 in the province of Tucuman; 14 at Canada Honda; 9 in the province of Catamarca; 1 in the province of Cordoba; and 1 at Ucaaha.

Cholera.—The incidence of cholera in India increased during the second half of October, after having decreased continuously since the middle of August. The increase was most marked in the Bengal Presidency, where the number of deaths from cholera increased from 426 during the week ended October 13 to 1,243 during the week ended November 3, and in the United Provinces, where the number of deaths increased from 576 to 1,477 during the same period. The total number of cholera deaths reported in India in October was about the same as that during the corresponding month of the preceding year, but the geographic distribution differed somewhat. Last year at that time the disease had almost disappeared from the United Provinces and Bihar. Cholera was more widespread also in the Madras Presidency than last year, while the situation in Bengal was more favorable. The total cholera mortality in India during 1928 differed little from that experienced in 1927. Both years were years of moderate epidemics and less favorable than the two preceding years.

A slight increase of cholera occurred in French Indo-China (India) during the month of November. In Siam the cholera situation remained relatively favorable during November and increased slightly at the beginning of December. Eighteen cholera cases were reported at Bangkok during the four weeks ended December 15.

Yellow fever.—Sporadic cases of yellow fever continued to occur in west Africa. An additional case was reported on November 27 in the military camp at Ouidah, in Dahomey, and 1 case occurred at Bathurst, in Gambia, on December 5. Official statistics gave 41 cases of yellow fever with 26 deaths in the Belgian Congo during the first half of 1928. In general, the yellow fever situation in west Africa in 1928 compared very favorably with that of the two preceding years.

Diphtheria and scarlet fever.—The whole central part of Europe, from France in the west to Poland and Rumania on the east and the Kingdom of the Serbs, Croats and Slovenes and Switzerland in the south, shows a much higher prevalence of diphtheria than in the two preceding years. In that whole area approximately 8,000 more cases of diphtheria were reported during the months August to November than occurred during the corresponding period in 1927, and almost 14,000 more than were reported for the period in 1926. In countries north of that area there was a slight increase during 1926. During

1927 the situation remained unchanged. Preliminary mortality reports did not indicate any increased severity in the type of the disease.

Scarlet fever is also spreading very rapidly throughout a large part of Europe. During the months August to November the number of cases reported in Germany and the United Kingdoms was particularly high. On the other hand, the incidence of the disease had decreased in eastern Europe, and returns for the Baltic Republics—Poland, Hungary, and Bulgaria—were markedly lower than for the preceding two years.

RECENT STATE MORTALITY STATISTICS

For the information of public-health officials and others interested, the rates in the following tables have been computed from monthly mortality data furnished by the State health departments for the latest month for which records are available. Statistics of most communicable diseases are not included, since they are available in other tabulations in the PUBLIC HEALTH REPORTS. Statistics of deaths from other causes are limited to principal groups of diseases and certain important specific causes.

For purposes of comparison, the mortality records for a few preceding years are given, the rates being for the month corresponding to the last month for which the 1928 rate is available.

Monthly State mortality statistics

[All rates are on an annual basis, and, with the exception of mortality from all causes and infant mortality, are per 100,000]

	1928										Corresponding month for—			
	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	1927	1926	1925	1924	
ALL CAUSES: ANNUAL RATE PER 1,000														
Alabama:														
White	9.5	9.5	9.6	9.3	8.7	8.7	8.7	9.3	11.1	11.3	9.9	-----	-----	-----
Colored	17.6	17.8	16.4	16.3	17.1	15.7	14.8	16.6	17.5	17.0	15.1	-----	-----	-----
California	14.5	13.6	12.9	12.8	12.2	12.5	13.2	16.6	-----	-----	-----	-----	-----	-----
Connecticut	12.5	13.0	10.5	9.8	9.3	9.4	10.1	10.2	-----	9.4	10.4	11.6	11.1	-----
Hawaii					12.0	11.0	12.4	11.0	-----	11.5	-----	-----	-----	-----
Indiana	13.6	12.7	11.0	9.9	10.6	(?)	(?)	-----	-----	10.2	10.7	11.4	10.6	-----
Iowa	11.2	10.9	9.3	9.9	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Kansas	12.4	10.9	9.4	9.0	9.7	10.0	-----	-----	-----	-----	-----	-----	-----	-----
Kentucky					11.0	11.5	10.5	10.4	11.7	-----	-----	-----	-----	-----
Louisiana	13.0	12.3	11.1	12.7	12.2	11.5	11.5	-----	-----	-----	-----	-----	-----	-----
Michigan				9.9	9.7	10.6	10.9	11.3	-----	-----	-----	-----	-----	-----
Minnesota	10.6	10.7	8.3	8.1	8.0	8.1	8.6	8.8	-----	-----	-----	-----	-----	-----
Mississippi				13.0	11.9	10.7	10.7	11.4	-----	-----	-----	-----	-----	-----
Nebraska			8.2	7.9	8.2	8.0	8.3	8.8	-----	-----	-----	-----	-----	-----
New Jersey	13.8	13.2	11.2	9.9	9.9	9.7	10.6	10.8	13.2	11.5	13.1	12.3	12.7	-----
New York ¹	14.4	14.2	12.8	11.4	11.0	11.7	12.1	12.4	-----	12.4	12.6	14.5	13.8	-----
North Carolina	11.9	11.7	14.3	11.2	11.2	11.0	10.8	11.1	-----	-----	-----	-----	-----	-----
Pennsylvania	13.7	13.5	11.2	10.3	10.1	10.4	10.9	11.5	-----	11.5	11.7	12.0	12.0	-----
South Dakota	8.3	9.6	8.0	7.6	8.2	7.1	-----	-----	-----	10.8	-----	-----	-----	-----
Tennessee	13.6	12.0	11.5	12.7	11.6	11.2	10.9	11.3	-----	-----	-----	-----	-----	-----
Virginia									13.1	-----	-----	-----	-----	-----

Exclusive of New York City.

¹ Not available.

Monthly State mortality statistics—Continued

	1928										Corresponding month for—			
	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.		1927	1926	1925	1924
INFANT MORTALITY: PER 1,000 LIVE BIRTHS														
Alabama:														
White	59	59	64	65	54	57	62	61	57	05	45			
Colored	100	113	83	93	99	79	82	85	95	91	68			
California	59	64	60	59	53	55	58	69						
Connecticut	83	71	56	43	52	42	59	39		53	52	66	67	
Hawaii						91	87	80						
Indiana	75	69	56	52	63	64	60			67	73	75	63	
Iowa	58	54	54	48										
Kansas	(?)	53	44	(?)	65	58								
Louisiana	93	102	81	79	62	69	79							
Michigan				49	53	58	66	69						
Minnesota					44	38	50	41						
Nebraska			48	37	45	50	62	45						
New Jersey			52	56	(?)	56	56	67						
New York ¹	75	73	67	52	55	60	62	63		64	76	69	64	(?)
Pennsylvania	84	89	59	54	58	66	66	65		64	72	74		
South Dakota	59	65	47	48	56	50								
Virginia								56	72					
Wisconsin	68	75	60	53	47	51	55	59	72					

INFLUENZA (11)

Alabama:														
White	78.9	67.3	26.8	16.8	11.9	12.3	21.0	35.5	152.8	43.7	24.4			
Colored	107.7	112.1	45.0	29.0	25.1	30.0	33.0	42.2	185.9	67.1	38.1			
California	17.1	15.2	14.4	12.1	8.3	7.7	29.5	127.1						
Connecticut	29.4	71.5	16.6	6.6	2.9	6.0	12.4	9.0		10.7	11.7	22.3	20.2	
Hawaii					37.1	45.3	37.1	27.9		11.2				
Indiana	82.0	96.4	27.4	13.7	8.2	11.9	16.3			12.7	19.2	17.1	10.8	
Iowa	87.2	67.9	24.1	19.4										
Kansas	112.7	78.9	23.2	14.8	16.7	9.3								
Kentucky				11.5	17.1	11.0	18.5	38.1	142.0					
Louisiana	73.0	40.5	28.1	19.9	29.0	21.8	18.7							
Michigan				9.0	5.4	8.7	10.0	13.8						
Minnesota	58.1	104.2	24.1	13.8	7.8	8.0	16.4	16.1						
Mississippi				15.8	19.1	11.5	9.2	38.7						
Nebraska			19.0	8.4	11.7	9.5	20.1	30.2						
New Jersey	28.0	23.7	9.2	3.7	3.4	4.8	7.7	11.5	13.2	11.5	13.1	12.3	12.7	
New York ¹	27.0	34.3	18.9	4.4	2.3	4.1	8.8	13.7		11.1	10.6	10.8		
North Carolina	58.0	34.1	22.8	6.8	7.6	6.6	14.0	35.2						
Pennsylvania	47.1	65.0	28.6	10.3	7.7	12.1	14.4	21.0		19.5	19.8	21.6	19.8	
South Carolina	50.9	26.5	20.2	8.8	12.0	11.1								
South Dakota	48.4	98.7	41.5	35.1	15.1	10.4								
Tennessee	112.3	74.4	40.8	16.0	13.2	9.7	17.9	34.5		31.3				
Virginia								21.7	155.0					
Wisconsin	70.9	83.7	25.1	11.8	5.2	11.1	10.0	16.5	199.8					

TUBERCULOSIS, ALL FORMS (31-37)

Alabama:														
White	48.5	43.5	52.1	50.5	37.8	50.7	38.5	39.1	44.9	48.8	36.2			
Colored	184.0	160.9	182.6	172.7	168.8	128.1	141.1	158.0	125.3	147.4	172.2			
California	153.8	143.4	128.4	133.4	120.7	113.5	118.1	129.0						
Connecticut	77.6	71.5	73.9	68.6	55.4	55.8	63.5	53.5		58.3	67.9	60.4	64.0	
Hawaii					148.4	104.6	121.5	90.6		101.1				
Indiana	76.2	81.9	80.6	57.5	58.9	57.5	64.1			57.9	70.9	68.5	74.1	
Iowa	36.6	45.6	35.6	38.3										
Kansas	49.1	43.6	39.8	38.5	39.8	31.2								
Kentucky				73.8	108.8	101.5	97.3	109.1	97.8					
Louisiana	107.3	107.5	96.1	93.0	96.0	72.4	55.5							
Michigan				62.8	60.8	59.1	58.2	64.1						
Minnesota	55.0	64.0	47.8	43.7	54.9	50.1	34.6	47.8						
Mississippi				78.2	82.9	78.1	54.6	80.2						
Nebraska			35.4	20.1	28.4	20.7	20.1	21.6						
New Jersey	83.1	86.3	87.2	68.4	76.1	66.9	73.6	63.7	65.9	72.9	84.5	75.9	79.9	
New York ¹	88.5	82.5	82.9	73.2	71.1	70.0	71.8	67.2		68.9	69.0	88.5	80.0	
North Carolina	88.2	93.8	106.4	65.7	81.8	77.9	60.9	69.2						
Pennsylvania	81.9	79.9	68.6	69.0	59.6	62.4	58.0	55.5		63.4	65.3	68.7	72.3	
South Carolina	86.8	97.9	80.9	87.8	66.3	53.5								
South Dakota	67.4	61.9	57.0	83.6	95.3	29.4								
Tennessee	150.5	104.9	129.8	134.1	112.5	99.7	106.8	118.2		101.8				
Virginia						69.0	84.1	71.3	88.3					
Wisconsin	63.0	79.3	60.1	52.2	52.2	49.0	42.3	47.8	48.6					

¹ Exclusive of New York City.² Not available.

Monthly State mortality statistics—Continued

	1928										Corresponding month for—			
	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.		1927	1926	1925	1924

CANCER, ALL FORMS (43-49)

Alabama:														
White	49.2	44.9	59.4	49.1	62.4	52.1	54.7	59.4	48.4	59.8	57.6			
Colored	36.8	51.4	46.3	48.8	47.5	46.3	47.5	43.6	54.1	56.6	40.7			
California	145.8	148.3	131.4	127.7	128.2	144.7	143.4	141.5						
Connecticut	102.5	84.6	113.8	99.2	110.2	103.3	132.8	110.1		100.5	100.0	112.9	115.8	
Hawaii					74.2	38.3	74.2	59.3		78.6				
Indiana	105.3	90.8	104.3	87.1	109.7	94.6	90.8			100.5	93.5	98.9	82.6	
Iowa	104.2	114.0	110.2	115.9										
Kansas	96.8			80.8	93.7	103.4								
Kentucky				54.4	70.1	73.4	64.1	72.0	57.7					
Louisiana	69.9	71.2	61.8	70.6	75.5	69.9	73.1							
Michigan				92.3	87.5	103.9	92.6	92.0						
Minnesota	93.0	108.1	110.0	107.3	105.1	110.4	104.7	100.1						
Mississippi				39.4	50.0	52.3	49.3	50.9						
Nebraska			90.7	87.0	82.0	99.4	93.7	102.0						
New Jersey	104.4	120.5	105.4	97.7	99.8	101.9	112.2	104.4	118.9	102.7	113.6	114.5	104.0	
New York ¹	122.0	121.8	117.2	123.5	123.5	122.0	104.7	115.5		117.6	120.4	128.5	133.8	
Pennsylvania	102.0	95.5	91.8	99.4	99.4	97.6	96.0	100.7		99.3	99.7	87.8	95.9	
South Carolina	34.6	50.5	39.2	46.7	34.1	41.1								
South Dakota	63.9	73.6	81.2	68.6	80.3	63.9								
Tennessee	67.6	47.5	73.4	70.6	55.5	50.8		54.0		53.4				
Virginia								61.0	63.6					
Wisconsin	106.7	98.1	(?)	111.6	104.1	106.7	103.7	103.0	111.2					

DIABETES (57)

