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THE PHYSICAL EXAMINATION AS AN INSTRUMENT OF RESEARCH[1]

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In research investigations, the determination of the physical fitness or condition of a group of persons, whether they be workers or subjects in some physiological experiment, has proved a difficult problem. No simple solution is to be expected. Health has no single touchstone. We must piece together information from whatever source it can be obtained and, of course, must always have an eye on the precise nature of the investigation itself. Where a study permits determination of a few specific effects—as those of lead or silica dust or of radium—the problem is much simplified, especially if laboratory or röntgenological methods are available. But it not infrequently happens that one is concerned with the general or broad effect on health, as that of high temperature and humidity in the work place, and then all possible means of measuring physical condition must be brought into play—mortality, sickness, and the general physical examination.

These points are generally recognized, but insufficient attention is given to making each instrument as precise as possible from a research point of view. The present discussion is an attempt to indicate some principles by which the general physical examination may be given sufficient accuracy to serve as a scientific instrument. Only the principles can be set forth at this time. The periodic health examination should obviously be developed along the same lines, both to make successive examinations reasonably comparable and to give real value to the statistical results.

Advancement of scientific knowledge rests to a large extent on the improvement of technique; but we are a little loath to catch the full significance of this fact. So long as a physician conducts an examination which will, clinically, ascertain anything seriously wrong with an individual, he is inclined to feel satisfied. A great deal of difficultly acquired technique has been employed in making such an examination, but customarily no two doctors have followed the same procedure. From an ideal standpoint, perhaps, no two doctors can follow the same procedure, except with respect to a few quantitative phases

[1] Discussion given before Philadelphia County Medical Society, Mar. 25, 1931.

of the examination. Practically speaking, however, it would seem that a degree of standardization is possible. Certain it is that, unless a fairly uniform technique is available, the general physical examination performed by different physicians is not an instrument of research at all.

It must be made clear that the demands of analysis of data collectively are different from the absolutely necessary demands of clinical medicine. The physician, examining a person in order to be of individual help to him, may feel that he need not be concerned if his standard as to what is an enlarged tonsil differs from that of another doctor. After all, he is looking for definitely pathological conditions—matters of importance to the general health of the patient. He can call attention to, or overlook, minor degrees of impairment without its making any particular difference in the recommendations he will make to the individual. He will probably not fail to note any really serious and practically determinable condition. But the statistical results largely depend on the minor degrees of impairment, because these are the conditions which are so much in the majority.

The tendency of minor impairments to outweigh the more serious ones in the statistical results is of such great importance that I should like to be quite specific about this point. It is difficult to give examples with respect to the conditions usually found in the course of the examinations, because the degree is determined only in a qualitative way. But suppose one considers the percentage of persons found to have arteriosclerosis of different degrees in certain examinations we have analyzed. These percentages are 20 for slight; 4 for moderate; and 0.24 for marked. In other words, for every one classified as marked there were nearly 100 classified as slight. Clearly the rate of prevalence of arteriosclerosis, unless we limit ourselves to marked cases, is determined almost entirely by the doctor's interpretation of what the border line is between no case at all and a slight case. I have taken an instance in which it is customary to express the results in degrees. Suppose we consider, instead, weak inguinal rings, where no such separation is customarily made. Eleven per cent are given as having weak rings. To me this percentage is a hazy and unreal thing, because it is determined almost entirely by cases on the border line between the purely normal and the pathological—the no-man's land of uncertainty in the doctor's diagnosis.

I should like also to give an example from some quantitative results—the hemoglobin percentage. We would not entirely agree as to what limits are to be set to the normal range. Similar data to those which I quoted in regard to arteriosclerosis give 36 per cent with readings under 83; 13 per cent with readings under 78; 3 per cent with readings under 73; and 0.4 of 1 per cent below 68. If one doctor should set a limit of 83 he would find three times as many

abnormal conditions as if he set the limit at 78. In quantitative data, which has simply been used as a hypothetical example, an arbitrary limit can be set or the distribution can be given; but in very few phases of the physical examination is this possible.

We have been accustomed to think of rates of impairments as having the same validity as mortality rates. But a death is a real thing whether its cause can be properly set down or not. Even sickness rates of a communicable disease such as smallpox are quite real, because for the purpose of our argument we can say that a case is a case. The gradual shading off into normality does not work the same havoc to our statistics that it does in the prevalence rates based on physical examinations. Reasons for such shading off are about as many as the number of conditions looked for. Sometimes they are inherent in the impairment (as in enlarged heart, when no two people have the same size of heart); sometimes in the difficulties of technique (as in pulmonary tuberculosis); sometimes in the differences in the subject's response (as in history). Whatever the precise reason, I feel that under present conditions we are discussing an unsubstantial and usually unreal thing when we say that the rate of enlarged or diseased tonsils is 26 per cent; or that 6 per cent have pyorrhea; or that 17 per cent have frequent colds. Relative comparisons—from age to age, from occupation to occupation—may in some instances have meaning, but hardly the actual rates.

The difficulty, as you will see, will affect, likewise, the recorded incidence of really serious conditions. One physician may record as severe, cases which another doctor would record as moderate, so that the results will reflect primarily a difference in the point of view of the individual doctor. Even where a single doctor examines both groups, he must have rigorous standards indeed if they do not gradually undergo a change during the making of a large number of examinations, a change which he usually does not realize himself.

Examples of the difficulty of securing comparable results from physical examinations could be cited from a hundred investigations. One is particularly appropriate, however, because different groups of physicians were employed in making these examinations in different industries.[2] In one industry 34 per cent were recorded as having enlarged tonsils and 25 per cent as having diseased tonsils; in another industry these percentages were 31 and 29; in another, 29 and 44. There is a good deal of consistency in these results. On the other hand, one industry had percentages of 4 and 2; another of 7 and 1; another of 7 and 0. These extreme differences are in all probability not due to any peculiar industrial factor, but to a difference in the standards of the examiners in each industry. It is perfectly obvious

[2] A health study of ten thousand male industrial workers. Statistical analysis of surveys in ten industries. By Rollo H. Britten and L. R. Thompson. Public Health Bulletin No. 162 (1926).

that, even if some industrial difference did exist with respect to this or some other condition, it would be entirely obscured by the great variation in the results due to the difference in the standards of the examiners.

It takes an optimistic soul indeed to hope to standardize the making of physicial examinations in the face of such discordant results; yet, if such examinations are to be regarded as an instrument of research at all, something must be done in that direction. What is aimed at in this discussion is to point out the necessity for such standardization, and to suggest a few principles along which progress would seem to lie. These principles may be set down forthwith:

1. *No impairment can be regarded as susceptible of quantitative analysis unless we can be sure that the condition has been looked for in each individual.*

We can not assume that it has been looked for unless the condition is specifically mentioned in the form and checked as negative (or otherwise) by the examiner. Thus, a rather detailed form is necessary. This requirement is more or less contrary to the methods of clinical medicine; but it is felt to be absolutely fundamental so far as collective data go. We must know that the doctor has weighed the question as to whether each particular condition is present. A complete form is not a guarantee of this; but it is a first necessity.

2. *Most impairments encountered in examinations are matters of degree, varying from nonpathological deviations from the normal to conditions requiring immediate treatment.*

As I have intimated, it is quite possible that it is a meaningless question to ask: What is the percentage of persons with flat feet? Where a physical condition varies from an extremely serious impairment to one that can not be separated from the normal, these percentages begin to lose all meaning. In dealing with this problem, some statement of the degree is all that is possible for items which can not be reduced at the present time to a quantititive basis. The following is suggested as a basis for such a statement:

O Normal.
OO Corrected.
X Abnormal, but not pathological.
XX Definitely pathological.
XXX Severe.

Notice here that the question is left to the examiner as to whether the condition is pathological or not. Certainly if the examiner does not know, the coder in the office will not know.

3. *It is necessary that these degrees mean more or less the same thing to the different examiners.*

To accomplish this end, exactly the same procedure must be followed in ascertaining the presence and degree of every impairment. This requires the preparation of a set of definite instructions and a short but intensive training of the examiners in each detail of the physical examination. An excellent procedure would be to have several doctors examine the same individual independently and compare their results.

It is not within the scope of this paper to outline the precise technique to be followed in the case of each condition; but no one point is to be emphasized more strongly than the necessity of having that done. As an example, take the condition of pyorrhea. It will not be sufficient to ask the examiner to record cases of pyorrhea. There must be a definite agreement as to what is meant by pyorrhea, and that interpretation must be kept in mind in any analysis of the data. We might take the rule that the examiner is to press the gum firmly against the teeth and observe whether pus exudes, recording the case as pyorrhea if it does. This is given simply as a suggestion of what is meant by a standardized technique. In a way, in line with a modern point of view in the physical sciences, we are defining these pathological conditions in terms of operations.

4. *The quantitative phases of an examination can be most effectively analyzed.*

Accordingly, physiological measurements, such as hemoglobin, blood pressure, weight in relation to height and age, Snellen test of vision, should be determined. Whenever a condition can be expressed in a quantitative way, this should be done, because this method will go far toward eliminating differences in the doctors' standards.

5. *The examination should be "blind" in so far as practicable.*

What I mean is that, wherever it can be done, the physician should make his examination without knowing whether the subject is exposed to any particular condition under study. He should have a chance to examine "control" subjects without knowing that they are such. This method has been followed in certain investigations with remarkable success. No one thing is so likely to inspire confidence, and rightly, in the results.

6. *A thorough history is necessary, because the examination itself gives only a cross-section survey.*

Since the history must also be analyzed statistically, a definite procedure should be followed with respect to questions as to constipation, frequent colds, chronic bronchitis, and other factors which may bear upon a person's present condition or be connected with any phase of the investigation. The same necessity for rigorous standardization exists here as in the case of the physical examination itself.

7. *The presence of acute conditions at the time of the examination must be allowed for.*

In making the general physical examination for the purposes outlined in this paper, the acute conditions, with certain specific exceptions, are of no moment. In fact, so long as acute conditions are present it is difficult to determine what underlying chronic conditions may exist. A preferable rule would be to examine the patient again after the acute condition has subsided. Where this is impossible, the doctor should, by questioning and observation, find out as to the acuteness or chronicity of symptoms and signs.