Alabama:														
White	8.0	7.7	7.2	4.2	9.1	15.2	8.4	9.4	11.9	16.8	8.9			
Colored	9.5	7.9	6.8	10.5	5.3	15.0	4.0	9.5	6.6	9.2	5.3			
California	25.9	21.4	17.6	18.3	19.4	16.3	16.3	24.8						
Connecticut	19.6	16.1	18.1	20.4	16.8	15.8	18.2	15.8						
Hawaii					6.7	10.5	13.5	7.0		3.7				
Indiana					14.5	16.1	16.3							
Iowa	25.6	19.4	12.5	15.0										
Kansas	23.2	18.6	21.9	16.7	14.8	17.2								
Kentucky				9.7	9.7	9.5	9.2	10.0	10.2					
Louisiana	15.0	8.5	8.1	9.7	13.3	6.9	15.1							
Michigan				16.9	16.2	18.3	20.5	19.6						
Minnesota	21.0	26.1	15.2	13.4	12.5	12.5	13.4	21.9						
Mississippi				5.9	7.2	5.4	6.6	3.4						
Nebraska			15.6	16.7	13.4	19.0	15.1	22.5						
New Jersey				16.0	19.4	21.3	21.3	23.9	26.2					
New York ¹	26.3	28.6	24.6	18.5	24.0	21.5	25.0	20.4		23.9	22.3	22.8	25.6	
Pennsylvania	25.9	23.2	19.9	18.6	20.0	17.4	20.8	21.3		19.4	19.3	18.4	16.4	
South Carolina	3.3	6.9	4.6	3.8	5.1	6.5								
South Dakota	27.7	13.4	15.6	10.0	18.4	6.9								
Tennessee			6.8	6.1	7.1	10.2	7.5	13.6						
Virginia								9.0	13.3					

DISEASES OF THE NERVOUS SYSTEM AND OF THE ORGANS OF SPECIAL SENSE (70-86)

Alabama:														
White				75.0	69.4	72.4	72.9	89.1	100.9					
Colored				118.7	133.2	132.2	116.0	139.0	125.3					
California	132.7	141.1	132.5	129.5	130.3	128.8	137.7	154.1						
Iowa	145.8	142.6	125.3	132.4										
Kansas	171.7	146.3	115.4	132.2	111.0	125.3								
Kentucky				82.1	97.3	103.4								
Louisiana	110.4	91.8	89.8	102.6	103.3	97.3	75.5							
Michigan				118.5	103.4	126.4	124.1	126.4						
Minnesota					76.6	82.7	88.2	80.9						
Nebraska			102.8	94.5	97.0	96.8	102.0	102.8						
New Jersey	139.5	132.5	110.8	98.6	98.3	95.8	110.9	113.7	118.9	123.1	145.3	152.4	132.4	
New York ¹	172.7	159.9	145.7	128.4	120.6	136.1	139.3	136.6		141.3	148.8	190.8	188.5	
Pennsylvania			119.4	109.8	108.1	97.6	115.4	119.8						
South Dakota	96.8	98.7	76.0	63.6	103.7	77.8								
Virginia								106.8	119.8					

¹ Exclusive of New York City.² Not available.

Monthly State mortality statistics—Continued

	1928										Corresponding month for—			
	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	1927	1926	1925	1924	
CEREBRAL HEMORRHAGE, APOPLEXY (74)														
Alabama:														
White-----	48.5	56.1	49.2	45.6	35.7	42.7	39.2	51.4	65.9	62.7	61.3	-----	-----	-----
Colored-----	85.9	75.2	69.5	75.2	75.2	80.4	83.1	72.2	63.3	80.3	71.0	-----	-----	-----
California	94.5	100.5	92.1	89.7	91.7	88.9	94.1	112.2	-----	-----	-----	-----	-----	-----
Hawaii	-----	-----	-----	-----	70.8	13.9	84.3	76.7	-----	33.7	-----	-----	-----	-----
Indiana	134.1	107.5	95.4	90.8	93.8	97.3	96.4	-----	-----	112.1	94.2	102.7	90.2	-----
Iowa	102.2	105.7	92.7	91.7	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Kansas	131.9	106.5	91.5	98.8	82.8	96.8	-----	-----	-----	-----	-----	-----	-----	-----
Kentucky	-----	-----	-----	48.0	66.4	64.3	53.5	66.7	60.9	-----	-----	-----	-----	-----
Louisiana	75.5	57.4	63.6	75.5	61.6	61.8	53.1	-----	-----	-----	-----	-----	-----	-----
Michigan	-----	-----	-----	83.9	77.2	87.5	92.3	87.5	-----	-----	-----	-----	-----	-----
Minnesota	-----	-----	-----	-----	59.3	59.0	67.5	63.0	-----	-----	-----	-----	-----	-----
Mississippi	-----	-----	-----	-----	58.5	59.2	67.9	61.8	66.6	-----	-----	-----	-----	-----
Nebraska	-----	-----	80.4	67.7	75.3	76.9	81.1	71.7	-----	-----	-----	-----	-----	-----
New Jersey	-----	-----	-----	73.6	70.3	72.0	80.7	86.0	90.3	-----	-----	-----	-----	-----
New York ¹	135.3	124.6	113.5	95.5	92.0	104.2	104.4	107.2	-----	107.2	112.3	149.0	142.8	-----
Pennsylvania	101.0	88.2	87.8	78.7	76.8	68.4	80.7	92.0	-----	88.1	91.2	63.9	(?)	-----
South Dakota	57.0	53.5	38.0	31.8	68.6	43.2	-----	-----	-----	-----	-----	-----	-----	-----
Virginia	-----	-----	-----	-----	-----	-----	-----	70.9	82.8	-----	-----	-----	-----	-----

DISEASES OF THE CIRCULATORY SYSTEM (87-96)

Alabama:														
White	-----	-----	-----	114.9	117.7	106.5	113.5	124.6	128.3	-----	-----	-----	-----	-----
Colored	-----	-----	-----	184.6	188.5	185.3	171.4	200.3	195.1	-----	-----	-----	-----	-----
California	318.6	290.0	280.4	266.2	256.4	267.3	293.8	387.8	-----	-----	-----	-----	-----	-----
Iowa	249.0	238.1	211.5	226.9	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Kansas	236.7	197.0	192.3	155.9	173.9	169.7	-----	-----	-----	-----	-----	-----	-----	-----
Kentucky	-----	-----	-----	143.0	178.6	128.8	155.4	202.5	-----	-----	-----	-----	-----	-----
Louisiana	213.4	193.2	168.6	186.6	191.4	184.7	193.8	-----	-----	-----	-----	-----	-----	-----
Michigan	-----	-----	-----	197.5	188.8	222.1	240.3	241.7	192.3	-----	-----	-----	-----	-----
Minnesota	-----	-----	-----	-----	145.3	156.0	172.2	194.4	-----	-----	-----	-----	-----	-----
Nebraska	-----	-----	176.3	161.4	152.2	163.3	178.1	188.4	-----	-----	-----	-----	-----	-----
New Jersey	306.6	286.0	231.2	209.2	213.2	215.9	250.8	254.7	307.2	256.6	272.9	255.1	234.0	-----
New York ¹	387.7	379.4	342.5	301.6	276.5	311.4	335.4	358.2	-----	318.4	315.5	348.6	314.0	-----
Pennsylvania	-----	-----	247.5	209.1	196.9	218.6	236.1	243.2	-----	-----	-----	-----	-----	-----
South Carolina	263.7	341.1	279.4	305.1	274.1	283.3	-----	-----	-----	-----	-----	-----	-----	-----
South Dakota	115.8	152.2	136.5	110.4	88.6	129.6	-----	-----	-----	-----	-----	-----	-----	-----
Virginia	-----	-----	-----	-----	-----	-----	-----	156.4	204.4	-----	-----	-----	-----	-----

DISEASES OF THE HEART (87-90)

Alabama:														
White	98.5	101.6	109.4	102.3	104.4	99.2	103.0	115.2	115.6	115.1	95.3	-----	-----	-----
Colored	199.0	188.6	183.9	186.8	180.7	166.2	155.6	182.6	187.2	144.7	134.1	-----	-----	-----
California	276.7	255.6	243.0	225.9	214.0	223.0	245.5	344.5	-----	-----	-----	-----	-----	-----
Connecticut	196.8	101.4	160.6	192.6	164.9	156.0	156.8	198.3	-----	-----	148.8	175.6	214.0	151.4
Hawaii	-----	-----	-----	-----	-----	121.5	115.0	114.7	108.1	-----	74.9	-----	-----	-----
Indiana	194.6	180.2	172.0	149.4	169.1	182.3	201.7	-----	-----	-----	179.4	168.3	148.4	125.2
Iowa	220.0	215.8	186.9	193.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Kansas	214.2	169.4	163.1	135.4	146.3	-----	153.2	-----	-----	-----	-----	-----	-----	-----
Kentucky	-----	-----	-----	128.7	150.4	-----	100.6	144.8	154.4	169.3	-----	-----	-----	-----
Louisiana	200.9	181.7	157.9	172.7	178.7	179.1	181.7	-----	-----	-----	-----	-----	-----	-----
Michigan	-----	-----	-----	173.4	163.9	187.9	215.4	205.7	-----	-----	-----	-----	-----	-----
Minnesota	125.6	154.4	130.1	120.7	128.5	127.4	144.5	157.8	-----	-----	-----	-----	-----	-----
Mississippi	-----	-----	-----	111.1	103.9	99.9	88.7	89.7	-----	-----	-----	-----	-----	-----
Nebraska	-----	-----	157.3	132.1	136.3	140.8	153.9	181.5	-----	-----	-----	-----	-----	-----
New Jersey	-----	-----	-----	191.4	196.6	193.3	229.0	233.7	278.6	-----	-----	-----	-----	-----
New York ¹	342.7	324.3	300.7	257.8	207.3	237.2	291.3	312.0	-----	275.2	270.4	299.8	273.1	-----
Pennsylvania	249.0	233.0	220.9	189.7	176.6	196.9	214.0	222.0	-----	225.0	214.0	199.0	(?)	-----
South Dakota	103.7	135.5	115.8	93.7	85.3	112.3	-----	-----	-----	-----	-----	-----	-----	-----
Tennessee	133.2	122.4	127.9	124.7	122.4	118.7	126.1	123.5	-----	-----	-----	-----	-----	-----
Virginia	-----	-----	-----	-----	-----	-----	-----	143.6	188.4	-----	-----	-----	-----	-----

¹ Exclusive of New York City.² Not available.

Monthly State mortality statistics—Continued

	1928										Corresponding month for—			
	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	1927	1926	1925	1924	
DISEASES OF THE RESPIRATORY SYSTEM (97-107)														
Alabama:														
White				34.3	35.7	37.7	59.6	91.3	114.2					
Colored				56.7	54.1	81.7	76.5	148.5	192.5					
California	103.6	84.8	75.3	67.7	55.8	68.1	92.0	159.2						
Iowa	104.2	91.2	53.1	36.9										
Kansas	107.4	69.9	45.1	28.2	26.9	32.5								
Kentucky				39.7	51.2	62.9	85.8	130.1	152.7					
Louisiana	129.8	114.1	51.2	56.2	62.5	54.9	74.9							
Michigan				51.3	41.5	49.3	76.2	107.9						
Minnesota					26.4	39.8	56.2	78.2						
Nebraska			38.9	26.8	27.6	30.2	53.5	83.0						
New Jersey				47.1	45.0	64.0	78.3	95.8	486.6					
New York ¹	170.9	138.7	93.1	42.9	44.1	65.2	82.5	104.4		98.7	117.0	142.8	102.7	
Pennsylvania			90.4	58.1	51.6	72.8	88.9	112.7						
South Dakota	72.6	61.9	60.5	53.5	56.6	31.1								
Virginia							77.5	113.6						

PNEUMONIA, ALL FORMS (100-101)

Alabama:														
White	120.2	84.8	48.5	30.1	28.0	29.7	46.3	81.1	104.4	136.5	85.7			
Colored	170.4	184.7	69.5	46.1	44.8	72.2	68.6	133.5	180.6	155.3	107.8			
California	88.9	74.7	65.7	54.8	43.9	57.4	78.0	139.9						
Connecticut	165.1	183.1	72.4	34.3			73.7	71.6		72.1	78.0	137.6	105.3	
Hawaii					118.1	118.5	134.9	97.6		213.4				
Indiana	173.2	120.5	58.0	30.0	33.7	44.1	61.5			67.7	65.2	70.8	63.4	
Iowa	92.2	80.5	41.1	31.0										
Kansas	96.8	56.5	35.8	21.8	16.0	25.9								
Kentucky				32.7	43.4	52.9	78.4	108.2	132.4					
Louisiana	119.2	102.6	41.2	46.5	52.5	41.2	60.4							
Michigan				37.4	21.3	37.6	61.3	90.1						
Minnesota	102.4	76.1	47.8	30.7	22.9	32.6	51.0	70.2						
Mississippi				25.0	23.0	29.9	28.9	76.8						
Nebraska			32.0	15.1	18.4	23.3	43.5	76.0						
New Jersey	104.1	86.3	52.2	39.4	36.4	54.1	68.4	83.7	160.5	61.2	76.8	79.8	83.6	
New York ¹	152.9	126.3	80.2	36.4	35.1	53.4	65.9	89.4		83.0	100.2	118.1		
North Carolina	125.5	93.4	91.5	40.5	24.8	31.5	48.9	78.7						
Pennsylvania	166.0	156.0	75.7	45.3	40.4	56.2	72.8	97.1		92.2	120.0	140.0	131.0	
South Carolina	124.7	111.2	58.7	44.2	49.9	56.8								
South Dakota	50.1	110.4	55.3	43.5	43.5	20.7								
Tennessee	116.7	104.5	61.3	38.1	39.5	40.4	59.3	91.9		97.4				
Virginia								64.3		98.3				
Wisconsin	128.5	116.8	99.7	40.7	29.9	38.3	58.2	(?)	164.3					

DISEASES OF THE DIGESTIVE SYSTEM (103-127)

Alabama:														
White				171.0	136.7	109.4	94.6	72.4	66.6					
Colored				143.7	147.7	115.8	85.7	57.2	69.9					
Hawaii					185.6	167.3	124.8	122.0		175.9				
Iowa	55.6	61.1	63.1	78.6										
Kansas	69.0	81.5	74.3	95.6	138.0	141.2								
Kentucky				135.6	180.8	171.6	107.5	89.6	57.2					
Louisiana	91.7	94.2	134.1	125.0	112.3	114.2	93.6							
Michigan				81.3	95.7	110.5	94.6	84.5						
Minnesota					50.2	58.6	64.4	57.7						
Nebraska			73.4	88.6	107.0	86.4	59.4	65.7						
New Jersey	(?)	(?)	(?)	82.0	101.4	90.7	78.6	68.5	74.6					
New York ¹	72.6	79.5	70.9	68.2	79.8	84.6	73.7	72.4		80.4	71.9	89.8	93.9	
Pennsylvania				71.7	79.3	91.7	118.3	73.8						
South Dakota	60.5	61.9	60.5	45.2	46.8	74.3								
Virginia								48.7	51.7					

¹ Exclusive of New York City.² Not available.³ Rate previously published was exclusive of infantile diarrhea.