8. *A minimum time should be set for each examination.*

Two doctors do not go through an examination at the same rate, but the finding of impairments depends to so great an extent on the thoroughness of the examination, which, in turn, depends on the time taken, that a certain amount of standardization is possible by regulating the minimum time. Where suspicious signs are found, much more time will, of course, be required to determine whether the condition is actually present.

9. *The work, its assembly, and the conclusions should be under the critical eye of one skilled in the various procedures, their interpretation, and the broad phases of human pathology.*

It is easy, otherwise, for mistakes to creep into so complex a mechanism as is this type of research, and it is particularly easy for emphasis to be laid in wrong places unless the details of possible inaccuracies and possible fallacies are duly weighted.

These principles are not given as original. Most of them have been used in different cases in the past and have really proved their worth. Nor are they given as complete; but they should provoke thought.

The application of the principles is not within the scope of this discussion. The difficulty of applying them is thoroughly recognized; but it is felt that the attempt must be made if the general physical examination is to be used in any real sense as an instrument of research.

A NEW SUBSPECIES, RADICANS, OF ALCALIGENES FAECALIS

By Alice C. Evans, *Senior Bacteriologist, National Institute of Health, United States Public Health Service*

According to a recent review of *Alcaligenes faecalis* by Wilson, that organism is frequently found in man's intestine, and may be found in large numbers in cases of enteric fever; but it is rare to find any evidence of its infectivity. Wilson quotes several authors, however, who cultivated it from the blood in cases of diseases resembling enteric fever, and a few of these authors cultivated it from the blood in small groups of cases.

The culture to be reported in this paper is of interest for two reasons: In the first place it was cultivated from the blood in a mild case of fever resembling typhoid. Hence it adds one more to the limited number of cases of enteric disease from which *Alcaligenes* was cultivated from the blood. In the second place it differs from *faecalis* in certain characters. Inasmuch as only one strain has been observed, it will be considered as a subspecies of *faecalis*, although it would be considered a separate species if it represented a number of cultures.

The name *radicans*, proposed for the new subspecies, is derived from *radico*, a Latin verb of the first conjugation meaning "to take root." This name was suggested by the root-like processes which develop beneath the surface growth on gelatin.

The culture was received from Dr. Paul Padget, of the Baltimore City Hospitals, to whom the writer is indebted for the following medical history: The culture was obtained from the blood of a student nurse who was suffering with what appeared at first to be typhoid fever. The serum gave negative agglutination reactions with typhoid and with paratyphoid A and B antigens. Cultures of stools and urine were negative for organisms of the typhoid group. Recovery was prompt, and the patient was discharged perfectly well in two weeks. After her discharge two more similar cases occurred among the student nurses, but blood cultures remained sterile.

MORPHOLOGY AND STAINING REACTIONS

The organism is a nonsporing Gram-negative rod 0.5 by 1.5 to 9 microns, motile by means of peritrichous flagella. In broth culture there are occasional chains of 4 or 5 cells. There is no capsule.

CULTURAL CHARACTERS

On agar slopes, after 24 hours' incubation, growth is moderate, dull, and finely wrinkled, with a few coarse wrinkles near the base of the slope. On further incubation the coarse wrinkles extend over a larger area. The finely wrinkled growth clings to the agar, but the coarsely wrinkled growth may be peeled from the agar as a tough pellicle. There is no pigment formation. Crystals develop in the agar on about the fifth day.

On agar plates the colonies grow to be 0.5 to 1 millimeter in diameter in a day. They continue to grow until the largest colonies may be 8 millimeters in diameter on the fourth day. After one day's growth the colonies appear bluish, in transmitted light, with smooth edges. As they grow larger, the center becomes darker, surrounded by concentric lighter and darker rings. The central disk may be elevated and surrounded by a circular depression, the latter being

surrounded by a raised ring. The outer ring is uniform in texture, with smooth surface and edge; but the ring next to the outside develops regular, fine, radial wrinkles. As the agar dries, tongues of growth may be pushed out, breaking the regularity of the edge.

There is no growth on Conradi-Drigalski agar unless the seeding be heavy, in which case growth is sparse with no change in the color of the medium.

In gelatin medium at room temperature growth occurs only on the surface at first. On about the fourth day the beginnings of rootlike processes may be seen. They appear as papules on the under side of the surface growth. Sometimes there is no further development of these papules, but usually they continue to grow until they appear as branched processes about 2 millimeters long and 1.5 millimeters thick on the eleventh or twelfth day. Liquefaction begins at the surface on about the fifteenth day, and continues slowly downward until about 12 millimeters of the gelatin column has been liquefied.

In broth culture after 24 hours' incubation the medium is faintly turbid, with a delicate ring which readily sinks intact to the bottom of the tube. The turbidity continues to increase for about a week until it becomes very dense, with heavy sediment.

Growth in litmus milk is accompanied by the development of an alkaline reaction which increases for a week or more. There is no growth on potato. Red blood cells are not hemolyzed. The organism is aerobic. Its optimum temperature is 37° C.

BIOCHEMICAL REACTIONS

An alkaline reaction is produced in broth containing dextrose, laevulose, maltose, lactose, galactose, saccharose, mannose, raffinose, rhamnose, xylose, arabinose, starch, salicin, inulin, dulcitol, mannitol, glycerol, sorbitol, erythritol, and inositol.

No growth occurs in synthetic media containing inorganic salts and cystine, tryptophane, or uric acid as a source of nitrogen. No growth occurs in Koser's synthetic citrate medium.

There is no production of acetyl-methyl-carbinol, hydrogen sulphide, or indol.

Growth occurs in 1 per cent Witte's peptone, but it is sparse or absent in a solution of Parke, Davis & Co.'s peptone.

SEROLOGICAL REACTIONS

The new subspecies *radicans* is a weak antigen. As already mentioned, at the time of the patient's illness the serum gave no agglutination reaction with typhoid or paratyphoid A and B antigens. At the time of her illness no serologic tests were made with the patient's serum and the organism cultivated from the blood. A

sample of serum taken five months later gave a negative agglutination reaction with this organism. Agglutinins were produced in the serum of two rabbits to a titer no higher than 1 to 160 after 3 and 5 injections, respectively, of living culture. *Alcaligenes faecalis*, *Eberthella typhi*, *Salmonella paratyphi*, *Salmonella schottmülleri*, and *Escherichia coli* were not agglutinated in these rabbit serums. The organism in question was not agglutinated in high titer serums prepared with antigens of the five mentioned organisms, respectively.

PATHOGENICITY FOR EXPERIMENTAL ANIMALS

On the day after receiving the culture two guinea pigs were inoculated with broth cultures, the first transfer from the original. Each animal was inoculated intraperitoneally with 1 cubic centimeter of broth culture, and intrapleurally with the same dose. One animal died on the sixth day. There was a mild peritonitis, and the omentum was congested, with a small hard abscess near the stomach. The inoculated organism was recovered in pure culture from the abscess. The other guinea pig was killed on the fifteenth day, and the organs were examined without finding evidence of disease. Two or three weeks later, further inoculations were made without results. A guinea pig was inoculated intraperitoneally with the washings from a young agar culture. The animal was killed on the seventh day and the organs were examined without finding evidence of disease. There was no evidence of disease during life in the two rabbits repeatedly injected intravenously with living culture for the preparation of the antiserum, nor post-mortem in one of these rabbits bled to death on the fourth day after the last inoculation. Two mice were injected intraperitoneally with broth culture without results. The results of tests for the pathogenicity of the organism for experimental animals may be summarized with the statement that soon after isolation it was found to be mildly pathogenic for a guinea pig. This pathogenic property appeared to be lost under artificial cultivation, for after a few weeks' cultivation it was nonpathogenic for rabbits, mice, and a guinea pig.

TABLE 1.—*Comparison of the distinguishing cultural characters and biochemical reactions of the type species* faecalis *and the new subspecies* radicans *of the genus* Alcaligenes

Medium	*A. faecalis*	*A. faecalis radicans*
Agar slope	Smooth, glistening	Dull, wrinkled.
Conradi-Drigalski agar	Good growth with alkaline reaction.	No growth unless the inoculation is heavy, in which case the growth is meager.
Gelatin	Surface growth with no liquefaction.	Rootlike processes develop downwards from the surface growth. Later there is slow liquefaction.
Broth	Growth rapid, with pellicle	Growth slow, with ring.
Potato	Brownish growth	No growth.
Synthetic media	Growth	No growth.
Peptone (Park, Davis & Co.) water.	Growth	Growth is sparse or absent.

DISCUSSION

A comparison of the distinguishing cultural characters and biochemical reactions of the type species *faecalis*, and the new subspecies *radicans* of the genus *Alcaligenes* is summarized in Table 1.

In the literature on *Alcaligenes faecalis* there was found a description by Straub and Krais of a strain isolated from the blood in a case of enteric disease. Their strain appears to hold an intermediate position between the species *faecalis* and the subspecies *radicans*. It grew less luxuriantly than the typical *faecalis*, and it liquefied gelatin. Their strain differed from *radicans* in growing meagerly on potato, and in liquefying gelatin rapidly.

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EFFECT OF FUMIGATION ON COCKROACHES ON SHIPS

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The cockroach discussed in this paper is *Blatella germanica*, which is by far the most important cockroach pest on ships seen at New York.

REASON FOR INVESTIGATION

It has been known to fumigators for years that cockroaches often are not eradicated by fumigations effective against rats.

The destruction of cockroaches on shipboard is not a recognized quarantine procedure, though it occurs incidentally in the destruction of rats by fumigation. So far as known, their destruction serves no specific quarantine purpose. From the viewpoint of the quarantine officer, therefore, the fumigation of cockroaches is not now considered a matter of great importance.

From the viewpoint of the shipowners and operating personnel the destruction of insect pests, particularly cockroaches, is the popular criterion by which the effectiveness of fumigation is judged. To them rats are more or less incidental, while the cockroaches occasion direct personal concern. The rats are usually confined to the holds and unoccupied portions of the ship, but cockroaches, while often numerous in the holds, as a rule congregate in the living quarters.

It is not surprising, then, that ship operators have questioned the effectiveness of quarantine fumigations nor that their criticisms should be given credence by those unacquainted with all the facts. On the other hand, it is not logical, nor justifiable from a quarantine

standpoint, to incur the additional expenditures required to kill cockroaches when their destruction does not serve a definite disease-preventive purpose.

To determine if possible a reasonable course between the two horns of this dilemma has been the object of the experiments reported herein.

RESTRICTIONS OF METHOD

Commercial fumigators kill insect pests by long exposures. In quarantine fumigation, however, exposure for the destruction of rats is generally limited to two hours. Obviously, therefore, it is desirable to find a method that kills insect pests in this time.

Cockroaches reproduce through eggs which are protected in egg cases. To kill the eggs is much more difficult than to kill the free running forms. The usual method in attempting complete eradication is to follow fumigation by refumigation, two to six weeks later, to kill the cockroaches that have hatched in the meantime. In quarantine work, results must be secured with a single fumigation. With hydrocyanic acid at approximately $1 a pound, any material increase in the amount of fumigant would not be justified. It will be seen by viewing these conflicting requirements that the chances of satisfactorily solving the problem appear to be small.

A change to some other fumigant has not been considered. This would mean extensive investigation to determine its primary suitability for rat destruction. Any change in the fumigant must come the other way—that is, it must first appear as a better rat-destructive gas.

LITERATURE

No extensive search of the literature has been attempted. So much of it as was examined soon brought to light that nearly all of the work on insect fumigation involved much longer exposures or higher concentrations of fumigant than we were permitted, so that apparently little was to be gained by further study. Among the publications of the Public Health Service only two were noted dealing directly with fumigation for the destruction of cockroaches.

In 1916 Creel [1] carried out limited experiments which indicated that large amounts of cyanide evolved by generative methods were required to kill cockroaches. In 1925 Rice [2] reported complete success in killing cockroaches on ships fumigated with a cyanogen chloride–hydrocyanic acid mixture used for rat destruction, provided fumigated compartments were tightly closed.

[1] Creel, R. H., and Faget, F. M.: Cyanide gas for the destruction of insects. Pub. Health Rep., June 9, 1916.

[2] Rice, C. E.: Destruction of cockroaches and devitalization of their eggs by cyanogen chloride mixture. Pub. Health Rep., August 28, 1925.

CASUAL OBSERVATIONS AND OTHER DATA

The casual, but extensive, observations of fumigators at New York, where cyanogen chloride was used for two years, have been to the effect that this gas was no more effective than other forms of cyanide in killing cockroaches.

For years fumigators have from time to time reported the revival of cockroaches. On numerous occasions cockroaches have been seen to crawl away within an hour after fumigation. Frequently ships' officers have stated that the cockroaches were numerous immediately after fumigation. The writer has learned from representatives of reliable exterminating companies that they regard cockroach eradication as exceptionally difficult. One of the largest fruit companies, despite periodic fumigations of their ships with large amounts of cyanide, uses quantities of insecticide powders between fumigations.

It is the personal observation of the writer that ships' holds are often infested, sometimes very heavily, with cockroaches. These vessels carry permanent reservoirs of infestation which continually reinfest the superstructure compartments. Cockroaches are frequently found between the tarpaulins covering the hatches.

Cockroaches, like rats, congregate most where food, water, and harborage are most accessible.

HARBORAGE AND INFESTATION

The amount of cockroach infestation may be very great. It is not unusual to kill approximately 20,000 to 50,000 in a forecastle (crews' quarters), while more than 20,000 have been taken from a single small stateroom.

Heavy cockroach infestation is usually obvious on even casual inspection, but sometimes close search is required to demonstrate a lighter degree, while the true extent of infestation of any grade is often apparent only after examination of the more remote hiding places.

During the day, cockroaches generally hide in dark places. The preferred refuge is a crack just wide enough for them to crawl into. On ships there are spaces between sinks and the wooden sheathing around them. The spaces between drawers and their casings are favored; and, strange to say, electric switch boxes sometimes harbor a thousand or more. In a forecastle, cockroaches may be found in the bedding and in the corners of the men's lockers. In a mess room they may gather on the underside of the table and under the permanent seats. Often they are found behind pictures and mirrors, when these are loosely attached to the wall, and at times appear in the folds of clothes, in shoes, in suitcases, and, in fact, in any place away from the light and not subject to frequent inspection.

MATERIAL USED

For laboratory experimentation large numbers of cockroaches were collected by light fumigation of infested compartments on ships. Small amounts of HCN stupefy these insects so that they can be readily gathered. Within a few hours most of them recover. In the laboratory those collected were put into a stock cage, which received fresh lots every few days and in which breeding was continuous. From time to time they were taken from this cage for experimentation.

Compartments on shipboard found heavily infested were fumigated under various conditions. The cockroaches gathered up after fumigation were taken to the laboratory for observation.

Fumigation tests were made with liquid HCN (hydrocyanic acid); liquid HCN containing chloropicrin (warning gas); Zyklon–B; and chloropicrin. Cyanogen chloride has not been included, since this material is no longer in use at the New York quarantine station. It is expected later to test the effect of this fumigant and of HCN produced by generation.

After establishing that the cyanogen content in mixtures containing chloropicrin was the important factor, most of the subsequent tests were made with liquid HCN, on account of the ease of measurement. In comparing this with HCN produced by generation, it should be borne in mind that, theoretically, it requires 4 ounces (130 gm.) of sodium cyanide to produce 2 ounces (60 gm.) of HCN; but, practically, there is a variable amount of HCN gas liberated by generative methods.

APPARATUS

All fumigations in the laboratory were done in large glass animal jars, closed by waxed paper stretched across the tops. Methyl orange test papers laid on the covers showed the loss of HCN during exposure to be very slight, a distinct pink color rarely appearing in less than 30 minutes.

In some experiments harborage was furnished by spreading in the bottom of the jar a 1-inch layer of fine wood shavings (planing machine chips) over which were placed four layers of folded cloths and six layers of loosely folded and crumpled newspapers. When given harborage, cockroaches were always allowed three days to become used to it before being subjected to fumigation. During this interval a cloth cover was substituted for the waxed paper.

By chance the cubic contents of the jars used were such that 0.1 c. c. of liquid HCN produced a concentration of 30 gm. (approximately 1 oz.) per 1,000 cubic feet. This greatly facilitated the mechanics of the experiments, since most of the doses utilized were multiples of 30 gm.

The stock cage was made of a tight wooden box covered at the top with very fine brass wire mesh (carburetor gasoline filter screening). (Only a fine mesh will stop the very young cockroaches.) Through the center was set a tin can 4 by 8 inches (a coffee can was used) from which the bottom had been removed. The wire mesh was soldered to the can at the middle so that the latter projected 4 inches into the box and an equal distance above it. The sleeve entrance thus produced was almost proof against the escape of the cockroaches but permitted relatively easy access. It could be entirely closed by a snugly fitting cover. Cockroaches were removed by inserting a small, wide-mouthed bottle, passing the open mouth over the corners and angles, covering it with the hand, and then withdrawing, bringing out as many as 50 at a time.

OBJECTS

The points to determine were as follows:

1. The minimum lethal concentration.
2. The minimum exposure.
3. Concentration and exposure required to sterilize the eggs.
4. The effect of harborage.
5. The effect of warning gas (chloropicrin).
6. To correlate the results of these determinations for the purpose of developing a practical fumigation method that would be effective in clearing cockroaches from superstructure compartments.

LETHAL CONCENTRATION

Starting with 2.6 gm. per 1,000 cu. ft., the concentrations were increased by small amounts while using a constant exposure of 2 hours. Two things soon became quite evident: The first was that even quite small amounts of HCN killed some of the cockroaches; the second, that a small percentage of cockroaches were very much more resistant to the fumigant than were the majority. Four experiments are illustrative:

Experiment 1 (part 2.)—Concentration, 5.2 gm. per 1,000 cu. ft.; 6 cockroaches subjected to fumigant 2 hours; one killed.

Experiment 2.—Concentration, 7.8 gm.; exposure 2 hours; 3 of 7 cockroaches killed.

Experiment 17.—Concentration, 15 gm.; exposure 2 hours; 35 cockroaches killed; 3 recovered.

Experiment 27.—Concentration, 25 gm.; exposure 2 hours; 191 cockroaches killed; 4 recovered.

It will be noted that despite the fact that a concentration of 7.8 gm. killed 3 of 7 cockroaches and one of 15 gm. killed 35 of 38, a concentration of 25 gm. was insufficient to kill all of 195, 4 of which

recovered. This exceptional resistance of a few individuals appears throughout the experiments. It is quite probable that this characteristic is largely responsible for the difficulty of eradicating this insect.

The minimum lethal concentration for free running forms, exposure 2 hours, was found to be 30 gm. (approximately 1 oz.) per 1,000 cu. ft. This is seen when experiment 29 is compared with experiment 27, already cited.

Experiment 29.—Concentration 30 gm.; exposure 2 hours; all of 163 cockroaches killed.

It appears again when experiment 30 is compared with experiment 28:

Experiment 30.—Concentration 30 gm. HCN, plus 10 per cent (by volume) chloropicrin; exposure 2 hours; all of 143 cockroaches killed.

Experiment 28.—Concentration 30 gm. of mixture, HCN plus 10 per cent chloropicrin (by volume); actual concentration of HCN content less than 27 gm.; exposure 2 hours; 176 cockroaches killed; three recovered.

MINIMUM EXPOSURE

The minimum lethal exposure appears to be, roughly, inversely proportional to the concentrations used. This is seen in the experiments recorded in Table 1.

TABLE 1

Exposure No.	Concentration in grams	Length of exposure	Number of cockroaches exposed	Number killed	Exposure No.	Concentration in grams	Length of exposure	Number of cockroaches exposed	Number killed
29	30	2 hours	163	All.	42	120	30 minutes	98	All.
33	60	1 hour	149	148	52	180	15 minutes	99	97
35	60	45 minutes	67	66	64	240	10 minutes	168	All.