Monthly State mortality statistics—Continued

	1928										Corresponding month for—			
	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.		1927	1926	1925	1924
DIARRHEA AND ENTERITIS UNDER 2 YEARS (113)														
Alabama:														
White.....	10.9	14.8	77.5	89.7	69.7	62.3	37.1	16.7	13.3	19.7	10.3	-----	-----	-----
Colored.....	21.8	18.5	59.9	73.8	58.0	53.1	18.5	8.2	13.2	17.1	10.5	-----	-----	-----
California.....	14.7	22.2	29.4	21.2	25.1	19.8	19.6	15.0	-----	-----	-----	-----	-----	-----
Connecticut.....	6.0	4.4	5.3	3.6	13.9	12.1	8.8	4.5	-----	17.6	7.8	8.7	21.1	-----
Hawaii.....	-----	-----	-----	-----	114.7	97.6	74.2	59.3	-----	108.6	-----	-----	-----	-----
Indiana.....	6.1	7.8	7.3	20.0	50.4	47.1	28.2	-----	-----	37.4	41.8	53.3	40.7	-----
Iowa.....	3.5	3.4	2.5	6.3	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Kansas.....	8.0	6.4	11.3	22.5	52.0	40.4	-----	-----	-----	-----	-----	-----	-----	-----
Kentucky.....	-----	-----	-----	70.1	95.9	99.1	60.0	34.3	12.5	-----	-----	-----	-----	-----
Louisiana.....	22.5	29.6	51.8	43.5	30.8	26.8	24.8	-----	-----	-----	-----	-----	-----	-----
Michigan.....	-----	-----	-----	14.6	23.9	38.7	25.9	15.1	-----	-----	-----	-----	-----	-----
Minnesota.....	(¹)	(¹)	(¹)	(¹)	4.3	6.7	6.1	4.9	-----	-----	-----	-----	-----	-----
Mississippi.....	-----	-----	-----	77.6	35.5	24.5	22.4	12.2	-----	-----	-----	-----	-----	-----
Nebraska.....	-----	-----	9.5	5.9	23.4	17.3	10.0	2.6	-----	-----	-----	-----	-----	-----
New Jersey.....	12.7	11.4	10.2	16.6	29.0	24.5	16.9	14.0	12.6	9.4	15.4	12.8	16.7	-----
New York ¹	12.4	10.9	13.5	8.0	14.5	20.9	15.2	10.0	-----	13.7	14.0	19.8	20.1	-----
North Carolina.....	7.0	29.7	119.7	97.8	70.9	44.7	30.9	26.1	-----	-----	-----	-----	-----	-----
Pennsylvania.....	16.4	16.5	13.5	18.6	32.1	50.7	30.0	15.8	-----	22.4	22.9	25.4	31.4	-----
South Carolina.....	² 5.9	² 38.5	² 83.5	² 78.3	² 43.0	² 36.6	-----	-----	-----	-----	-----	-----	-----	-----
South Dakota.....	8.6	1.7	5.2	8.4	6.7	12.1	-----	-----	-----	-----	-----	-----	-----	-----
Tennessee.....	3.4	8.9	59.8	94.6	80.5	55.9	35.8	19.9	-----	3.9	-----	-----	-----	-----
Virginia.....	-----	-----	-----	-----	42.1	22.9	9.0	7.3	-----	-----	-----	-----	-----	-----
Wisconsin.....	16.5	15.6	9.5	12.4	8.8	(³)	8.4	4.5	13.6	-----	-----	-----	-----	-----

NEPHRITIS (128, 129)

Alabama:														
White.....	73.9	68.0	80.4	74.3	60.3	73.9	65.2	75.3	91.8	79.4	76.1	-----	-----	-----
Colored.....	111.8	124.0	113.1	151.6	156.9	137.6	123.9	147.1	112.1	123.7	97.3	-----	-----	-----
California.....	128.4	109.6	105.2	96.7	93.8	100.1	96.1	130.1	-----	-----	-----	-----	-----	-----
Connecticut.....	73.1	84.6	89.0	67.8	57.6	63.3	60.5	67.1	-----	-----	-----	-----	-----	-----
Hawaii.....	-----	-----	-----	-----	⁴ 60.7	⁴ 59.3	⁴ 40.5	⁴ 66.2	-----	⁴ 59.9	-----	-----	-----	-----
Indiana.....	90.0	83.0	78.1	71.2	77.1	84.3	75.6	-----	-----	75.1	84.8	76.1	69.1	-----
Iowa.....	52.6	52.4	58.1	61.6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Kansas.....	114.0	94.3	78.9	75.1	75.7	88.2	-----	-----	-----	-----	-----	-----	-----	-----
Kentucky.....	-----	-----	-----	71.0	76.6	80.5	96.4	84.5	86.7	-----	-----	-----	-----	-----
Louisiana.....	120.4	131.6	99.2	120.2	102.6	93.6	117.1	-----	-----	-----	-----	-----	-----	-----
Michigan.....	-----	-----	-----	61.3	68.2	62.5	68.2	74.7	-----	-----	-----	-----	-----	-----
Minnesota.....	61.7	54.9	38.0	45.9	45.9	50.5	52.8	39.3	-----	-----	-----	-----	-----	-----
Mississippi.....	-----	-----	-----	101.9	106.5	81.5	112.4	95.1	-----	-----	-----	-----	-----	-----
Nebraska.....	-----	-----	44.9	44.3	44.3	31.1	46.8	53.6	-----	-----	-----	-----	-----	-----
New Jersey.....	108.6	114.6	98.7	95.2	84.7	90.4	91.5	101.3	118.9	111.5	108.5	109.2	119.7	-----
New York ¹	127.0	121.4	104.2	93.0	94.1	92.6	100.6	99.6	-----	112.2	113.0	128.0	123.7	-----
Pennsylvania.....	122.0	125.0	95.6	93.3	94.2	50.7	99.9	109.3	-----	97.8	106.0	105.0	108.0	-----
South Carolina.....	⁷ 105.7	⁷ 95.4	⁷ 106.4	⁷ 111.8	⁷ 87.8	⁷ 92.7	-----	-----	-----	-----	-----	-----	-----	-----
South Dakota.....	50.1	46.8	34.6	41.8	31.8	41.5	-----	-----	-----	-----	-----	-----	-----	-----
Virginia.....	-----	-----	-----	-----	-----	-----	-----	94.5	112.0	-----	-----	-----	-----	-----

¹ Exclusive of New York City.² Not available.³ Rate previously published was for diarrhea in children under 5 years.⁴ Reported as intestinal diarrhea in children under 1 year.⁵ Chronic nephritis (129) only.⁷ Reported as kidney diseases.

Monthly State mortality statistics—Continued

	1928										Corresponding month for—			
	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	1927	1926	1925	1924	
PUERPERAL STATE (143-150)														
Alabama:														
White.....	18.1	14.7	16.7	14.7	15.4	14.5	19.6	13.0	14.0	18.9	14.0	-----	-----	-----
Colored.....	31.3	33.0	31.3	34.3	36.9	24.5	23.7	17.7	21.1	18.4	23.7	-----	-----	-----
California.....	11.8	10.3	9.1	9.8	9.3	10.4	8.0	7.7	-----	-----	-----	-----	-----	-----
Connecticut.....	21.1	8.8	6.0	10.2	8.0	5.3	9.5	6.0	-----	8.4	13.3	5.6	13.8	-----
Hawaii.....	-----	-----	-----	-----	6.7	17.4	-----	7.0	-----	-----	-----	-----	-----	-----
Indiana.....	9.2	13.3	10.8	8.9	11.1	15.3	9.3	-----	-----	9.7	10.9	7.2	3.5	-----
Iowa.....	15.0	10.7	9.5	4.8	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Kansas.....	13.3	22.5	12.6	13.5	9.6	9.9	-----	-----	-----	-----	-----	-----	-----	-----
Kentucky.....	-----	-----	-----	6.0	9.7	10.5	11.5	8.6	11.1	-----	-----	-----	-----	-----
Louisiana.....	21.2	22.9	29.3	26.6	10.9	19.3	30.8	-----	-----	-----	-----	-----	-----	-----
Michigan.....	-----	-----	-----	10.8	12.6	7.7	9.7	10.6	-----	-----	-----	-----	-----	-----
Minnesota.....	13.0	12.1	8.0	7.8	7.8	4.0	5.6	4.0	-----	-----	-----	-----	-----	-----
Mississippi.....	-----	-----	-----	22.4	23.0	14.3	18.4	16.3	-----	-----	-----	-----	-----	-----
Nebraska.....	-----	-----	14.7	13.4	12.5	6.9	10.9	7.8	-----	-----	-----	-----	-----	-----
New Jersey.....	-----	-----	-----	9.6	12.0	10.2	12.6	14.5	8.0	-----	-----	-----	-----	-----
New York ¹	15.2	12.8	8.5	12.2	9.7	8.9	7.6	8.7	-----	11.5	7.9	10.0	12.0	-----
Pennsylvania.....	* 6.7	* 7.1	* 5.8	* 5.4	* 4.4	* 4.4	* 5.1	* 5.6	-----	* 4.7	* 5.9	* 6.3	(?)	-----
South Dakota.....	8.6	10.0	5.2	6.7	10.0	12.1	-----	-----	-----	-----	-----	-----	-----	-----
Tennessee.....	* 5.3	* 7.5	* 4.4	* 5.6	* 6.6	* 3.9	* 4.7	* 2.9	-----	* 3.9	-----	-----	-----	-----
Virginia.....	-----	-----	-----	-----	-----	-----	-----	14.2	18.3	-----	-----	-----	-----	-----

CONGENITAL MALFORMATION AND DISEASES OF EARLY INFANCY (159-163)

Alabama:														
White.....	57.9	79.2	73.9	61.0	63.1	73.9	68.7	46.4	62.4	80.9	76.1	-----	-----	-----
Colored.....	80.4	83.1	58.6	60.7	93.6	77.7	65.9	58.6	44.8	85.5	81.5	-----	-----	-----
California.....	50.7	57.4	49.7	53.0	48.8	54.7	50.1	53.9	-----	-----	-----	-----	-----	-----
Indiana.....	60.9	64.5	59.5	53.4	51.2	52.9	54.6	-----	-----	-----	-----	-----	-----	-----
Iowa.....	66.0	60.6	66.1	65.5	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Kansas.....	56.4	46.8	40.4	51.3	52.6	64.3	-----	-----	-----	-----	-----	-----	-----	-----
Louisiana.....	66.1	64.6	49.3	71.2	65.8	75.5	67.6	-----	-----	-----	-----	-----	-----	-----
Minnesota.....	-----	-----	-----	-----	53.6	48.3	52.3	43.8	-----	-----	-----	-----	-----	-----
Mississippi.....	-----	-----	-----	55.2	44.0	47.6	49.3	49.6	-----	-----	-----	-----	-----	-----
Nebraska.....	-----	-----	59.6	51.8	53.5	57.9	68.6	49.3	-----	-----	-----	-----	-----	-----
New York ¹	66.5	72.4	72.2	60.6	62.7	60.0	58.9	60.2	-----	62.7	71.9	74.5	72.5	-----
Pennsylvania.....	¹⁰ 37.4	¹⁰ 37.7	¹⁰ 30.8	¹⁰ 31.1	¹⁰ 30.4	¹⁰ 27.5	¹⁰ 32.7	¹⁰ 34.1	-----	¹⁰ 34.7	¹⁰ 36.2	¹⁰ 35.7	(?)	-----
South Dakota.....	60.5	56.9	57.0	26.8	73.6	63.9	-----	-----	-----	-----	-----	-----	-----	-----
Virginia.....	-----	-----	-----	-----	-----	-----	55.8	(?)	-----	-----	-----	-----	-----	-----

¹ Exclusive of New York City.² Not available.³ Rate per 1,000 total births.⁴ Reported as puerperal septicemia.¹⁰ Rate per 1,000 live births.

COURT DECISION RELATING TO PUBLIC HEALTH

Receipt and filing of birth certificate after time specified in statute compelled.—(Washington Supreme Court; In re Seung et al.; Seung v. Mikkelson, Assistant Registrar of Vital Statistics, 272 P. 968; decided December 13, 1928.) The births of two of petitioner's children had not been registered, no physician or midwife having been present at their births and the parents being ignorant of the birth registration

law. One of the children was born in 1907 and the other in 1910. One of the sections of the registration statute provided as follows:

It shall be the duty of the attending physician or midwife to file a certificate of birth, properly and completely filled out, giving all of the particulars required by this act, with the local registrar of the district in which the birth occurred, within 10 days after the date of birth. And if there be no attending physician or midwife, then it shall be the duty of the father or mother of the child, householder or owner of the premises, manager or superintendent of public or private institution in which the birth occurred, to notify the local registrar, within 10 days after the birth, of the fact of such a birth having occurred. It shall then, in such case, be the duty of the local registrar to secure the necessary information and signature to make a proper certificate of birth.