The importance of this factor lies in the apparent possibility of performing effective fumigations with short exposures by increasing the amounts of fumigant.

It will be seen that 240 gm. (8 oz.) per 1,000 cu. ft. is fatal to all exposed insects, free running forms, in a few minutes. It would be expected, therefore, that even in the presence of extensive harborage, such a concentration would be effective within the time available—usually 2 hours.

EGG RESISTANCE

The eggs proved more resistant than the free running forms. To render the eggs nonviable required about twice as much HCN, or twice the time of exposure.

The inverse relationship of concentration and exposure permits expressing lethal effects numerically. Thus, when concentration (C) is given in grams and exposure (E) in hours, the minimum lethal

effect for free running forms (M. L. E. F.) may be written: M. L. E. F. = CE = 60. For the eggs this becomes: M. L. E. E. = 2CE = 120. A concentration of 60 gm. was found to sterilize all exposed eggs in 2 hours; a concentration of 120 grams accomplished this result in 1 hour; while one of 240 grams required only one-half hour.

After fumigation, cockroaches with egg sacs were kept under observation for two weeks. It is possible that some eggs may have hatched at later periods. This occurred only once among approximately 200 egg sacs of several lots retained under observation for one month. This egg sac hatched after 16 days.

HARBORAGE

When furnished harborage, the cockroaches availed themselves of it to a marked degree. As a rule, less than 10 per cent of the cockroaches would be in view at any time during daylight hours. After fumigation they would be found scattered through the various layers of paper, cloth, and shavings.

The harborage provided was certainly not greater than that ordinarily available to cockroaches on shipboard and was decidedly less than that afforded on some ships.

In the presence of harborage, a concentration of 60 grams per 1,000 cu. ft. failed to sterilize all eggs in 2 hours. All were sterilized, however, with 120 grams. A concentration of 240 grams sterilized all eggs in 1 hour, but failed to destroy all eggs in one-half hour.

The following experiments are illustrative:

Experiment 55.—1,316 cockroaches, including 107 with egg sacs. Concentration 60 grams; exposure 2 hours; 10 cockroaches recovered, 8 egg sacs hatched.

Experiment 81.—658 cockroaches, including 51 with egg sacs. Concentration 120 grams; exposure 1 hour; 1 cockroach recovered; 3 egg sacs hatched.

Experiment 82.—535 cockroaches, including 47 with egg sacs. Concentration 120 grams; exposure 2 hours; no recoveries; no hatching.

Experiment 71.—633 cockroaches, including 70 with egg sacs. Concentration 240 grams; exposure 30 minutes; no recoveries; 3 egg sacs hatched.

Experiment 70.—545 cockroaches, including 90 with egg sacs. Concentration 240 grams; exposure one hour; no recoveries; no hatching.

It will be seen that M. L. E. E. H. (H = with harborage) = 4CE = 240. This figure, however, would necessarily vary with the amount, kind, and depth of the harborage.

COMMENT ON CONCENTRATION AND EXPOSURE

Minimum dosage and exposure as determined in the laboratory are premised upon one condition true in the laboratory but rarely obtained in practice. That condition is the maintenance of the concentration at a constant level throughout the period of exposure.

In the practice of fumigation two factors tend to produce a progressive reduction of the concentration: These are leakage and absorption.

One of the qualities that renders HCN so effective as a fumigant is its rapid diffusion and, hence, relatively deep penetration. The same quality causes rapid dissipation through even small openings. In the superstructure of a ship, dissipation may at times be so rapid as to reduce concentration to a level sublethal, even to rats, within one hour.

This rapid dissipation of the fumigant can be to a large extent overcome by carefully searching out all of the small openings and sealing them with paper and paste, or adhesive paper strips. The procedure is time-consuming (one would hardly believe the number of small cracks, crevices, and other openings that close search will uncover), but it will greatly improve effectiveness against insects. The longer the maximum concentration is maintained, the greater the penetration secured.

Numerous tests [3] have been made of the concentration actually occurring during fumigation in various ship compartments. In general these show that in the superstructure, when door cracks and other small openings are not pasted over, the concentration seldom attains more than one-half the calculated concentration. That is, when fumigant to the amount of 60 gm. (2 oz.) for every 1,000 cu. ft. of space has been actually introduced, the highest concentration found in air samples, withdrawn at intervals, is seldom greater than 30 gm. (1 oz.) per 1,000 cu. ft. The average concentration for the period of exposure will be less than this, and the terminal concentration is often quite low. When all cracks and small openings have been carefully closed with paper and paste, the concentration obtained approaches that calculated, though it seldom reaches it, but is maintained close to the high level. In a carefully sealed compartment one may expect, and will generally secure, when 60 gm. of fumigant per 1,000 cu. ft. have been used, a maximum actual concentration of not less than 45 gm. per 1,000 cu. ft., with an average during 2 hours of not less than 30 gm.

Besides dissipation through small openings, absorption is a material factor. This plays a relatively greater part in superstructure compartments, where porous material, such as bedding, cushions, carpets, and other fabrics take up the gas, than in the holds. It is presumably this factor that prevents attaining the calculated concentration even in the most carefully closed compartments.

Observation of results obtained on shipboard bear out those of concentrations, as a few experiments will illustrate:

Experiment 58.—Routine fumigation on shipboard: Forward superstructure fumigated with Zyklon, 60 gm. (2 oz.) HCN per 1,000 cu. ft. Exposure 2 hours. Cracks not sealed. After fumigation, 624 cockroaches gathered from pantry. Next morning at least 90 per cent of these were alive and lively.

[3] These will be discussed at length in another paper.

Experiment 60.—Experimental fumigation on shipboard: Forecastle fumigated with Zyklon, 150 gm. (5 oz.) HCN per 1,000 cu. ft. Cracks not sealed. Exposure 2 hours. After fumigation, 502 cockroaches gathered. Next morning 8 alive.

Experiment 72.—Routine fumigation on shipboard: Forward superstructure fumigated with Zyklon, 60 gm. (2 oz.) HCN per 1,000 cu. ft. Exposure 2 hours. Cracks not sealed. After fumigation, 5,000 (est.) cockroaches gathered. Next morning 2,000 (est.) had recovered. After 2 days, several hundred young hatched.

Experiment 73.—Experimental fumigation on shipboard: Cook's room, opening onto deck only through 1 door and 1 port, closed but not sealed. Fumigated with liquid HCN, 300 gm. (10 oz.) per 1,000 cu. ft. Exposure 2 hours. After fumigation, 650 cockroaches gathered from suitcases, drawers, clothing, and bedding; 2,000 (est.) cockroaches swept from the floor. Next morning 53 of those in harborage were alive and 64 of those from the floor had recovered.

Experiment 79.—Experimental fumigation: Forecastle fumigated with Zyklon, 300 gm. (10 oz.) HCN per 1,000 cu. ft. Exposure 2 hours. All cracks and openings sealed. After fumigation, 1,276 cockroaches gathered from floor, cracks in walls, and bedding. No recoveries; no hatching.

PRACTICAL APPLICATION

Restating our problem, we have as our object the eradication of cockroaches in living compartments on ships fumigated for the destruction of rats. Affecting this problem we find the following conflicting factors:

1. For rat destruction 60 gm. (2 oz.) HCN per 1,000 cu. ft. for 2 hours is the dosage and exposure used.

2. In the laboratory we find that this dose and exposure kills cock roaches, including eggs, only if maintained at full concentration throughout exposure and in the absence of harborage.

3. In the laboratory 120 gm. (4 oz.) HCN per 1,000 cu. ft., exposure 2 hours, is required to kill all forms in the presence of harborage.

4. Concentration tests on shipboard show that in practical fumigation the actual average concentration can not be counted upon as exceeding one-half that calculated.

5. Therefore, a theoretical working formula would be as follows: Fumigation with 240 gm. (8 oz.) HCN per 1,000 cu. ft.; exposure, 2 hours. This is four times the amount used for rats. To give a reasonable margin, at least 300 gm. (10 oz.) HCN per 1,000 cu. ft., should be used.

6. Fumigation of an entire ship with 240 or 300 gm. per 1,000 cu. ft. would increase the cost of materials from approximately $40 per ship to $160 or $200 per ship, an apparently unjustifiable expense to the Government.

7. On some ships the holds are heavily infested with cockroaches. Eradication of those in the superstructure alone would be futile in such cases.

8. Dissipation of the fumigant is often very rapid in superstructure compartments, unless all small openings are sought out and sealed.

9. Cockroach infestation is often largely confined to the galley, pantry, storeroom, and forecastle.

10. The cubic capacity of superstructure compartments is relatively small, and so the increased cost of material necessary to kill cockroaches therein would average approximately $10 per ship.

11. Ship owners and operating personnel generally judge the effectiveness of fumigation on the basis of cockroach destruction, giving little consideration to its specific quarantine purpose to kill rats, and usually are quite unaware that much stronger concentrations are required to kill cockroaches.

12. The additional expenditure of $10 per ship is probably justified when this will secure practical eradication of cockroaches, thereby promoting cleanliness, inspiring respect for the effectiveness of the fumigation, and obviating criticism.

An endeavor to harmonize these factors is being made at the New York quarantine station as embodied in the following instructions contained in an order to the fumigation division, dated March 3, 1930:

Officers in charge of fumigations are directed to pay particular attention to cockroaches in the superstructure. In making their inspections they should look for cockroaches in cupboards, drawers, under permanent benches, under tables, in cracks in the walls, and other locations where they are likely to hide.

All lockers, cupboards, drawers, settees, and other small inclosed spaces must be opened and articles in the compartment so arranged as to permit free penetration.

Compartments in the superstructure found infested with cockroaches shall be fumigated with 10 oz. (300 gm.) HCN per 1,000 cu. ft., and these compartments shall be tightly closed during such fumigation. All cracks and small openings shall be sealed by pasting over them strips of paper.

Following fumigation bed clothing and other material likely to absorb dangerous amounts of the fumigant shall be taken into the open air. The officer in charge should assure himself that this is done before leaving the ship.

In all cases where it is not possible or practicable to comply with these instructions or in which heavy cockroach infestation in the holds renders fumigation of cockroaches in the superstructure useless, the officer should make a note of the circumstances on his report.

CLEARING

It has been noted that clearing, even in the superstructure, was considerably prolonged when a concentration of 300 gm. (10 oz.) per 1,000 cu. ft. was employed. Occasionally storerooms ventilated only through a small hatch in the floor of the pantry are encountered. Heavy doses in these will require artificial ventilation, unless overnight airing can be had with safety. Since, with only 60 gm. (2 oz.) per 1,000 cu. ft., it has been noted that bedding may absorb a dangerous quantity of the fumigant, it must be obvious that greater amounts may be absorbed when the dosage is increased.

INFLUENCE OF WARNING GAS

For the purpose of giving warning of its presence, it is customary to mix a lachrimatory gas with HCN. The gas generally used in the United States is chloropicrin, in the amount of 5 per cent or 10 per cent (by weight) of the HCN present.

There was reason to suspect that the presence of this warning gas might interfere with the lethal action of HCN on insects. Insects breath through spiracles in the thorax and abdomen, which probably are contractile and capable of closure. It is known that insects apparently dead from asphyxiation may recover after considerable intervals of time. On these premises the theory has been advanced that the irritant warning gas may cause the spiracles to close, resulting in the partial asphyxiation of the insect without, however, its poisoning by the HCN, so that upon the return of fresh air it recovers.

This theory was experimentally tested in the laboratory by first determining the minimum lethal concentration of HCN, without warning gas, and then subjecting cockroaches to greater concentrations containing 5 per cent or 10 per cent chloropicrin.

It may be briefly stated that the chloropicrin exerted no influence that could be noted. In all experiments the death or recovery of the cockroaches resulted only as the HCN content was up to or below the lethal concentration. This appeared most clearly in several experiments wherein HCN with chloropicrin, in concentrations near the lethal point, was used. When the concentration was 30 gm. *of the mixture* per 1,000 cu. ft., some cockroaches recovered; but when the dosage of the mixture was increased so that *the HCN content* reached a concentration of 30 gm. per 1,000 cu. ft., none of the cockroaches recovered.

One experiment was performed with chloropicrin alone. In this experiment 22 cockroaches were subjected to a concentration of 150 gm. chloropicrin per 1,000 cu. ft. for 40 minutes. For a few minutes they were very active indeed, but at the end of 10 minutes they had become sluggish in their movements. At the end of 40 minutes they were still moving their legs, though most of them were on their backs. After airing overnight, 9 were alive and 13 dead. Chloropicrin is sometimes used as an insecticide, but relatively long exposures are recommended by the manufacturers.

TABULATION OF EXPERIMENTS

For the information of those who may desire to study the experimental determinations in more detail, all pertinent experiments are listed in Table 2.

TABLE 2.—*A tabulation of all experiments. Fumigant is liquid HCN unless otherwise stated*

PART 1. LABORATORY EXPERIMENTS

Experiment number	Concentration in gm. per 1,000 cu. ft.	Exposure in hours	Total number of cockroaches	Cockroaches killed	Cockroaches recovering	Cockroaches with egg sacs	Egg sacs hatched	Number of young hatched	Remarks
1	5.2	2	6	1	5				Concentration started at 2.6 gm. increased to 5.2 at end of first 10 minutes.
2	7.8	2	7	4	3				
5	12	2	15	4	11				One fell over in 2 minutes; all were down and quiet in 13 minutes.
8	25	2	22	22	0	(?)	1	20	
9	35	2	24	24	0	1	0		All were down and movement stopped in 3 minutes.
11	35	1	48	48	0				After 14 hours, 6 were moving legs, but all were dead 24 hours later.
13	35	⅙	14	4	10				
14	15	2	26	26	0				
15	15	2	32	32	0	(?)	2	(?)	
16	15	2	41	39	2	4	0	0	Fumigant, liq. HCN containing 5 per cent (by vol.) chloropicrin; concentration of mixture 15 gm. per 1,000 cu. ft.; 4 alive after 14 hours, but 2 of these were dead 24 hours later.
17	15	2	38	35	3	8	2	(?)	
18	15	2	22	21	1	6	2	(?)	Fumigant same as in Exp. No. 16; concentration 15 gm. of mixture; 3 alive after 14 hours, but 2 of these dead 24 hours later.
19	15	2	30	30	0	5	0	0	
20	20	2	37	35	2	(?)	2	(?)	Fumigant same as in Exp. No. 16; concentration 15 gm. of mixture; 4 alive after 14 hours, but 2 of these dead 24 hours later.
21	20	2	32	30	2	(?)	1	(?)	
22	25	2	32	32	0	4	2	(?)	Fumigant same as in Exp. No. 16; concentration 25 gm. of mixture.
23	25	2	47	47	0	6	0	0	
24	25	2	46	46	0	4	0	0	Do.
25	25	2	44	44	0	6	0	0	
26	25	2	220	197	23	64	12	179	Do.
27	25	2	195	191	4	62	19	291	
28	30	2	179	176	3	59	16	220	Fumigant, liquid HCN containing 10 per cent (by vol.) chloropicrin; concentration 30 gm. of mixture.
29	30	2	163	163	0	76	3	41	
30	30	2	143	143	0	44	4	55	Fumigant same as in Exp. No. 28; concentration 30 gm. of HCN content. 3 were moving legs after 14 hours, but dead 24 hours later.
31	30	2	134	134	0	44	1	36	Fumigant liquid HCN containing 5 per cent (by weight) chloropicrin; concentration 30 gm. of mixture; 2 alive after 14 hours, but 1 died 24 hours later and 1 died 48 hours later.
32	30	2	57	50	7	13	0	0	Fumigant, frozen HCN. Evaporation required 20 minutes.
33	60	1	149	148	1	37	3	59	
34	30	2	77	77	0	25	2	54	Fumigant, liquid. HCN frozen for 2 days and melted shortly before use.
35	60	¾	67	66	1	25	3	54	

TABLE 2.—*A tabulation of all experiments. Fumigant is liquid HCN unless otherwise stated*—Continued

PART 1. LABORATORY EXPERIMENTS—Continued

Experiment number	Concentration in gm. per 1,000 cu. ft.	Exposure in hours	Total number of cockroaches	Cockroaches killed	Cockroaches recovering	Cockroaches with egg sacs	Egg sacs hatched	Number of young hatched	Remarks
36	60	½	108	99	11	38	(?)	61	Egg sacs observed for 1 day only.
37	60	¼	114	(?)	(?)	29	----	----	The majority had recovered after 3 hours.
38	60	1	125	125	0	26	9	138	Fumigant liquid HCN containing 5 per cent (by weight) chloropicrin; concentration 60 grams of mixture.
39	60	¾	129	128	1	23	(?)	(?)	Fumigant and concentration same as in experiment No. 38. About 250 young hatched in 5 days.
40	60	¾	131	129	2	36	2	42	Fumigant liquid HCN containing 10 per cent (by volume) chloropicrin; concentration 60 grams of mixture; 3 alive after 14 hours but 1 died 24 hours later. (Comparison of 39 and 40 suggests that chloropicrin kills eggs.)
41	60	2	105	105	0	27	0	0	
42	120	½	98	98	0	14	1	12	
43	120	¼	86	86	0	12	0	0	
45	60	2	142	142	0	45	0	0	
46	60	1½	120	120	0	35	0	0	
47	120	⅛	47	37	10	17	----	----	Observed only 1 day.
48	120	1/12	48	8	40	15	----	----	Do.
49	120	1	100	100	0	30	0	0	
50	120	¾	82	82	0	23	0	0	
51	180	½	157	157	0	32	2	33	
52	180	¼	99	98	1	17	5	67	
53	60	2	1,625	1,574	51	83	14	(?)	Harborage as described in text. Paper wet from spilled water. Eggs observed 2 days only.
54	120	½	121	121	0	23	3	54	25 young died shortly after hatching.
55	60	2	1,316	1,306	10	107	8	158	Harborage, dry.
59	240	½	624	624	0	42	----	----	Recovered cockroaches from experiment No. 58.
62	240	⅓	199	199	0	53	0	0	
63	240	¼	283	283	0	88	0	0	
64	240	⅙	168	168	0	56	0	0	
65	120	1	193	193	0	58	0	0	
66	120	¾	177	177	0	44	0	0	
67	180	¾	210	210	0	49	0	0	
69	240	2	481	481	0	70	0	0	Harborage.
70	240	1	545	545	0	90	0	0	Do.
71	240	½	633	633	0	70	3	69	Do.
75	30	2	308	308	0	42	1	22	Fumigant, Zyklon-B.
76	60	1	381	381	0	44	0	0	Do.
77	240	½	232	232	0	32	0	0	Do.
78	20	2	313	306	7	46	2	49	Fumigant, Zyklon-B. 9 alive at end of 14 hours, but 2 died during next 24 hours.
81	120	1	658	657	1	51	2	47	Harborage.
82	120	2	535	535	0	47	1	16	Do.

PART 2 (TABLE 2). EXPERIMENTS ON SHIPS

Experiment No. 56.—Officers' quarters fumigated with Zyklon, 60 gm. (2 oz.) per 1,000 cu. ft.; exposure 2 hours; openings not sealed. Samples from five locations taken at 25-minute intervals showed concentrations varying from 15 gm. to 60 gm. per 1,000 cu. ft.; average 20, 40, 45, 35, and 25 at each interval. From shelves and cracks 113 cockroaches were gathered. Next day 43 were alive.

Experiment No. 58.—Officers' quarters fumigated with Zyklon, 60 gm. (2 oz.) per 1,000 cu. ft.; exposure 1¼ hours; openings not sealed. From floor, shelves, and cracks 624 cockroaches were gathered. Next day at least 90 per cent of these were alive.