The father sought a writ of mandamus to compel the local registrar to file certificates of birth of the two children. The supreme court said that the question was whether, under the statute, it was the duty of the registrar to file the certificate more than 10 days after the birth when the registrar was not notified of the fact of birth within 10 days. The holding of the court was that the registrar had the power, and that there was a duty, to file the certificate after the 10 days' limitation when the officer was satisfied as to the correctness and authenticity of the certificate. Portions of the opinion are as follows:

* * * The primary purpose of the statute is to make a record of births. There is nothing in the statute that would appear to make time the essence of the thing to be done. The statute contains no negative words and does not indicate that the time mentioned was intended as a limitation of power, authority, or right. The vital statistics statutes are passed in the exercise of the police power and should be given a liberal construction. * * *

* * * * *

The rule is that the provisions of statutes regulating duties of public officers and specifying the time for their performance are in that respect generally regarded as directory and not mandatory, unless the nature of the act to be performed or the phraseology of the statute is such that the designation of time must be considered as a limitation of power. * * *

* * * * *

As already pointed out, there is nothing in the nature of the act to be performed or in the language of the statute which would indicate that it was the legislative intent that the mention of 10 days within which the certificate should be prepared and filed was a limitation of power. Support is given to this view by section 6038 of the Code, which makes every person whose duty it is to file a certificate of birth guilty of a misdemeanor for failure to perform that duty. The purpose of the penal provision was to add assurance that the certificates would be filed within the time mentioned.

We are satisfied that the registrar of vital statistics has the power and there is a duty to file the certificate after the 10 days' limitation when the officer is satisfied that the certificate is correct and authentic. * * *

DEATHS DURING WEEK ENDED FEBRUARY 16, 1929

Summary of information received by telegraph from industrial insurance companies for the week ended February 16, 1929, and corresponding week of 1928. (From the Weekly Health Index, February 20, 1929, issued by the Bureau of the Census, Department of Commerce)

	Week ended Feb. 16, 1929	Corresponding week, 1928
Policies in force.....	73, 242, 495	70, 286, 592
Number of death claims.....	16, 424	13, 083
Death claims per 1,000 policies in force, annual rate	11. 7	9. 7

Deaths from all causes in certain large cities of the United States during the week ended February 16, 1929, infant mortality, annual death rate, and comparison with corresponding week of 1928. (From the Weekly Health Index, February 20, 1929, issued by the Bureau of the Census, Department of Commerce)

City	Week ended Feb. 16, 1929		Annual death rate per 1,000, corre- sponding week, 1928	Deaths under 1 year		Infant mortality rate, week ended Feb. 16, 1929 ¹
	Total deaths	Death rate ¹		Week ended Feb. 16, 1929	Corre- sponding week, 1928	
Total (64 cities).....	8, 681	15. 3	14. 0	875	834	² 74
Akron.....	44			2	10	21
Albany ⁴	45	19. 5	18. 7	2	0	40
Atlanta.....	98	20. 1	13. 5	10	5	104
White.....	52			6	2	
Colored.....	46	(⁵)	(⁵)	4	4	
Baltimore ⁴	285	17. 9	17. 6	23	36	74
White.....	210			15	22	60
Colored.....	75	(⁵)	(⁵)	8	14	127
Birmingham.....	85	20. 0	15. 8	11	11	100
White.....	38			1	1	15
Colored.....	47	(⁵)	(⁵)	10	10	229
Boston.....	305	20. 0	16. 2	30	35	83
Bridgeport.....	43			7	4	121
Buffalo.....	157	14. 8	14. 9	15	16	65
Cambridge.....	34	14. 1	12. 5	1	3	18
Camden.....	39	15. 1	10. 4	1	3	17
Chicago ⁴	821	13. 6	13. 3	83	79	74
Cincinnati.....	169			15	18	87
Cleveland.....	244	12. 6	10. 4	29	19	85
Columbus.....	101	17. 7	14. 5	7	9	66
Dallas.....	81	19. 4	16. 1	10	8	
White.....	61			7	6	
Colored.....	20	(⁵)	(⁵)	3	2	
Dayton.....	50	14. 2	16. 4	7	4	111
Denver.....	104	18. 5	17. 9	11	12	106
Des Moines.....	36	12. 4	11. 0	3	2	54
Detroit.....	365	13. 8	10. 8	63	41	101
Duluth.....	24	10. 7	10. 7	1	3	24
El Paso.....	66	29. 3	19. 5	21	8	
Erie.....	25			4	3	82
Fall River ⁴	31	12. 1	16. 4	3	9	56
Flint.....	30	10. 5	13. 0	6	5	73
Fort Worth.....	37	11. 3	12. 9	1	5	
White.....	26			1	5	
Colored.....	11	(⁵)	(⁵)	0	0	
Grand Rapids.....	21	6. 7	10. 5	3	4	45
Houston.....	68			5	6	
White.....	50			4	6	
Colored.....	18	(⁵)	(⁵)	1	0	
Indianapolis.....	123	16. 8	13. 0	13	6	104
White.....	105			10	6	93
Colored.....	18	(⁵)	(⁵)	3	0	179
Jersey City.....	99	15. 9	14. 2	17	14	131
Kansas City, Kans.....	41	18. 1	14. 1	3	5	66
White.....	27			3	2	76
Colored.....	14	(⁵)	(⁵)	0	3	0
Kansas City, Mo.....	111	14. 8	17. 0	8	10	67
Knorrville.....	16	7. 9	11. 4	2	4	44
White.....	12			2	4	49
Colored.....	4	(⁵)	(⁵)	0	0	0

Footnotes at end of table.

Deaths from all causes in certain large cities of the United States during the week ended February 16, 1929, infant mortality, annual death rate, and comparison with corresponding week of 1928—Continued

City	Week ended Feb. 16, 1929		Annual death rate per 1,000, corresponding week, 1928	Deaths under 1 year		Infant mortality rate, week ended Feb. 16, 1929 ¹
	Total deaths	Death rate ¹		Week ended Feb. 16, 1929	Corresponding week, 1928	
Los Angeles.....	242			19	27	56
Louisville.....	106	16.8	15.6	11	17	89
White.....	81			10	11	93
Colored.....	25	(²)	(²)	1	6	63
Lowell.....	39			1	4	23
Lynn.....	26	12.9	14.4	2	2	55
Memphis.....	83	22.8	20.9	12	12	141
White.....	44			7	7	132
Colored.....	39	(²)	(²)	5	5	156
Milwaukee.....	131	12.6	10.0	21	12	92
Minneapolis.....	112	12.8	8.6	8	5	49
Nashville.....	65	24.3	21.7	6	7	97
White.....	36			1	2	22
Colored.....	29	(²)	(²)	5	5	314
New Bedford.....	32			3	2	64
New Haven.....	53	14.7	10.6	4	4	61
New Orleans.....	170	20.7	24.1	11	14	55
White.....	97			5	8	35
Colored.....	73	(²)	(²)	6	6	101
New York.....	1,829	15.9	14.4	185	191	76
Bronx Borough.....	244	13.4	10.9	23	18	68
Brooklyn Borough.....	630	14.3	12.9	69	87	70
Manhattan Borough.....	714	21.3	20.1	69	62	84
Queens Borough.....	177	10.8	10.2	19	20	78
Richmond Borough.....	64	22.2	15.3	5	4	91
Newark, N. J.....	108	11.9	11.9	6	18	32
Oakland.....	78	14.9	13.4	7	6	78
Oklahoma City.....	44			5	3	100
Omaha.....	64	15.0	15.7	4	3	47
Paterson.....	37	13.4	14.1	3	6	53
Philadelphia.....	560	14.2	15.2	38	61	54
Pittsburgh.....	181	14.0	14.9	24	21	83
Portland, Oreg.....	92			3	2	34
Providence.....	95	17.3	12.6	8	5	70
Richmond.....	62	16.7	15.1	4	0	56
White.....	36			2	0	42
Colored.....	26	(²)	(²)	2	0	82
Rochester.....	88	14.0	13.7	7	7	59
St. Louis.....	267	16.5	13.5	18	15	61
St. Paul.....	63			4	6	41
Salt Lake City.....	41	15.5	9.9	8	0	123
San Antonio.....	87	20.9	18.9	20	11	
San Diego.....	48	21.0	19.7	3		57
San Francisco.....	172	15.4	14.3	8	9	51
Schenectady.....	28	15.7	13.4	5	4	169
Seattle.....	89	12.1	9.6	5	3	53
Somerville.....	26	13.2	14.8	1	4	36
Spokane.....	35	16.8	14.9	1	1	26
Springfield, Mass.....	35	12.2	11.9	5	3	83
Syracuse.....	56	14.7	10.0	6	6	72
Tacoma.....	25	11.8	13.7	3	1	77
Toledo.....	97	16.2	12.0	12	8	112
Trenton.....	42	15.8	11.7	2	7	36
Washington, D. C.....	185	17.5	13.3	15	3	88
White.....	118			7	2	59
Colored.....	67	(²)	(²)	8	1	152
Waterbury.....	32			5	4	127
Wilmington, Del.....	34	13.8	10.2	4	2	104
Worcester.....	71	18.8	14.0	9	1	113
Yonkers.....	15	6.5	12.1	2	3	47
Youngstown.....	31	9.3	10.8	3	3	43

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 71 cities.

⁴ Deaths for week ended Friday.

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, 28; Nashville, 30; New Orleans, 20; 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 February 16, 1929, and February 18, 1928

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended February 16, 1929, and February 18, 1928

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Feb. 16, 1929	Week ended Feb. 18, 1928	Week ended Feb. 16, 1929	Week ended Feb. 18, 1928	Week ended Feb. 16, 1929	Week ended Feb. 18, 1928	Week ended Feb. 16, 1929	Week ended Feb. 18, 1928
New England States:								
Maine.....	2	8	188	5	353	29	0	0
New Hampshire.....	1	7	65	24	29	48	0	0
Vermont.....			19		18	6	0	0
Massachusetts.....	96	120	405	21	378	1,833	1	2
Rhode Island.....	6	6	33		74	26	0	0
Connecticut.....	30	29	373	10	328	318	2	0
Middle Atlantic States:								
New York.....	244	404	1 243	1 36	817	1,723	45	13
New Jersey.....	118	149	71	18	226	451	5	1
Pennsylvania.....	158	268			2,012	1,323	8	2
East North Central States:								
Ohio.....	104	78	367	19	1,311	423	7	7
Indiana.....	25	33	119	31	358	141	0	0
Illinois.....	139	177	137	18	692	103	13	7
Michigan.....	101	62	25	4	413	572	26	4
Wisconsin.....	16	36	139	88	460	47	3	2
West North Central States:								
Minnesota.....	27	39	6	2	285	5	3	3
Iowa.....	8	14				56	5	7
Missouri.....	51	46	113	25	284	133	18	3
North Dakota.....	9	5	50	2	18	4	8	2
South Dakota.....	4	2	2		47	21	0	0
Nebraska.....	25	12	63	3	24	3	3	2
Kansas.....	15	13	34	31	65	31	3	2
South Atlantic States:								
Delaware.....		2	3		23	10	0	0
Maryland ¹	31	40	649	40	127	696	1	1
District of Columbia.....	10	33	25	4	3	61	0	0
West Virginia.....	15	45	211	74	130	118	1	0
North Carolina.....	28	39			98	4,257	0	0
South Carolina.....	11	18	922	1,423	2	1,430	0	0
Georgia.....	7	13	203	281	53	214	0	1
Florida.....	9	8	39	15	10	19	1	1

¹ New York City only.

² Week ended Friday.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended February 16, 1929, and February 18, 1928—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Feb. 16, 1929	Week ended Feb. 18, 1928	Week ended Feb. 16, 1929	Week ended Feb. 18, 1928	Week ended Feb. 16, 1929	Week ended Feb. 18, 1928	Week ended Feb. 16, 1929	Week ended Feb. 18, 1928
East South Central States:								
Kentucky.....	9	6	30	13	23	253	0	0
Tennessee.....	17	13	1,629	102	4	457	0	1
Alabama.....	24	23	956	137	160	264	4	0
Mississippi.....	9	13					2	
West South Central States:								
Arkansas.....	23	8	1,175	275	88	605	0	0
Louisiana.....	24	21	78	70	42	166	10	0
Oklahoma ¹	24	27	689	209	1	220	0	2
Texas.....	36	68	368	140	51	118	6	1
Mountain States:								
Montana.....	3	18	4		133		2	5
Idaho.....	1	1	4		13		9	0
Wyoming.....	4	2			30	15	0	1
Colorado.....	15	5	27	2	8	40	7	3
New Mexico.....	5	2	1	1	9	163	1	0
Arizona.....	7	5			27	4	19	2
Utah ¹		3	4			1	16	4
Pacific States:								
Washington.....	5	11	42		96	278	2	4
Oregon.....	6	6	94	28	140	78	6	3
California.....	61	109	244	56	58	146	16	8

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Feb. 16, 1929	Week ended Feb. 18, 1928	Week ended Feb. 16, 1929	Week ended Feb. 18, 1928	Week ended Feb. 16, 1929	Week ended Feb. 18, 1928	Week ended Feb. 16, 1929	Week ended Feb. 18, 1928
New England States:								
Maine.....	0	0	35	40	4	0	2	5
New Hampshire.....	0	1	5	34	0	0	0	0
Vermont.....	0	0	7	6	1	0	0	0
Massachusetts.....	0	4	267	327	0	0	2	2
Rhode Island.....	0	0	35	59	0	0	0	0
Connecticut.....	0	0	65	86	0	1	0	1
Middle Atlantic States:								
New York.....	1	2	496	776	0	4	12	18
New Jersey.....	0	1	159	283	0	0	3	2
Pennsylvania.....	4	1	473	608	0	1	12	12
East North Central States:								
Ohio.....	1	3	432	278	48	23	8	7
Indiana.....	0	0	191	145	40	116	1	3
Illinois.....	0	1	511	316	149	77	3	14
Michigan.....	1	0	478	262	43	42	2	7
Wisconsin.....	0	2	136	192	9	58	3	3
West North Central States:								
Minnesota.....	0	0	173	173	5	3	2	4
Iowa.....	1	0	176	110	31	96	1	2
Missouri.....	0	0	91	113	36	25	2	2
North Dakota.....	0	1	39	62	2	7	1	1
South Dakota.....	0	0	24	33	47	9	0	1
Nebraska.....	0	0	140	96	55	22	1	0
Kansas.....	0	0	175	188	46	78	1	0
South Atlantic States:								
Delaware.....	0	0	5	4	0	0	0	0
Maryland ¹	0	0	72	60	0	0	6	3
District of Columbia.....	0	0	28	54	0	0	0	0
West Virginia.....	0	0	19	64	15	102	2	5
North Carolina.....	0	1	53	43	13	93	2	4
South Carolina.....	4	0	3	10	3	12	8	3
Georgia.....	0	0	15	25	1	0	3	4
Florida.....	0	0	14	12	3	2	1	4

¹ Week ended Friday.