Experiment No. 60.—Forecastle (crews' quarters) fumigated with Zyklon, 150 gm. (5 oz.) per 1,000 cu. ft.; exposure 2½ hours; openings not sealed, but doors tight fitting. From floor and one locker 502 cockroaches were gathered. Next day 8 were alive. No hatching.

Experiment No. 61.—Forecastle (crews' quarters) fumigated with Zyklon, 4 oz. per 1,000 cu. ft.; exposure 2 hours; openings not closed. From the floor approximately 2,000 cockroaches were gathered. Next day 26 were alive. One of 200 egg sacs hatched.

Experiment No. 72.—Fumigation of superstructure with Zyklon, 60 gm. (2 oz.) per 1,000 cu. ft.; exposure 2 hours; openings not sealed. From various locations 5,000+ (estimated) cockroaches were gathered. Next day 40 per cent or more (2,000 estimated) were alive. The following day several hundred young hatched.

Experiment No. 73.—Cooks' room—isolated, with one door and one port only openings—closed tightly, but not sealed. Fumigated with liquid HCN, 300 gm. (10 oz.) per 1,000 cu. ft.; exposure 2 hours. From protected locations such as suitcases (open but full of clothes), drawers, clothing, and bedding were gathered 650 cockroaches, and from the floor 2,000+ (estimated) cockroaches. Next morning 53 of the 650 from harborage were alive and 64 of the 2,000+ from the floor had recovered.

Experiment No. 74.—Fumigation of holds, loaded with cocoa beans in sacks. Fumigated with Zyklon, 60 gm. (2 oz.) per 1,000 cu. ft.; exposure 4 hours. One week later great numbers (certainly more than 100,000) of cockroaches, both *Blattela germanica* and *Blatta orientalis*, were seen in the holds. Many of these were dead, but the majority were alive.

Experiment No. 79.—Forecastle (crews' quarters) fumigated with Zyklon, 300 gm. (10 oz.) per 1,000 cu. ft.; exposure 2 hours. All openings sealed. After fumigation, 1,276 cockroaches were gathered from floor, cracks, and bedding. No recoveries; no hatching.

Experiment No. 80.—Pantry fumigated with liquid HCN, 300 gm. (10 oz.) per 1,000 cu. ft.; exposure 2 hours. Openings not sealed. After fumigation 1,000+ (estimated) cockroaches gathered from floor. Next day 9 were alive but sluggish. Only 2 fully recovered.

Experiment No. 84.—Mess room fumigated with HCN discoids, 300 gm. (10 oz.) per 1,000 cu. ft.; exposure 2 hours. Openings not sealed. Hallways on either side into which doors opened fumigated with 60 gm. (2 oz.) per 1,000 cu. ft. After fumigation 273 cockroaches were gathered from shelves and drawers. Next day 18 were alive, but only 5 of these survived beyond the third day.

Experiment No. 85.—Galley fumigated with Zyklon, 900 gm. (30 oz.) per 1,000 cu. ft.; exposure 1 hour. Closure poor due to poorly fitting skylights and doors. Stove still hot. Openings not sealed. After fumigation 600+ (estimated) cockroaches gathered from floor and table. Next day 4 alive.

Experiment No. 86.—Forecastle (crews' quarters) fumigated with Zyklon, 450 gm. (15 oz.) per 1,000 cu. ft.; exposure 2 hours. Openings not sealed. After fumigation 1,000+ (estimated) cockroaches gathered. No recoveries; no hatching.

Experiment No. 87.—Mess room fumigated with HCN discoids, 300 gm. (10 oz.) per 1,000 cu. ft.; exposure 2 hours. All openings sealed. After fumigation 2,000+ (estimated) cockroaches gathered from floor and table. Next day 6 were alive. About 30 minutes after opening this mess room 3 live cockroaches were seen to emerge from behind a large mirror, 3 feet by 3½ feet, which was screwed to one wall. Since 200 or more of the cockroaches gathered were on the table under this mirror it is presumed that the six recovering probably emerged from this harborage late in the fumigation.

Experiment No. 88.—Crews' quarters in the stern fumigated with liquid HCN, 300 gm. (10 oz.) per 1,000 cu. ft.; exposure 2 hours. All openings sealed.

After fumigation 500+ (estimated) cockroaches gathered from various rooms. No recoveries, no hatching. Next day the crew tapped over the surface of a sheathing covering a bulkhead. This sheathing was incomplete at the bottom. From behind it dropped many thousands of dead cockroaches. No live ones were seen.

COURT DECISION RELATING TO PUBLIC HEALTH

Death from cerebrospinal meningitis held compensable under Federal longshoremen's and harbor workers' compensation act.—(United States District Court, W. D. Washington, N. D.; Todd Dry Docks, Inc., et al. (Pittson, Intervener) *v.* Marshal, Deputy Com'r, 49 F. (2d) 621; decided Jan. 15, 1931.) The Federal longshoremen's and harbor workers' compensation act provided:

> The term "injury" means accidental injury or death arising out of and in the course of employment, and such occupational disease or infection as arises naturally out of such employment or as naturally or unavoidably results from such accidental injury.

A steamship arrived at Seattle from the Orient, having on board a number of Filipino steerage passengers suffering from cerebrospinal meningitis. After the arrival of the ship, a pipe fitter, in connection with his duties, worked on board the vessel for several days. A week after being so employed he died of cerebrospinal meningitis. The district court held that the deceased employee died from an infectious disease that arose naturally out of his employment and approved an award which had been made under the compensation act.

The court also stated that it appeared under the findings and evidence that the award was within the "accidental injury" phase as well. Concerning this, the court said:

> No doubt, if the body of the deceased had been penetrated by shots from the accidental discharge of a shotgun on the steerage, from the effects of which he lingered and died of blood poisoning, an award would be sustained. By the same token, the discharge of infectious germs by coughing or sneezing on the steerage, some of which penetrated the mucous membrane of the employee, resulting in his speedy death, resulted in accidental injury. In the one the shot penetrated the muscles of the body, and in the other the germ penetrated the mucous membrane.

DEATHS DURING WEEK ENDED JUNE 27, 1931

Summary of information received by telegraph from industrial insurance companies for the week ended June 27, 1931, and corresponding week of 1930. (From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce)

	Week ended June 27, 1931	Corresponding week, 1930
Policies in force	75, 148, 752	75, 988, 917
Number of death claims	13, 184	12, 937
Death claims per 1,000 policies in force, annual rate	9. 1	8. 9

Deaths [1] from all causes in certain large cities of the United States during the week ended June 27, 1931, infant mortality, annual death rate, and comparison with corresponding week of 1930. (From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce)

[The rates published in this summary are based upon midyear population estimates derived from the 1930 census]

City	Week ended June 27, 1931				Corresponding week, 1930		Death rate [2] for the first 26 weeks	
	Total deaths	Death rate [2]	Deaths under 1 year	Infant mortality rate [3]	Death rate [2]	Deaths under 1 year	1931	1930
Total (82 cities)	7,669	11.2	632	[4] 48	11.3	691	13.0	12.8
Akron	41	8.3	2	20	4.7	1	8.2	8.3
Albany [5]	28	11.3	3	59	12.2	7	15.0	15.8
Atlanta	65	12.2	7	72	22.3	22	15.8	16.9
White	31		5	79		6		
Colored	34	(6)	2	57	(6)	16	(6)	(6)
Baltimore [5]	215	13.8	18	61	13.1	17	15.7	14.9
White	172		12	52		11		
Colored	43	(6)	6	94	(6)	6	(6)	(6)
Birmingham	62	12.0	5	50	17.3	12	14.6	14.3
White	26		4	69		5		
Colored	36	(6)	1	24	(6)	7	(6)	(6)
Boston	198	13.1	17	49	10.7	14	15.4	15.5
Bridgeport	31	11.0	2	33	7.8	2	12.1	12.3
Buffalo	143	12.8	15	61	12.2	7	14.2	14.0
Cambridge	33	15.1	4	80	14.2	3	13.5	13.4
Camden	27	11.8	4	70	13.2	5	15.7	14.7
Canton	15	7.3	5	114	8.9	0	11.1	10.9
Chicago [5]	681	10.3	63	56	9.2	35	11.3	11.2
Cincinnati	147	16.8	4	24	14.4	9	16.8	16.4
Cleveland	190	12.9	12	35	10.7	13	12.0	12.1
Columbus	71	12.5	3	29	12.5	6	14.7	17.3
Dallas	67	12.8	12		11.7	5	12.1	12.1
White	40		7			4		
Colored	27	(6)	5		(6)	1	(6)	(6)
Dayton	49	12.4	1	14	10.1	3	12.9	10.5
Denver	73	13.0	7	68	13.9	4	14.9	15.0
Des Moines	53	19.1	3	53	10.9	1	11.9	12.5
Detroit	270	8.5	22	35	8.6	38	9.1	10.2
Duluth	22	11.3	0	0	8.7	1	11.3	11.7
El Paso	37	18.4	5		24.3	19	17.4	18.7
Erie	23	10.2	1	19	14.8	2	11.4	11.5
Fall River [5] [7]	13	5.9	1	23	8.6	4	12.9	13.3
Flint	10	3.2	1	13	8.9	6	7.8	10.0
Fort Worth	33	10.3	1		8.9	3	11.7	11.6
White	27		1			3		
Colored	6	(6)	0		(6)	0	(6)	(6)
Grand Rapids	37	11.2	0	0	10.8	4	9.8	11.4
Houston	63	10.6	11		13.6	3	11.6	12.8
White	49		10			2		
Colored	14	(6)	1		(6)	1	(6)	(6)
Indianapolis	99	14.0	6	49	15.0	6	14.5	15.3
White	88		4	38		6		
Colored	11	(6)	2	134	(6)	0	(6)	(6)
Jersey City	73	11.9	12	107	10.2	4	12.7	12.4
Kansas City, Kans	29	12.3	2	41	9.4	2	14.1	11.6
White	19		0	0		2		
Colored	10	(6)	2	254	(6)	0	(6)	(6)
Kansas City, Mo	97	12.4	6	46	12.3	7	14.2	13.7
Knoxville	16	7.6	0	0	11.3	5	13.5	14.6
White	12		0	0		2		
Colored	4	(6)	0	0	(6)	3	(6)	(6)
Long Beach	27	9.2	0	0	7.2	3	10.4	10.0
Los Angeles	273	10.8	22	64	10.1	20	11.3	11.6
Louisville	68	11.5	1	9	11.7	5	15.4	14.1
White	51		1	10		4		
Colored	17	(6)	0	0	(6)	1	(6)	(6)
Lowell [7]	32	16.6	5	127	12.4	3	13.7	14.7
Lynn	9	4.6	1	26	9.7	0	10.9	11.8
Memphis	79	15.9	9	95	20.5	15	17.2	18.0
White	41		6	100		7		
Colored	38	(6)	3	87	(6)	8	(6)	(6)
Miami	17	7.9	3	76	11.3	2	12.9	12.1
White	9		0	0		2		
Colored	8	(6)	3	265	(6)	0	(6)	(6)

See footnotes at end of table.