² Figures for 1929 are exclusive of Oklahoma City and Tulsa and for 1928 are exclusive of Tulsa.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended February 16, 1929, and February 18, 1928—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Feb. 16, 1929	Week ended Feb. 18, 1928	Week ended Feb. 16, 1929	Week ended Feb. 18, 1928	Week ended Feb. 16, 1929	Week ended Feb. 18, 1928	Week ended Feb. 16, 1929	Week ended Feb. 18, 1928
East South Central States:								
Kentucky.....	0	0	106	45	16	16	1	4
Tennessee.....	0	0	82	26	3	33	0	9
Alabama.....	0	2	0	13	10	4	1	2
Mississippi.....	0	0	7	11	0	0	4	6
West South Central States:								
Arkansas.....	0	0	30	21	6	0	6	3
Louisiana.....	0	0	36	8	4	33	6	17
Oklahoma ¹	0	1	37	77	47	94	4	14
Texas.....	1	0	59	88	89	62	2	4
Mountain States:								
Montana.....	0	0	32	11	8	27	0	0
Idaho.....	0	1	9	5	20	6	1	0
Wyoming.....	0	0	5	17	4	0	0	0
Colorado.....	0	0	23	137	55	9	1	0
New Mexico.....	0	1	8	14	2	1	3	4
Arizona.....	1	0	11	4	7	28	0	0
Utah ¹	0	2	14	9	4	22	0	0
Pacific States:								
Washington.....	0	0	48	52	35	26	3	3
Oregon.....	0	3	33	24	56	59	0	0
California.....	3	7	368	247	59	18	9	13

¹ Week ended Friday.

¹ Figures for 1929 are exclusive of Oklahoma City and Tulsa and for 1928 are exclusive of Tulsa.

Report for week ended December 15, 1928

MAINE		MAINE—continued	
	Cases		Cases
Diphtheria.....	4	Scarlet fever.....	53
Influenza.....	56	Smallpox.....	12
Measles.....	278	Typhoid fever.....	3

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	Menin- gococ- cus menin- gitis	Diph- theria	Influ- enza	Ma- laria	Mea- sles	Pellag- ra	Polio- mye- litis	Scarlet fever	Small- pox	Ty- phoid fever
<i>December, 1928</i>										
Kansas.....	12	98	112, 018	-----	86	1	0	460	73	5
<i>January, 1929</i>										
Maine.....	2	18	5, 214	-----	1, 049	-----	2	105	1	3
Minnesota.....	8	111	423	-----	634	-----	2	551	7	5
Nebraska.....	4	91	1, 771	-----	113	-----	0	418	209	7
New Jersey.....	37	601	6, 412	2	722	-----	4	642	1	7
North Dakota.....	25	31	1, 485	-----	76	-----	0	144	8	2
Porto Rico.....	-----	71	525	2, 717	256	8	-----	-----	-----	55
Vermont.....	-----	11	1, 538	-----	121	-----	0	43	10	0

December, 1928		Mumps:		Cases
Kansas:	Cases	Maine.....		138
Chicken pox.....	560	Nebraska.....		39
German measles.....	52	North Dakota.....		4
Lethargic encephalitis.....	3	Porto Rico.....		19
Mumps.....	189	Vermont.....		281
Paratyphoid fever.....	2	Ophthalmia neonatorum:		
Trachoma.....	1	New Jersey.....		3
Tularaemia.....	2	Porto Rico.....		9
Undulant fever.....	3	Paratyphoid fever:		
Whooping cough.....	129	Nebraska.....		4
January, 1929		Puerperal fever:		
Anthrax:		Porto Rico.....		30
New Jersey.....	2	Rabies in animals:		
Porto Rico.....	2	Minnesota.....		1
Chicken pox:		Scabies:		
Maine.....	221	North Dakota.....		15
Minnesota.....	1,011	Septic sore throat:		
Nebraska.....	204	Maine.....		1
New Jersey.....	1,306	Nebraska.....		6
North Dakota.....	75	Tetanus:		
Vermont.....	82	Porto Rico.....		14
Dysentery:		Tetanus (infantile):		
Minnesota (amebic).....	3	Porto Rico.....		47
Porto Rico.....	608	Trachoma:		
Filariasis:		North Dakota.....		2
Porto Rico.....	4	Undulant fever:		
German measles:		Minnesota.....		1
Maine.....	50	Vincent's angina:		
Nebraska.....	12	Maine.....		3
New Jersey.....	56	North Dakota.....		28
Lead poisoning:		Whooping cough:		
New Jersey.....	4	Maine.....		74
Leprosy:		Minnesota.....		269
Porto Rico.....	1	Nebraska.....		46
Lethargic encephalitis:		New Jersey.....		704
Minnesota.....	8	North Dakota.....		52
North Dakota.....	6	Porto Rico.....		70
		Vermont.....		116

RECIPROCAL NOTIFICATIONS

Notifications regarding communicable diseases sent during the month of January, 1929, by departments of health of certain States to other State health departments

Disease	California	Connecticut	Illinois	Kansas	Minnesota	New York
Diphtheria.....						1
Dysentery (amebic).....					3	
Influenza.....			4			
Measles.....						2
Scarlet fever.....		1	3			4
Smallpox.....	2		12			
Syphilis.....				18		
Tuberculosis.....					21	
Typhoid fever.....	1				1	

GENERAL CURRENT SUMMARY AND WEEKLY REPORTS FROM CITIES

The 93 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 30,855,000. The estimated population of the 86 cities

reporting deaths is more than 29,280,000. The estimated expectancy is based on the experience of the last nine years, excluding epidemics.

Weeks ended February 9, 1929, and February 11, 1928

	1929	1928	Estimated expectancy
<i>Cases reported</i>			
Diphtheria:			
46 States.....	1,572	2,265	-----
93 cities.....	705	1,003	1,005
Measles:			
45 States.....	7,577	15,805	-----
93 cities.....	2,228	4,592	-----
Poliomyelitis:			
46 States.....	17	45	-----
Scarlet fever:			
46 States.....	4,551	5,628	-----
93 cities.....	1,476	1,732	1,532
Smallpox:			
46 States.....	946	1,288	-----
93 cities.....	33	128	94
Typhoid fever:			
46 States.....	117	208	-----
93 cities.....	29	42	32
<i>Deaths reported</i>			
Influenza and pneumonia:			
86 cities.....	1,620	1,036	-----
Smallpox:			
86 cities.....	0	0	-----

City reports for week ended February 9, 1929

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 1920 is included. In obtaining the estimated expectancy the figures are smoothed when necessary to avoid abrupt deviation 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, 1928, estimated	Chick- en pox, cases re- ported	Diphtheria		Influenza		Meas- les, cases re- ported	Mumps, cases re- ported	Pneu- monia, deaths re- ported
			Cases esti- mated expec- tancy	Cases re- ported	Cases re- ported	Deaths re- ported			
NEW ENGLAND									
Maine:									
Portland	78,600	2	1	0	1	2	32	0	2
New Hampshire:									
Concord	(1)	0	0	0	-----	0	0	0	4
Manchester	85,700	0	2	1	-----	2	0	0	6
Nashua	(1)	0	1	0	-----	1	0	0	3
Vermont:									
Barre	(1)	0	0	0	-----	1	0	6	0
Burlington	(1)	1	1	0	-----	0	0	1	2
Massachusetts:									
Boston	799,200	53	47	27	98	9	29	26	87
Fall River	134,300	2	4	4	8	7	19	0	11
Springfield	149,800	3	3	5	1	1	100	1	2
Worcester	197,600	9	4	2	18	2	15	3	6

¹ No estimate of population made.

City reports for week ended February 9, 1929—Continued

Division, State, and city	Population, July 1, 1928, estimated	Chick- en pox, cases re- ported	Diphtheria		Influenza		Meas- les, cases re- ported	Mumps, cases re- ported	Pneu- monia, deaths re- ported
			Cases esti- mated expec- tancy	Cases re- ported	Cases re- ported	Deaths re- ported			
NEW ENGLAND—contd.									
Rhode Island:									
Pawtucket.....	73, 100	5	1	1	-----	0	8	0	12
Providence.....	286, 300	0	11	8	35	7	32	0	22
Connecticut:									
Bridgeport.....	(1)	4	9	1	81	6	6	3	4
Hartford.....	172, 300	6	9	4	23	2	6	2	5
New Haven.....	187, 900	28	2	0	23	3	3	1	16
MIDDLE ATLANTIC									
New York:									
Buffalo.....	555, 800	20	17	13	6	6	2	1	29
New York.....	6, 017, 500	216	230	205	413	74	48	86	404
Rochester.....	328, 200	11	13	5	1	2	22	20	19
Syracuse.....	199, 300	9	4	0	-----	2	0	4	6
New Jersey:									
Camden.....	135, 400	2	8	4	-----	0	0	2	7
Newark.....	473, 600	39	18	25	25	2	5	42	22
Trenton.....	139, 000	3	4	2	5	1	0	0	12
Pennsylvania:									
Philadelphia.....	2, 064, 200	116	76	27	37	14	39	6	73
Pittsburgh.....	673, 800	30	25	12	-----	19	14	4	40
Reading.....	115, 400	6	3	0	-----	1	138	0	5
Scranton.....	144, 700	2	5	3	-----	0	15	0	0
EAST NORTH CENTRAL									
Ohio:									
Cincinnati.....	413, 700	8	10	7	15	7	1	1	14
Cleveland.....	1, 010, 300	39	36	22	40	7	249	20	28
Columbus.....	299, 000	12	4	0	6	3	5	2	8
Toledo.....	313, 200	27	8	2	8	8	5	4	8
Indiana:									
Fort Wayne.....	105, 300	1	3	2	-----	0	3	0	2
Indianapolis.....	382, 100	40	8	2	-----	4	54	2	18
South Bend.....	86, 100	1	1	0	-----	0	17	0	0
Terre Haute.....	73, 500	3	1	1	-----	0	0	2	2
Illinois:									
Chicago.....	3, 157, 400	47	86	78	29	8	136	13	73
Springfield.....	67, 200	9	1	0	3	1	0	0	5
Michigan:									
Detroit.....	1, 378, 900	74	59	54	23	9	34	9	25
Flint.....	148, 800	6	5	0	-----	1	3	2	4
Grand Rapids.....	164, 200	3	2	0	-----	0	108	0	2
Wisconsin:									
Kenosha.....	56, 500	3	1	1	-----	0	10	0	0
Milwaukee.....	544, 200	50	21	10	4	4	251	11	23
Racine.....	74, 400	2	2	-----	-----	-----	-----	-----	-----
Superior.....	(1)	0	1	0	0	0	0	0	1
WEST NORTH CENTRAL									
Minnesota:									
Duluth.....	116, 800	7	1	3	-----	0	1	59	3
Minneapolis.....	455, 900	79	20	15	9	7	218	60	4
St. Paul.....	(1)	-----	12	-----	-----	-----	-----	-----	-----
Iowa:									
Davenport.....	(1)	1	1	0	-----	-----	0	0	-----
Des Moines.....	151, 900	0	3	1	-----	-----	0	0	-----
Sioux City.....	80, 000	10	2	0	-----	-----	4	1	-----
Waterloo.....	37, 100	0	0	1	-----	-----	2	35	-----
Missouri:									
Kansas City.....	391, 000	31	8	7	1	5	224	4	23
St. Joseph.....	78, 500	3	2	0	-----	0	1	0	0
St. Louis.....	848, 100	38	52	39	12	-----	15	17	-----
North Dakota:									
Fargo.....	(1)	-----	6	-----	-----	-----	-----	-----	-----
Grand Forks.....	(1)	0	1	0	-----	-----	0	0	-----
South Dakota:									
Aberdeen.....	(1)	0	0	0	-----	-----	21	0	-----
Sioux Falls.....	(1)	0	1	0	-----	-----	200	0	-----