Deaths [1] from all causes in certain large cities of the United States during the week ended June 27, 1931, infant mortality, annual death rate, and comparison with corresponding week of 1930—Continued

City	Week ended June 27, 1931				Corresponding week, 1930		Death rate [2] for the first 26 weeks	
	Total deaths	Death rate [2]	Deaths under 1 year	Infant mortality rate [3]	Death rate [2]	Deaths under 1 year	1931	1930
Milwaukee	99	8.8	19	82	9.9	11	10.0	10.4
Minneapolis	97	10.7	7	45	9.8	5	11.8	11.1
Nashville	51	17.1	3	45	20.0	7	17.3	16.7
White	26		2	40		2		
Colored	25	(6)	1	59	(6)	5	(6)	(6)
New Bedford [7]	30	13.9	2	53	9.3	2	13.3	12.2
New Haven	39	12.5	1	19	11.5	1	12.7	14.4
New Orleans	126	14.1	11	60	21.5	20	17.8	18.8
White	77		7	58		8		
Colored	49	(6)	4	65	(6)	12	(6)	(6)
New York	1,416	10.4	104	43	10.3	136	12.3	11.8
Bronx Borough	223	8.7	15	34	7.8	15	9.0	8.5
Brooklyn Borough	494	9.8	39	41	9.1	33	11.4	10.9
Manhattan Borough	523	15.0	41	70	15.8	65	18.9	17.7
Queens Borough	134	6.1	7	19	6.2	16	7.9	7.6
Richmond Borough	37	11.8	2	36	14.7	7	14.2	15.0
Newark, N. J.	87	10.2	9	47	12.8	7	12.7	13.4
Oakland	57	10.2	4	51	8.4	1	11.2	11.5
Oklahoma City	42	11.1	7	97	9.7	8	11.9	10.5
Omaha	44	10.6	4	45	13.9	2	14.5	13.8
Paterson	33	12.4	1	17	12.0	3	14.6	13.3
Peoria	28	13.5	2	53	13.8	0	13.0	13.1
Philadelphia	402	10.7	28	41	10.5	35	14.6	13.4
Pittsburgh	156	12.0	16	55	12.6	23	16.2	15.0
Portland, Oreg	57	9.7	2	24	11.2	2	12.3	13.0
Providence	63	12.9	8	74	11.7	5	14.1	14.5
Richmond	41	11.6	6	87	16.2	8	16.6	15.9
White	19		2	44		2		
Colored	22	(6)	4	174	(6)	6	(6)	(6)
Rochester	68	10.7	5	46	10.0	6	12.9	12.4
St. Louis	294	18.5	27	91	16.7	15	16.5	14.7
St. Paul	52	9.8	4	41	11.1	6	11.3	11.0
Salt Lake City [8]	24	8.8	1	15	12.6	2	12.8	13.6
San Antonio	55	11.9	13		16.5	8	16.1	18.6
San Diego	35	11.7	2	41	13.9	2	14.7	14.8
San Francisco	135	10.8	2	13	10.0	3	13.7	13.4
Schenectady	21	11.4	1	29	9.8	1	10.9	12.1
Seattle	59	8.3	2	19	8.1	3	12.2	11.4
Somerville	21	10.4	0	0	6.0	0	10.4	10.9
South Bend	14	6.8	2	50	9.4	0	8.8	9.5
Spokane	25	11.2	1	26	12.6	1	12.8	13.2
Springfield, Mass	26	8.9	5	77	10.1	3	13.1	13.4
Syracuse	52	12.7	3	36	9.2	2	12.5	12.9
Tacoma	25	12.1	3	77	13.6	5	13.2	13.0
Toledo	63	11.1	7	64	9.8	8	12.8	13.5
Trenton	35	14.7	4	70	16.9	1	18.2	17.7
Utica	25	12.7	2	52	12.8	1	15.3	16.3
Washington, D. C	127	13.4	10	55	13.8	11	16.9	15.9
White	85		7	57		4		
Colored	42	(6)	3	52	(6)	7	(6)	(6)
Waterbury	14	7.2	1	30	13.5	7	10.3	10.6
Wilmington, Del. [7]	29	14.2	1	22	11.7	2	15.4	15.4
Worcester	37	9.8	3	41	10.7	3	13.7	14.1
Yonkers	23	8.6	1	26	10.8	2	9.5	8.7
Youngstown	26	7.8	2	28	9.2	5	10.9	10.7

[1] Deaths of nonresidents are included. Stillbirths are excluded.
[2] These rates represent annual rates per 1,000 population, as estimated for 1931 and 1930 by the arithmetical method.
[3] Deaths under 1 year of age per 1,000 live births. Cities left blank are not in the registration area for births.
[4] Data for 77 cities.
[5] Deaths for week ended Friday.
[6] For the cities for which deaths are shown by color, the percentage of colored population in 1920 was as follows: Atlanta, 31; Baltimore, 15; Birmingham, 39; Dallas, 15; Fort Worth, 14; Houston, 25; Indianapolis, 11; Kansas City, Kans., 14; Knoxville, 15; Louisville, 17; Memphis, 38; Miami, 31; Nashville, 30; New Orleans, 26; Richmond, 32; and Washington, D. C., 25.
[7] Population Apr. 1, 1930; decreased 1920 to 1930, no estimate made.

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 July 4, 1931, and July 5, 1930

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended July 4, 1931, and July 5, 1930

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended July 4, 1931	Week ended July 5, 1930	Week ended July 4, 1931	Week ended July 5, 1930	Week ended July 4, 1931	Week ended July 5, 1930	Week ended July 4, 1931	Week ended July 5, 1930
New England States:								
Maine	2	1			25	17	0	0
New Hampshire					36	2	0	0
Vermont	1	2			43	9	0	0
Massachusetts	39	31	1		300	409	0	0
Rhode Island	11	2			99	17	0	0
Connecticut	10	5	1		131	20	2	1
Middle Atlantic States:								
New York	113	89	[1] 6	[1] 6	1,108	824	4	7
New Jersey	33	38	2	4	334	502	6	2
Pennsylvania	52	103			1,018	791	4	4
East North Central States:								
Ohio	15	20	1	3	390	205	2	1
Indiana	6	7	1		129	60	4	3
Illinois	80	98	9	16	753	222	9	3
Michigan	35	44	1		237	316	3	10
Wisconsin	13	12	11	1	499	308	1	1
West North Central States:								
Minnesota	4	4	1		58	72	1	0
Iowa	1	4			7	14	0	1
Missouri	13	21			27	38	2	3
North Dakota	2				8	2	1	0
South Dakota	8	4	1		3	19	0	0
Nebraska	1	5				47	0	3
Kansas	5	11			28	103	2	1
South Atlantic States:								
Delaware	1				35	11	0	0
Maryland [2] [3]	6	7	1	2	180	19	1	1
District of Columbia	3	6			18	43	0	1
Virginia [2]								
West Virginia	5	10		6	163	82	2	4
North Carolina [2]	7	6		9	203	40	1	1
South Carolina	9	9	86	69	63		0	1
Georgia [2]	2			4	33	29	2	0
Florida	6	2			12	14	1	0

[1] New York City only.
[2] Typhus fever: 1931, 15 cases; 2 cases in Maryland; 1 case in Virginia; 1 case in North Carolina; 5 cases in Georgia; 3 cases in Alabama; and 3 cases in Texas. Report of 3 cases of tyhus fever in Mississippi during the week ending June 20, 1931, was erroneous.
[3] Week ended Friday.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended July 4, 1931, and July 5, 1930—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended July 4, 1931	Week ended July 5, 1930	Week ended July 4, 1931	Week ended July 5, 1930	Week ended July 4, 1931	Week ended July 5, 1930	Week ended July 4, 1931	Week ended July 5, 1930
East South Central States:								
Kentucky					36	3	0	0
Tennessee	1	1	1	2	26	24	2	7
Alabama [2]	7	3	2	2	19	21	3	1
Mississippi [3]	7	4					0	4
West South Central States:								
Arkansas		5		3	7	8	0	0
Louisiana	18	12	20	3		7	1	2
Oklahoma [4]	5	4	17	2	3	41	0	2
Texas [2]	16	21	3	7	26	51	1	0
Mountain States:								
Montana		2			3	5	0	0
Idaho						4	1	0
Wyoming					7	12	0	0
Colorado	3	3			169	160	0	0
New Mexico	4	5			10	19	0	0
Arizona	2		1		8	34	0	2
Utah [3]	2		3		10	23	0	2
Pacific States:								
Washington	11	1			46	173	0	0
Oregon	2	3	9	3	13	53	0	0
California	53	46	16	22	269	665	0	2