1 No estimate of population made.

City reports for week ended February 9, 1929—Continued

Division, State, and city	Population, July 1, 1928, 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			
WEST NORTH CENTRAL—continued									
Nebraska:									
Lincoln.....	71,100	5	1	0	-----	0	2	1	0
Omaha.....	222,800	2	4	7	-----	0	3	0	15
Kansas:									
Topeka.....	62,800	26	2	0	-----	1	79	0	0
Wichita.....	99,300	12	4	2	-----	1	0	0	3
SOUTH ATLANTIC									
Delaware:									
Wilmington.....	128,500	1	3	0	-----	1	17	0	5
Maryland:									
Baltimore.....	830,400	68	33	18	232	18	0	88	54
Cumberland.....	(¹)	2	1	0	2	2	8	2	2
Frederick.....	(¹)	0	1	0	-----	0	0	0	0
District of Columbia:									
Washington.....	552,000	24	21	8	36	7	3	0	36
Virginia:									
Lynchburg.....	38,600	4	1	0	-----	1	0	12	2
Norfolk.....	184,200	4	2	0	5	0	0	33	13
Richmond.....	194,400	0	4	3	5	0	0	0	4
Roanoke.....	64,600	1	1	1	-----	3	0	0	1
West Virginia:									
Charleston.....	55,200	8	1	0	1	1	7	0	1
Wheeling.....	(¹)	5	1	1	43	0	33	9	4
North Carolina:									
Raleigh.....	(¹)	9	0	1	-----	2	0	0	2
Wilmington.....	39,100	4	0	0	-----	1	0	0	2
Winston-Salem.....	80,000	12	1	1	-----	0	1	0	2
South Carolina:									
Charleston.....	75,900	0	0	0	27	0	0	0	4
Columbia.....	50,600	0	0	-----	-----	-----	-----	-----	-----
Greenville.....	(¹)	0	0	0	-----	0	0	0	1
Georgia:									
Atlanta.....	255,100	2	3	2	64	10	1	3	0
Brunswick.....	(¹)	0	0	0	-----	0	0	0	0
Savannah.....	99,900	0	1	0	14	3	0	0	3
Florida:									
Miami.....	156,700	0	2	2	10	0	4	0	4
St. Petersburg.....	53,300	0	0	1	5	0	-----	-----	2
Tampa.....	113,400	0	2	1	19	0	1	0	2
EAST SOUTH CENTRAL									
Kentucky:									
Covington.....	59,000	0	1	2	-----	1	0	0	1
Tennessee:									
Memphis.....	190,200	0	4	0	268	10	0	1	7
Nashville.....	139,600	2	1	0	-----	3	1	0	10
Alabama:									
Birmingham.....	222,400	2	3	4	24	3	1	0	7
Mobile.....	69,600	0	0	3	8	0	0	3	1
Montgomery.....	63,100	0	1	3	1	-----	0	0	-----
WEST SOUTH CENTRAL									
Arkansas:									
Fort Smith.....	(¹)	1	1	0	0	-----	0	1	-----
Little Rock.....	79,200	0	1	1	5	2	2	0	5
Louisiana:									
New Orleans.....	429,400	1	13	14	18	10	4	0	10
Shreveport.....	81,300	2	0	0	-----	0	0	0	6
Oklahoma:									
Oklahoma City.....	(¹)	0	2	1	11	4	0	0	9
Tulsa.....	170,500	16	1	0	-----	-----	2	0	-----
Texas:									
Dallas.....	217,800	2	7	6	-----	4	2	0	7
Fort Worth.....	170,600	3	3	6	-----	4	4	3	3
Galveston.....	50,600	0	0	1	-----	1	0	0	2
Houston.....	(¹)	2	4	5	-----	1	1	0	9
San Antonio.....	218,100	0	2	3	-----	8	0	2	10

¹ No estimate of population made.

City reports for week ended February 9, 1929—Continued

Division, State, and city	Population, July 1, 1928, estimated	Chick- en pox, cases re- ported	Diphtheria		Influenza		Meas- les, cases re- ported	Mumps, cases re- ported	Pneu- monia, deaths re- ported
			Cases, esti- mated expect- ancy	Cases re- ported	Cases re- ported	Deaths re- ported			
MOUNTAIN									
Montana:									
Billings.....	(1)	2	0	0	0	0	0	0	1
Great Falls.....	(1)	5	1	1	0	0	95	3	2
Helena.....	(1)	0	0	0	0	1	31	0	0
Missoula.....	(1)	0	0	0	1	1	26	0	2
Idaho:									
Boise.....	(1)	2	0	0	0	0	0	0	0
Colorado:									
Denver.....	294,200		13						
Pueblo.....	44,200	7	2	1	0	0	0	0	3
New Mexico:									
Albuquerque.....	(1)	0	0	0	0	0	0	0	3
Utah:									
Salt Lake City.....	138,000	41	3	1	1	2	75		4
Nevada:									
Reno.....	(1)	0	0	0	0	0	0	0	0
PACIFIC									
Washington:									
Seattle.....	383,200	45	6	3		1	9		
Spokane.....	109,100	9	3	1	3	39	0		
Tacoma.....	110,500	3	2	0	0	1	0	12	1
Oregon:									
Portland.....	(1)	21	8	12	3	3	33	4	3
Salem.....	(1)	1	0	0	0	0	1	0	0
California:									
Los Angeles.....	(1)	57	44	17	59	5	13	27	31
Sacramento.....	75,700	6	3	2	4	1	1	8	3
San Francisco.....	585,300	31	23	5	11	6	2	4	6

Division, State, and city	Scarlet fever		Smallpox			Tuber- culosis, deaths re-ported	Typhoid fever			Whoop- ing cough, cases re-ported	Deaths, all causes
	Cases, esti- mated expect- ancy	Cases re- ported	Cases, esti- mated expect- ancy	Cases re- ported	Deaths re- ported		Cases, esti- mated expect- ancy	Cases re- ported	Deaths re- ported		
NEW ENGLAND											
Maine:											
Portland.....	4	12	0	0	0	1	0	0	0	2	31
New Hampshire:											
Concord.....	0	0	0	0	0	0	0	0	0	0	9
Manchester.....	3	4	0	0	0	3	0	0	0	0	20
Nashua.....	1	0	0	0	0	0	0	0	0	6	14
Vermont:											
Barre.....	0	0	0	0	0	2	0	0	0	2	7
Burlington.....	1	0	0	1	0	0	0	2	0	0	13
Massachusetts:											
Boston.....	82	72	0	0	0	15	1	0	0	21	340
Fall River.....	4	6	0	0	0	7	1	0	0	1	64
Springfield.....	9	9	0	0	0	0	0	0	0	0	42
Worcester.....	10	9	0	0	0	0	0	1	0	6	51
Rhode Island:											
Pawtucket.....	2	5	0	0	0	0	0	0	0	1	48
Providence.....	12	14	0	0	0	5	0	0	0	3	121
Connecticut:											
Bridgeport.....	13	2	0	0	0	2	0	0	0	1	53
Hartford.....	6	6	0	0	0	6	1	0	0	1	40
New Haven.....	11	1	0	0	0	0	0	0	0	1	71

¹ No estimate of population made.

City reports for week ended February 9, 1929—Continued

Division, State, and city	Scarlet fever		Smallpox			Tuber- culosis, deaths re-ported	Typhoid fever			Whoop- ing cough, cases re-ported	Deaths, all causes
	Cases, esti- mated expec- tancy	Cases re- ported	Cases, esti- mated expec- tancy	Cases re- ported	Deaths re- ported		Cases, esti- mated expec- tancy	Cases re- ported	Deaths re- ported		
MIDDLE ATLANTIC											
New York:											
Buffalo.....	29	24	0	0	0	15	1	0	1	20	188
New York.....	336	214	0	0	0	127	7	5	1	68	2,042
Rochester.....	13	4	0	0	0	3	0	0	0	36	104
Syracuse.....	17	7	0	0	0	3	0	2	0	34	54
New Jersey:											
Camden.....	7	12	0	0	0	1	0	0	0	3	30
Newark.....	35	16	0	0	0	3	0	0	0	10	120
Trenton.....	6	7	0	0	0	4	0	0	0	4	43
Pennsylvania:											
Philadelphia.....	102	77	0	0	0	38	2	0	0	64	611
Pittsburgh.....	42	20	0	0	0	12	0	1	1	23	255
Reading.....	4	5	0	0	0	2	0	0	0	1	36
Scranton.....	4	0	0	0	0	0	0	0	0	3	-----
EAST NORTH CENTRAL											
Ohio:											
Cincinnati.....	21	28	1	1	0	11	1	0	1	23	158
Cleveland.....	51	21	0	0	0	20	1	3	0	75	224
Columbus.....	13	3	1	0	0	1	0	0	0	20	85
Toledo.....	14	20	1	0	0	4	0	0	0	101	74
Indiana:											
Fort Wayne.....	6	4	0	0	0	1	0	0	0	0	29
Indianapolis.....	13	34	13	3	0	5	1	0	0	18	93
South Bend.....	3	1	0	0	0	0	0	0	0	0	11
Terre Haute.....	4	3	1	0	0	0	0	0	0	2	20
Illinois:											
Chicago.....	148	121	3	1	0	56	3	1	0	34	763
Springfield.....	3	19	0	0	0	2	0	0	0	2	33
Michigan:											
Detroit.....	102	182	4	3	0	26	1	1	0	91	291
Flint.....	10	21	1	2	0	0	0	0	0	8	26
Grand Rapids.....	11	13	0	3	0	0	0	0	0	3	35
Wisconsin:											
Kenosha.....	2	0	0	0	0	0	0	0	0	6	7
Milwaukee.....	36	47	2	0	0	3	0	0	0	98	144
Racine.....	6		0			0					
Superior.....	4	0	1	0	0	0	0	0	0	0	10
WEST NORTH CENTRAL											
Minnesota:											
Duluth.....	8	13	1	0	0	4	0	0	0	5	29
Minneapolis.....	61	28	3	0	0	2	0	0	0	30	93
St. Paul.....	37		2				1				
Iowa:											
Davenport.....	1	1	2	0			0	0		1	
Des Moines.....	7	32	2	1			0	0		0	30
Sioux City.....	2	1	1	0			0	0		3	
Waterloo.....	2	46	0	0			0	0		14	
Missouri:											
Kansas City.....	13	17	3	0	0	13	0	0	0	5	136
St. Joseph.....	3	2	0	0	0	2	0	0	0	2	24
St. Louis.....	48	19	2	0	0	17	0	0	0	33	283
North Dakota:											
Fargo.....	3		0				0				
Grand Forks.....	1	4	1	0			0	0		1	
South Dakota:											
Aberdeen.....	1	2	0	0			0	0		0	
Sioux Falls.....	3	0	0	0			0	0		0	8
Nebraska:											
Lincoln.....	2	12	0	0	0	0	0	0	0	1	
Omaha.....	7	7	5	1	0	1	0	0	0	0	66
Kansas:											
Topeka.....	2	8	0	0	0	2	0	0	0	12	11
Wichita.....	5	6	1	0	0	1	0	0	0	12	35

City reports for week ended February 9, 1929—Continued

Division, State, and city	Scarlet fever		Smallpox			Tuber- culosis, deaths re- ported	Typhoid fever			Whoop- ing cough, cases re- ported	Deaths, all causes
	Cases, esti- mated expect- ancy	Cases re- ported	Cases, esti- mated expect- ancy	Cases re- ported	Deaths re- ported		Cases, esti- mated expect- ancy	Cases re- ported	Deaths re- ported		
SOUTH ATLANTIC											
Delaware:											
Wilmington	5	4	0	0	0	2	0	0	0	3	32
Maryland:											
Baltimore	40	23	0	0	0	22	2	0	0	73	305
Cumberland	1	0	0	0	0	0	0	0	0	0	14
Frederick	2	0	0	0	0	0	0	0	0	0	3
District of Col.:											
Washington	27	22	1	0	0	14	1	0	0	6	190
Virginia:											
Lynchburg	0	0	0	0	0	0	0	0	0	2	12
Norfolk	2	0	0	0	0	3	0	0	0	0	—
Richmond	4	9	0	0	0	3	0	2	0	0	55
Roanoke	1	2	0	0	0	2	0	0	0	1	18
West Virginia:											
Charleston	1	1	1	0	0	0	0	0	0	1	12
Wheeling	2	0	0	0	0	1	1	0	0	0	21
North Carolina:											
Raleigh	1	0	0	0	0	1	0	0	0	0	17
Wilmington	0	0	0	0	0	1	0	0	0	0	14
Winston-Salem	2	2	1	0	0	1	0	0	0	7	13
South Carolina:											
Charleston	1	2	0	0	0	2	0	0	0	0	37
Columbia	0	0	0	—	—	—	—	—	—	—	—
Greenville	0	0	0	0	0	1	0	0	0	2	7
Georgia:											
Atlanta	5	10	3	0	0	4	0	0	0	4	116
Brunswick	0	0	0	0	0	0	0	0	0	0	6
Savannah	0	0	0	0	0	1	0	0	0	0	36
Florida:											
Miami	2	3	0	0	0	2	0	0	0	0	45
St. Petersburg	0	2	0	—	0	1	0	—	0	0	13
Tampa	1	2	0	0	0	2	1	1	0	0	26
EAST SOUTH CENTRAL											
Kentucky:											
Covington	2	8	0	0	0	0	0	0	0	0	10
Tennessee:											
Memphis	6	10	3	0	0	6	0	1	0	7	80
Nashville	3	4	0	0	0	7	0	0	0	0	62
Alabama:											
Birmingham	3	3	5	0	0	7	1	0	0	5	66
Mobile	0	2	1	0	0	0	0	0	0	0	24
Montgomery	0	9	0	0	—	—	0	0	—	0	—
WEST SOUTH CENTRAL											
Arkansas:											
Fort Smith	0	4	0	0	—	—	0	0	—	0	—
Little Rock	2	14	0	0	0	3	0	2	0	3	—
Louisiana:											
New Orleans	7	24	0	0	0	5	2	3	1	1	148
Shreveport	1	0	0	0	0	0	0	0	0	1	19
Oklahoma:											
Oklahoma City	3	5	3	1	0	0	0	0	1	0	37
Tulsa	2	4	1	2	—	—	0	0	—	2	—
Texas:											
Dallas	4	11	2	10	0	4	1	1	0	2	57
Fort Worth	0	11	2	17	0	1	0	0	0	0	34
Galveston	0	2	0	0	0	4	0	0	0	0	19
Houston	2	2	3	0	0	3	0	1	0	0	52
San Antonio	2	4	0	3	0	7	1	0	0	0	79
MOUNTAIN											
Montana:											
Billings	0	0	0	1	0	0	0	0	0	0	12
Great Falls	3	0	1	0	0	1	0	0	0	14	11
Helena	1	2	0	0	0	0	0	0	0	0	6
Missoula	0	0	1	0	0	0	0	0	0	0	3

City reports for week ended February 9, 1929—Continued

Division, State, and city	Scarlet fever		Smallpox			Tuber- culosis, deaths re- ported	Typhoid fever			Whoop- ing cough, cases re ported	Deaths, all causes
	Cases, esti- mated expect- ancy	Cases re- ported	Cases esti- mated expect- ancy	Cases re- ported	Deaths re- ported		Cases, esti- mated expect- ancy	Cases re- ported	Deaths re- ported		
MOUNTAIN—con.											
Idaho:											
Boise.....	1	1	1	0	0	0	0	0	0	2	2
Colorado:											
Denver.....	14		2								
Pueblo.....	2	1	1	0	0	0	0	1	0	0	7
New Mexico:											
Albuquerque...	2	0	0	0	0	2	0	0	0	49	10
Utah:											
Salt Lake City...	3	4	2	2	0	0	0	0	0	1	37
Nevada:											
Reno.....	0	2	0	0	0	0	0	0	0	0	6
PACIFIC											
Washington:											
Seattle.....	11	5	5	2			0	2		33	
Spokane.....	7	7	9	0			0	0		5	
Tacoma.....	2	1	4	0	0	0	0	0	0	0	16
Oregon:											
Portland.....	7	5	10	24	0	2	0	0	0	0	79
Salem.....	0	3	1	0	0	0	0	0	0	0	
California:											
Los Angeles...	33	48	7	0	0	27	1	0	1	18	284
Sacramento.....	2	15	1	1	0	2	0	0	0	2	31
San Francisco...	18	50	3	0	0	14	0	1	1	30	178

Division, State, and city	Meningococcus meningitis		Lethargic encephalitis		Pellagra		Poliomyelitis (infantile paralysis)			
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases, esti- mated expect- ancy	Cases	Deaths	
NEW ENGLAND										
Massachusetts:										
Boston.....	2	1	0	0	0	0	0	0	0	0
Worcester.....	1	0	0	0	0	0	0	0	0	0
Connecticut:										
Bridgeport.....	2	0	0	0	0	0	0	0	0	0
Hartford.....	0	0	0	0	0	0	0	1	0	0
MIDDLE ATLANTIC										
New York:										
New York.....	27	12	5	4	0	0	1	2	0	0
Rochester.....	0	0	1	0	0	0	0	0	0	0
Syracuse.....	1	1	0	0	0	0	0	0	0	0
New Jersey:										
Newark.....	3	1	0	0	0	0	0	0	0	0
Pennsylvania:										
Philadelphia.....	6	6	2	2	1	0	0	0	0	0
Pittsburgh.....	1	3	0	2	0	0	0	0	0	0
EAST NORTH CENTRAL										
Ohio:										
Cleveland.....	1	2	2	1	0	0	0	0	0	0
Columbus.....	0	0	1	1	0	0	0	0	0	0
Indiana:										
Indianapolis.....	0	1	0	0	0	0	0	0	0	0
Illinois:										
Chicago.....	10	7	1	0	0	0	1	0	0	0
Michigan:										
Detroit.....	18	5	5	1	0	0	0	1	0	0
Wisconsin:										
Milwaukee.....	4	1	0	0	0	0	0	0	0	0

City reports for week ended February 9, 1928—Continued

Division, State, and city	Meningococcus meningitis		Lethargic encephalitis		Pellagra		Pollomyelitis (infantile paralysis)		
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases, estimated expectancy	Cases	Deaths
WEST NORTH CENTRAL									
Minnesota:									
Duluth.....	1	0	0	0	0	0	0	0	0
Missouri:									
Kansas City.....	6	6	0	0	0	0	0	0	0
St. Louis.....	10	4	0	0	0	0	0	0	0
Nebraska:									
Lincoln.....	4	1	0	0	0	0	0	0	0
SOUTH ATLANTIC									
Maryland:									
Baltimore.....	0	0	1	1	0	0	0	0	0
West Virginia:									
Wheeling.....	1	0	0	0	0	0	0	0	0
North Carolina:									
Winston-Salem.....	0	0	0	0	0	1	0	0	0
South Carolina:									
Charleston.....	0	0	0	0	0	1	0	0	0
Georgia: ¹									
Atlanta.....	1	2	0	0	0	0	0	0	0
Brunswick.....	0	0	0	0	0	1	0	0	0
Florida:									
Miami.....	0	0	0	0	0	1	0	0	0
EAST SOUTH CENTRAL									
Tennessee:									
Memphis.....	0	2	0	0	0	0	0	0	0
Nashville.....	1	0	0	0	0	1	0	0	0
Alabama:									
Mobile.....	0	0	0	0	0	2	0	0	0
WEST SOUTH CENTRAL									
Louisiana:									
New Orleans.....	2	2	0	0	0	0	0	0	0
Oklahoma:									
Oklahoma City.....	1	0	0	0	0	0	0	0	0
Tulsa.....	1	0	0	0	0	0	0	0	0
Texas:									
Fort Worth.....	2	0	0	0	0	1	0	0	0
MOUNTAIN									
Montana:									
Great Falls.....	2	1	0	0	0	0	0	0	0
Utah:									
Salt Lake City.....	4	1	0	0	0	0	0	0	0
Nevada:									
Reno.....	1	1	0	0	0	0	0	0	0
PACIFIC									
Washington:									
Spokane.....	1	0	0	0	0	0	0	0	0
Oregon:									
Portland.....	1	1	0	0	0	0	0	0	0
California:									
Los Angeles.....	3	2	1	0	1	0	1	2	0
Sacramento.....	3	2	0	0	0	0	0	0	0
San Francisco.....	3	1	0	0	0	0	0	0	0

¹ Typhus fever; 1 case at Savannah, Ga.

The following table gives the rates per 100,000 population for 98 cities for the 5-week period ended February 9, 1929, compared with those for a like period ended February 11, 1928. The population

figures used in computing the rates are approximate estimates, authoritative figures for many of the cities not being available. The 98 cities reporting cases had estimated aggregate populations of more than 31,000,000. The 91 cities reporting deaths had nearly 30,000,000 estimated population. 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, January 6 to February 9, 1929—Annual rates per 100,000 population compared with rates for the corresponding period of 1928*¹

DIPHTHERIA CASE RATES

	Week ended—									
	Jan. 12, 1929	Jan. 14, 1928	Jan. 19, 1929	Jan. 21, 1928	Jan. 26, 1929	Jan. 28, 1928	Feb. 2, 1929	Feb. 4, 1928	Feb. 9, 1929	Feb. 11, 1928
98 cities	139	204	132	193	125	194	109	194	119	170
New England	183	200	179	168	201	172	109	193	118	136
Middle Atlantic	157	254	158	253	136	252	133	279	141	231
East North Central	124	220	107	192	122	186	106	145	114	174
West North Central	158	111	146	139	115	131	90	113	159	100
South Atlantic	118	155	99	155	79	149	105	180	69	121
East South Central	190	56	170	105	136	84	58	77	81	63
West South Central	119	207	79	154	119	166	99	154	119	130
Mountain	87	115	61	168	52	124	70	106	52	44
Pacific	67	143	107	125	95	161	67	156	70	133

MEASLES CASE RATES

	235	551	218	611	262	571	277	718	376	790
98 cities	235	551	218	611	262	571	277	718	376	790
New England	873	1,021	706	1,249	672	1,078	518	1,508	566	1,614
Middle Atlantic	94	501	70	480	86	484	93	620	129	649
East North Central	315	300	302	325	380	368	417	358	560	440
West North Central	304	110	423	260	627	139	769	223	1,175	217
South Atlantic	66	1,366	84	1,624	84	1,469	105	1,823	136	2,034
East South Central	7	2,020	34	1,845	27	1,564	10	1,459	14	1,312
West South Central	43	272	12	567	36	507	36	928	26	1,321
Mountain	427	106	853	97	871	89	687	115	2,675	186
Pacific	115	527	57	532	77	435	102	709	140	719

SCARLET FEVER CASE RATES

	221	260	225	268	230	278	234	270	249	300
98 cities	221	260	225	268	230	278	234	270	249	300
New England	317	398	296	508	319	372	305	359	308	432
Middle Atlantic	190	266	183	269	217	289	190	296	186	334
East North Central	251	285	258	286	262	301	280	289	320	310
West North Central	253	262	248	225	296	274	306	248	316	291
South Atlantic	124	152	122	210	114	191	132	201	147	224
East South Central	156	63	231	91	251	112	165	70	244	77
West South Central	182	126	190	89	103	130	150	134	241	101
Mountain	167	391	163	266	104	301	61	391	174	540
Pacific	252	229	389	341	267	397	362	217	314	192

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, 1929 and 1928, respectively.

² South Bend, Ind., not included.

³ Columbia, S. C., and Birmingham, Ala., not included.

⁴ Racine, Wis., St. Paul, Minn., Fargo, N. Dak., Columbia, S. C., and Denver, Colo., not included.

⁵ Racine, Wis., not included.

⁶ St. Paul, Minn., and Fargo, N. Dak., not included.

⁷ Columbia, S. C., not included.

⁸ Birmingham, Ala., not included.

⁹ Denver, Colo., not included.

Summary of weekly reports from cities, January 6 to February 9, 1929—Annual rates per 100,000 population compared with rates for the corresponding period of 1928—Continued

SMALLPOX CASE RATES

	Week ended—									
	Jan. 12, 1929	Jan. 14, 1928	Jan. 19, 1929	Jan. 21, 1928	Jan. 26, 1929	Jan. 28, 1928	Feb. 2, 1929	Feb. 4, 1928	Feb. 9, 1929	Feb. 11, 1928
98 cities.....	5	23	17	22	8	23	17	21	16	22
New England.....	2	0	0	0	0	0	0	0	0	0
Middle Atlantic.....	0	0	0	0	0	0	0	0	0	0
East North Central.....	3	7	16	9	8	12	10	9	18	14
West North Central.....	6	147	13	121	2	121	8	117	12	110
South Atlantic.....	2	29	6	15	7	15	11	19	10	23
East South Central.....	41	7	7	70	14	28	10	28	0	21
West South Central.....	16	28	47	4	47	20	28	12	51	16
Mountain.....	78	142	17	106	61	133	78	115	152	44
Pacific.....	7	31	17	64	20	59	7	59	7	69

TYPHOID FEVER CASE RATES

	4	8	14	6	4	8	14	7	15	7
98 cities.....	4	8	14	6	4	8	14	7	15	7
New England.....	2	14	5	9	2	21	2	14	2	9
Middle Atlantic.....	4	5	4	3	2	5	4	5	4	6
East North Central.....	1	3	13	6	4	5	1	3	13	6
West North Central.....	0	8	2	2	4	8	6	2	10	6
South Atlantic.....	4	2	6	6	2	8	18	6	16	10
East South Central.....	7	77	20	42	7	28	10	21	7	7
West South Central.....	28	20	8	12	24	41	8	41	28	41
Mountain.....	0	0	0	9	0	0	0	9	17	0
Pacific.....	0	10	2	8	10	0	7	10	7	0

INFLUENZA DEATH RATES

	241	25	183	26	131	20	183	20	158	18
91 cities.....	241	25	183	26	131	20	183	20	158	18
New England.....	100	7	143	18	206	7	143	9	90	7
Middle Atlantic.....	161	21	152	19	134	16	82	14	58	15
East North Central.....	236	13	148	17	70	12	48	13	128	10
West North Central.....	165	21	123	28	69	15	57	15	50	6
South Atlantic.....	395	40	289	29	182	11	116	25	194	31
East South Central.....	1,522	115	940	153	615	100	253	100	126	54
West South Central.....	467	67	333	67	207	79	174	46	106	88
Mountain.....	165	62	157	71	70	80	35	53	152	53
Pacific.....	79	37	79	17	46	20	43	34	43	20

PNEUMONIA DEATH RATES

	408	196	366	182	328	164	274	155	230	172
91 cities.....	408	196	366	182	328	164	274	155	230	172
New England.....	322	179	446	156	468	126	511	126	387	149
Middle Atlantic.....	443	214	446	193	454	183	360	178	298	201
East North Central.....	414	158	280	137	184	121	170	129	182	114
West North Central.....	285	168	240	205	189	147	189	73	172	159
South Atlantic.....	485	243	474	230	388	214	263	207	237	230
East South Central.....	659	253	452	207	355	169	198	146	193	222
West South Central.....	528	291	398	312	308	271	199	212	199	204
Mountain.....	200	168	200	186	157	177	148	204	208	151
Pacific.....	134	142	125	142	128	145	118	128	134	182

¹ South Bend, Ind., not included.

² Columbia, S. C., and Birmingham, Ala., not included.

³ Racine, Wis., St. Paul, Minn., Fargo, N. Dak., Columbia, S. C., and Denver, Colo., not included.

⁴ Racine, Wis., not included.

⁵ St. Paul, Minn., and Fargo, N. Dak., not included.

⁶ Columbia, S. C., not included.

⁷ Birmingham, Ala., not included.

⁸ Denver, Colo., not included.

Number of cities included in summary of weekly reports, and aggregate population of cities of each group, approximated as of July 1, 1929 and 1928, 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	
			1929	1928	1929	1928
Total.....	98	91	31,568,400	31,052,700	20,995,100	20,498,600
New England.....	12	12	2,305,100	2,273,900	2,305,100	2,273,900
Middle Atlantic.....	10	10	10,809,700	10,702,200	10,809,700	10,702,200
East North Central.....	16	16	8,181,900	8,001,300	8,181,600	8,001,300
West North Central.....	12	9	2,712,100	2,673,300	1,736,900	1,708,100
South Atlantic.....	19	19	2,783,200	2,732,900	2,783,200	2,732,900
East South Central.....	6	5	767,900	745,500	704,300	682,400
West South Central.....	8	7	1,319,100	1,289,900	1,265,000	1,256,400
Mountain.....	9	9	598,800	590,200	598,800	590,200
Pacific.....	6	4	2,090,600	2,043,500	1,690,300	1,551,200

FOREIGN AND INSULAR

CANADA

Provinces—Communicable diseases—Week ended February 2, 1929.—The Department of Pensions and National Health reports cases of certain communicable diseases from seven provinces of Canada for the week ended February 2, 1929, as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Alberta	Total
Cerebrospinal fever.....				1	4			5
Influenza.....	36	49		240	144	5		474
Smallpox.....	2	1		5	25	12		45
Typhoid fever.....				6	4			10

Quebec—Communicable diseases—Week ended February 2, 1929.—The Bureau of Health of the Province of Quebec reports cases of certain communicable diseases for the week ended February 2, 1929, as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis.....	1	Mumps.....	22
Chicken pox.....	32	Scarlet fever.....	114
Diphtheria.....	77	Smallpox.....	5
German measles.....	2	Tuberculosis.....	39
Influenza.....	240	Typhoid fever.....	6
Measles.....	17	Whooping cough.....	16

JAMAICA

Communicable diseases—Four weeks ended February 2, 1929.—During the four weeks ended February 2, 1929, cases of certain communicable diseases were reported from Kingston, Jamaica, and from the Island of Jamaica outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Chicken pox.....	1	9	Smallpox (alastrim).....		1
Dysentery.....	1	9	Tuberculosis (pulmonary).....	33	69
Puerperal fever.....	1	2	Typhoid fever.....	14	58

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 table 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:

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

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CHOLERA—Continued

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

Place	Week ended—						
	Aug.		Sept.		Oct.		Nov. 24, 1928
	26- 27, 1928	28- 29, 1928	28- 29, 1928	30- 31, 1928	31- 1, 1929	1- 2, 1929	
India (French):							
Chandernagor.....	3	16	43	18	3	1	1
Karikal.....	2	7	34	6	1	2	1
Pondicherry Province.....	41	9	111	6	1	4	1
Indo-China (see also table below):	26	8	85	13	3	4	40
Phnompenh.....	132	31	6	9	8	5	13
Saigon.....	72	19	5	1	7	12	27
Japan: Osaka.....	3	---	1	1	1	3	21
Kwangchow-Wan (see table below).	2	---	1	1	1	2	19
Siam.....	1	1	1	1	1	2	1
Anthonag.....	21	14	47	26	20	1	72
Ayudhya.....	14	10	27	15	11	1	60
Bangkok.....	1	7	16	5	39	60	51
Charoenngso.....	1	6	12	8	25	45	38
Dhannapuri.....	5	4	5	2	4	1	1
Lobpur.....	1	1	3	7	2	8	1
Nondpur.....	3	3	7	1	1	6	1
Pradumdhani.....	3	3	7	1	1	6	1
Singhapuri.....	3	3	7	1	1	6	1

Place	Aug. 26- Sept. 22, 1923	Sept. 23- Oct. 17, 1923	Oct. 18- Nov. 24, 1923	October, 1923			November, 1923			December, 1923			January, 1929		
				Aug- ust, 1923	Sep- tember, 1923		October, 1923		Nov- ember, 1923	December, 1923		Jan- uary, 1929	February, 1929		March, 1929
					1-10	11-20	21-31	1-10	11-20	21-31	1-10	11-20	21-31	1-10	11-20
Smud Pratar.....	C														
Smud Segara.....	D														
On vessel: S. S. Glenapp, at Yokohama, from Shanghai.....	C	P													
Indo-China (French) (see also table above):															
Annan.....				11	4	4	5								
Cambodia.....				38	16	6	19								
Cochin-China.....				28	28	6	26								
Tonkin.....				2											
Kwangchow-Wan.....				1											

PLAGUE

Place	Aug. 26- Sept. 22, 1923	Sept. 23- Oct. 17, 1923	Oct. 18- Nov. 24, 1923	Week ended—											
				December, 1923			January, 1929			February, 1929			March, 1929		
				1	8	15	22	29	5	12	19	26	2	9	
Algeria:															
Algiers.....			2												
Oran.....			2												
Philippaville.....		1													
Argentina:		2													
Buenos Aires 1.....															
Catamarca Province: Hecro.....			P												
Cordoba Province.....															
Canada Honda.....			14												
Laborda.....															
July Province: Perico.....															
Rosario.....															

1 During the period from Nov. 10 to Dec. 11, 1923, 13 cases of plague were reported at El Mollar, Tucuman Province, Argentina. During the same period 1 case of plague was reported at Chiplon and 1 at Ucaha, both in Cordoba Province, Argentina.

2 18 plague-infected rats were reported at Buenos Aires, Argentina, from July 1 to Dec. 31, 1923.

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

PLAGUE—Continued

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

Place	Week ended—														Feb. 7, 1929
	Aug. 26- Sept. 23, 1928	Sept. 23- Oct. 20, 1928	Oct. 21- Nov. 17, 1928	December, 1928							January, 1929				
				1	8	15	22	29	5	12	19	26			
Argentina—Continued.			7												
Santiago del Estero.....															
Tucuman Province: El Mollar.....	2	3	3	5											
Azores: St. Michaels Island.....			1												
Belgian Congo:			2												
Djugu.....			1												
Lenza.....			1						1						
Brazil: Santos.....									2						
British East Africa (see also table below):															
Mombasa.....	1	3													
	1	3													
Plague-infected rats.....															
Tanganyika.....	8														
	8														
Uganda.....	102	106	114	33											
	64	86	103	33											
Canary Islands:															
Las Palmas.....	2	2													
	1	1													
Teneriffe.....	6	2													
	3	2													
Laguna.....		4													
Oeyton:															
Colombo.....	3	2	1												
	3	1	1												
Plague-infected rats.....		1	1	3											
Jaffna.....		2	1												
		2													
China:															
Mongolia—															
Chien Chia Tien.....	P	P	19												
Tungshoo.....	220	173													
Ura.....	P	P													
Shansi—Yenchow.....															
Suyuan Province.....															

February, 1929

March, 1929

April, 1929

May, 1929

June, 1929

July, 1929

August, 1929

September, 1929

October, 1929

November, 1929

December, 1929

January, 1930

February, 1930

March, 1930

April, 1930

May, 1930

June, 1930

July, 1930

August, 1930

September, 1930

October, 1930

November, 1930

December, 1930

January, 1931

February, 1931

March, 1931

April, 1931

May, 1931

June, 1931

July, 1931

August, 1931

September, 1931

October, 1931

November, 1931

December, 1931

January, 1932

February, 1932

March, 1932

Union of South Africa:									
Cape Province.....	C	1	2	1					
Orange Free State.....	C		P						
Union of Socialist Soviet Republics:									
Astrakhan.....									
Kirghiz District.....									
Krasnoarsk District.....	D	54							
Chita District.....	D	1							
Kalmouks District.....	D		10						
Kassaniz.....	D		7						
Ural Government.....	D		7						
Uruguay: Rivera.....	D		7						
On vessel:									
S. S. Automedon, at Penang, Straits Settlements.....								1	
S. S. Halydan, at Bangkok, from Singapore.....	C								
S. S. Slomand, at Alexandria, from Batoum.....	C	P						1	
British East Africa (see also table above):									
Kenya.....	C	144	15	37	16	15			
Uganda.....	D	34			2				
Uganda.....	D	52	128	134					
Ecuador: Guayaquil.....	D	141	98	108					
Plague-infected rats.....	D	3	3	3	21	20			
Greece (see also table above).....	D		8	2	7				
Indo-China (see also table above).....	C	27	21	21	29	75			
Madagascar (see also table above).....	C		2		1	1			
Ambositra Province.....	D	2	6	2					
Antsirabe Province.....	D	65	59	88					
Itasy Province.....	D	61	61	84					
Majunga.....	D	3		8	14				
Moramanga Province.....	D	3	10	2	6				
Majunga.....	D	2	2	5	6				
Moramanga Province.....	D	2	2	5	6				
Moramanga Province.....	D	11	20	38	32				
Moramanga Province.....	D	10	18	35	32				
Madagascar—Continued.									
Tamatave.....	C								
Tananarive Province.....	C								
Peru.....	C								
Senegal.....	C								
Baol ¹	C								
Cayor ¹	C								
Fatick ¹	C								
Louga ¹	C								
Rufisque ¹	C								
Thies ¹	C								
Tivacouane ¹	C								
Syria, Beirut.....	C								

¹ Reports incomplete.

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

SMALLPOX

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

Place	Aug. 28- Sept. 22, 1928	Sept. 23- Oct. 20, 1928	Oct. 21- Nov. 17, 1928	Week ended—												February, 1929		
				Nov. 24, 1928	December, 1928					January, 1929								
					1	8	15	22	29	5	12	19	26	2	9	16		
Algeria:																		
Algiers.....	O	2	4	2														
Oran.....	O	1	21	1	1	7					1	1	1					
Arabia: Aden.....	O																	
Brazil (see table below).																		
British East Africa (see also table below), Kenya—																		
Mombasa.....	O		1					3										
British South Africa:																		
Northern Rhodesia.....	O	382	195	342			67	173										
Southern Rhodesia.....	D	22	7	14			8	23										
Tanganyiki.....	O	5	9	1	2		3											
Canada:																		
Alberta.....	O	6	4	4	7	1	13	1		1	1	3						
Edmonton.....	O			21	5	4	8	1	11	1	1	2						
British Columbia—Vancouver.....	O	5	16	14	16	5	1	13	9	17	1	1		2				
Manitoba.....	O		1		13	2	1	1	2	1	4	3		12				
Winnipeg and vicinity.....	O																	
Nova Scotia.....	O																	
Ontario.....	O	3	15	12	4	4	2	5	4	1	14	7	4	1				
Kingston.....	O	1	1	1														
North Bay.....	O																	
Ottawa.....	O	6	2	6	1		1											
Sarnia.....	O			1														
Toronto.....	O																	
Prince Edward Island.....	O																	
Quebec.....	O	28	75	118	25	72	20	8	16	8	7	12	9	1				
Montreal.....	O	12	4	1	1	1	1	1	2	1	2	3	5	2	1			
Quebec.....	O	13	12	12	3	1	1	1			4	4	4	2				
Saskatchewan.....	O	3	1	10	11	12	11	18	1	6	7		3					
Moose Jaw.....	O	2		2	1													
Regina.....	O	1			2						1		2					
Saskatoon.....	O																	

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

SMALLPOX—Continued

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

Place	Aug. 26- Sept. 22, 1928	Sept. 23- Oct. 20, 1928	Oct. 21- Nov. 17, 1928	Week ended—											
				December, 1928					January, 1929					February, 1929	
				Nov. 24, 1928											
				1	8	15	22	29	5	12	19	26	2	9	16
Great Britain—Continued.															
England and Wales—Continued.															
Nottingham.....	15	5	1				1	3							
Plymouth.....	3	2	6												
Sheffield.....	4														
Stoke-on-Trent.....			9	2	2	1	6	1	1	1	2	8			
Scotland.....															
Arbroath.....	3														
Dundee.....	1	3	2			1									
Greece (see table below).															
Hedjaz.....															
India.....															
Bombay.....	4,553	2,732	3,041	985	1,644	1,487	1,776			22	26	55			
Calcutta.....	1,116	698	836	291	475	373	463			9	6	20			
Calcutta.....	14	24	9	1	2	2	6	3	10	21	34	42			
Calcutta.....	11	12	4	2	2	2	6	1	6	14	13	17			
Calcutta.....	13	7	2	3	2	4	4	6	3	4	8	4			
Calcutta.....	17	4	2	2	1	2	2	2	2	3	5	1			
Karachi.....		1								2	4	10			
Madras.....	90	77	71	16	18	15	9	8	5	36	45	50			
Moulmein.....	21	23	22	4	6	6		2	1	4	18	6			
Moulmein.....	4	2		2			1			1	3	2			
Nagapatam.....	1		1		1					1	1	1			
Rangoon.....	46	51	38	5	16	7	5	4	4	3	1	3			
Tuticorin.....	10	11	8		2	1	2	2	1	1	1	1			
Vizagapatam.....		3	1				1			1		4			
India (French):	14	1													
Chandernagor.....	3									2	2				
Pondicherry Province.....	9	4	3												
Pondicherry Province.....	2	2	4												
Pondicherry Province.....	92	111	84	18	13	17		24	19	11	21	22			
Pondicherry Province.....	87	73	67	16	13	17		20	18	10	14	20			

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

SMALLPOX—Continued

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

Place	Week ended—															
	Aug. 26- Sept. 22, 1928	Sept. 23- Oct. 20, 1928	Oct. 21- Nov. 17, 1928	December, 1928								January, 1929				
				Nov. 24, 1928	1	8	15	22	29	5	12	19	26	2	9	16
Tunisia: Tunis.....	1		1		1											
Union of South Africa:																
Cape Province.....	P	P	P	P												
Natal.....																
Orange Free State.....																
Transvaal.....		P	P	P												
Upper Volta.....	P	P	P	P												
On vessel: S. S. Ballarat, en route to Cape Town, South Africa.....	P	10	5													
			1													
													</			

Natal..... D.....
 Orange Free State..... C.....
 Yugoslavia (see table below)..... C.....

Place	Aug- st, 1928	Sep- tem- ber, 1928	Octo- ber, 1928	No- vem- ber, 1928	De- cem- ber, 1928	Jan- uary, 1929
Chosen.....	C 41	C 36				
Chemulpo.....	D 6	D 2				
Seoul.....	C 1	C 1	C 3			
Greece: Athens.....	D 1	D 1	C 1			
	C	C	C			

YELLOW FEVER

Place	Week ended—													
	Aug 20- Sept. 22, 1928			November, 1928							December, 1928			
	Aug 20- Sept. 22, 1928	Sept. 23- Oct. 20, 1928	Oct. 27, 1928	3	10	17	24	1	8	15	22	29	5	12
Brazil:														
Bahia.....	C 1	C 2	1											
Para.....	C	C												
Rio de Janeiro.....	C 9	C 4	1	1					2					
Dahomey: Ouidah Military Camp.....	C 8	C				1		1						
Gambia: Bathurst.....	C	C				1								
On vessel:	C	C		2	1	2	2	1	1					
S. S. Berini, at Santos, Brazil.....	C	C 4												
S. S. Victoria, at Mannos from Para, Brazil.....	C	C 1												
	C	C												

120 cases of yellow fever with 14 deaths were reported at Rio de Janeiro during January, 1929, mostly suburban.

X