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended July 4, 1931	Week ended July 5, 1930	Week ended July 4, 1931	Week ended July 5, 1930	Week ended July 4, 1931	Week ended July 5, 1930	Week ended July 4, 1931	Week ended July 5, 1930
New England States:								
Maine	2	0	30	6	0	0	4	0
New Hampshire	0	1	2	0	0	0	0	0
Vermont	1	0	2	8	21	0	0	0
Massachusetts	5	2	136	60	0	0	7	0
Rhode Island	0	0	16	4	0	0	0	0
Connecticut	2	0	22	16	0	0	1	1
Middle Atlantic States:								
New York	5	1	252	91	39	27	13	16
New Jersey	0	0	91	49	1	0	0	4
Pennsylvania	1	1	254	197	1	0	19	15
East North Central States:								
Ohio	5	4	134	88	45	72	24	10
Indiana	0	11	47	38	72	101	6	3
Illinois	4	5	131	126	27	63	14	8
Michigan	2	0	240	65	13	42	6	4
Wisconsin	2	0	46	43	19	10	0	2
West North Central States:								
Minnesota	0	10	24	27	3	0	2	3
Iowa	0	0	12	8	35	73	4	3
Missouri	1	1	21	33	6	19	16	9
North Dakota	0	0	6	1	9	10	0	0
South Dakota	0	0	2	6	3	14	4	1
Nebraska	0	0	5	24	7	39	5	0
Kansas	2	0	6	24	20	72	6	6
South Atlantic States:								
Delaware	0	0	9	0	0	0	0	0
Maryland [2] [3]	0	0	23	26	0	0	6	8
District of Columbia	0	0	6	4	0	0	0	0
Virginia [2]								
West Virginia	0	1	13	15	3	2	10	8
North Carolina [2]	2	3	14	15	1	8	31	29
South Carolina	0	4	0	5	0	1	68	82
Georgia [2]	1	0	11	1	4	0	38	7
Florida	0	0	3	0	0	0	1	42

[2] Typhus fever: 1931, 15 cases; 2 cases in Maryland; 1 case in Virginia; 1 case in North Carolina; 5 cases in Georgia; 3 cases in Alabama; and 3 cases in Texas. Report of 3 cases of typhus fever in Mississippi during the week ended June 20, 1931, was erroneous.

[3] Week ended Friday.

[4] Figures for 1931 are exclusive of Oklahoma City and Tulsa.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended July 4, 1931, and July 5, 1930—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended July 4, 1931	Week ended July 5, 1930	Week ended July 4, 1931	Week ended July 5, 1930	Week ended July 4, 1931	Week ended July 5, 1930	Week ended July 4, 1931	Week ended July 5, 1930
East South Central States:								
Kentucky	0	0	27	8	8	0	6	6
Tennessee	0	2	1	7	8	4	14	52
Alabama [2]	0	0	10	16	9	0	26	31
Mississippi	0	0	1	2	15	1	15	38
West South Central States:								
Arkansas	1	0	3	2	14	2	22	20
Louisiana	1	20	6	15	25	2	25	29
Oklahoma [4]	0	11	5	12	24	68	23	27
Texas [2]	2	4	14	18	70	77	24	22
Mountain States:								
Montana	0	0	4	5	1	6	2	1
Idaho	0	0	0	1	3	3	0	0
Wyoming	1	0	7	2	2	0	0	1
Colorado	0	1	20	11	11	7	10	2
New Mexico	0	1	2	2	1	2	4	5
Arizona	0	0	1	2	0	3	1	17
Utah [3]	0	0	1	5	4	0	1	1
Pacific States:								
Washington	0	2	12	11	11	30	1	1
Oregon	0	0	7	4	25	8	4	8
California	5	88	45	38	8	17	9	10

[2] Typus fever: 1931, 15 cases; 2 cases in Maryland; 1 case in Virginia; 1 case in North Carolina; 5 cases in Georgia; 3 cases in Alabama; and 3 cases in Texas. Report of 3 cases of typhus fever in Mississippi during the week ended June 20, 1931, was erroneous.
[3] Week ended Friday.
[4] Figures for 1931 are exclusive of Oklahoma City and Tulsa.

SUMMARY OF MONTHLY REPORTS FROM STATES

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

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
May, 1931										
California	17	304	183	1	4,780	11	10	554	93	44
Georgia	8	31	336	161	823	106	0	276	44	48
Kansas	2	46	13	-------	497	2	0	170	284	10
Mississippi	5	33	1,024	2,495	260	2,144	3	78	184	45
South Carolina	-------	82	1,879	1,264	674	788	2	28	6	47
June, 1931										
Arizona	7	8	4	1	148	-------	0	5	4	20
Connecticut	2	15	7	-------	1,211	-------	2	122	0	8
District of Columbia	2	38	1	-------	313	1	1	57	0	-------
Georgia	-------	18	67	164	270	82	3	102	0	93
Maine	1	14	2	-------	115	-------	0	92	0	11
Nebraska	3	25	2	-------	17	-------	0	83	80	-------

May, 1931	Cases
Actinomycosis:	
California	1
Botulism:	
California	3
Chicken pox:	
California	1,710
Georgia	179
Kansas	335
Mississippi	694
South Carolina	392
Conjunctivitis:	
Georgia	2
Dengue:	
Mississippi	10
Diarrhea:	
South Carolina	1,427
Dysentery:	
California (amebic)	9
California (bacillary)	8
Georgia	54
Mississippi (amebic)	30

	Cases
Food poisoning:	
California	58
German measles:	
California	44
Kansas	5
South Carolina	118
Granuloma, coccidioidal:	
California	2
Hookworm disease:	
Georgia	50
Mississippi	204
South Carolina	101
Leprosy:	
California	2
Georgia	1
Lethargic encephalitis:	
California	6
South Carolina	4
Mumps:	
California	1,145
Georgia	175
Kansas	557
Mississippi	331
South Carolina	152
Ophthalmia neonatorum:	
California	2
Mississippi	5
South Carolina	16
Paratyphoid fever:	
California	1
Puerperal septicemia:	
Mississippi	26
Rabies in animals:	
California	104
Mississippi	5
South Carolina	10
Rabies in man:	
California	2
South Carolina	2
Scabies:	
Kansas	3
Septic sore throat:	
California	12
Georgia	42
Kansas	4
Tetanus:	
California	3
Georgia	1
Kansas	1
South Carolina	2
Trachoma:	
California	14
Mississippi	5
Trichinosis:	
California	1
Tularaemia:	
Georgia	1
Kansas	2
Typhus fever:	
Georgia	52
Undulant fever:	
California	7
Kansas	2
South Carolina	1
Vincent's angina:	
Kansas	4
Whooping cough:	
California	1,166
Georgia	172
Kansas	176
Mississippi	450
South Carolina	304

June, 1931

Chicken pox:	
Arizona	20
Connecticut	397
District of Columbia	78
Georgia	60
Maine	107
Nebraska	125
Conjunctivitis:	
Connecticut	9
Maine	1
Dysentery:	
Arizona	3
Connecticut (bacillary)	2
Georgia	93
German measles:	
Connecticut	25
Maine	5
Lethargic encephalitis:	
Connecticut	1
District of Columbia	1
Mumps:	
Arizona	5
Connecticut	222
Georgia	105
Maine	148
Nebraska	254
Ophthalmia neonatorum:	
Arizona	1
Paratyphoid fever:	
Connecticut	6
Georgia	3
Maine	1
Rabies in animals:	
Connecticut	4
Rocky Mountain spotted or tick fever:	
District of Columbia	3
Septic sore throat:	
Connecticut	5
Georgia	25
Tetanus:	
Connecticut	1
Trachoma:	
Arizona	1
Typhus fever:	
Connecticut	1
Georgia	5
Undulant fever:	
Arizona	3
Connecticut	1
Vincent's angina:	
Maine	11
Whooping cough:	
Arizona	23
Connecticut	245
District of Columbia	52
Georgia	94
Maine	54
Nebraska	51

GENERAL CURRENT SUMMARY AND WEEKLY REPORTS FROM CITIES

The 96 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 33,235,000. The estimated population of the 89 cities reporting deaths is more than 31,690,000. The estimated expectancy is based on the experience of the last nine years, excluding epidemics.

Weeks ended June 27, 1931, and June 28, 1930

	1931	1930	Estimated expectancy
Cases reported			
Diphtheria:			
46 States	677	784	----
96 cities	347	411	633
Measles:			
45 States	9,910	8,266	----
96 cities	3,648	3,054	----
Meningococcus meningitis:			
46 States	75	95	----
96 cities	38	35	----
Poliomyelitis:			
46 States	40	120	----
Scarlet fever:			
46 States	2,474	1,640	----
96 cities	1,074	667	715
Smallpox:			
46 States	470	768	----
96 cities	49	82	36
Typhoid fever:			
46 States	375	493	----
96 cities	66	82	58
Deaths reported			
Influenza and pneumonia:			
89 cities	431	414	----
Smallpox:			
89 cities	0	0	----

City reports for week ended June 27, 1931

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 nonepidemic 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 1922 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	Chicken pox, cases reported	Diphtheria		Influenza		Measles, cases reported	Mumps, cases reported	Pneumonia, deaths reported
		Cases, estimated expectancy	Cases reported	Cases reported	Deaths reported			
NEW ENGLAND								
Maine:								
Portland	9	0	1		0	1	1	0
New Hampshire:								
Concord	0	0	0		0	1	0	0
Vermont:								
Barre	0	0	0		0	0	0	0
Burlington	2	0	1		0	0	0	0
Massachusetts:								
Boston	54	25	21	1	0	36	14	12
Fall River	1	2	3		0	20	3	1
Springfield	10	2	2		0	14	24	2
Worcester	9	2	0		0	2	5	1
Rhode Island:								
Pawtucket		0						
Providence	0	4	0		0	78	99	1
Connecticut:								
Bridgeport	10	4	0	1	1	5	3	2
Hartford		3						
New Haven	21	0	1		0	24	3	2
MIDDLE ATLANTIC								
New York:								
Buffalo	16	8	5		1	75	16	18
New York	213	203	73	5	1	623	69	107
Rochester	5	6	1		0	142	8	3
Syracuse	15	1	0		0	19	8	1
New Jersey:								
Camden	1	5	2		0	0	2	3
Newark	47	11	7		0	21	2	6
Trenton	0	2	0	1	0	18	6	1
Pennsylvania:								
Philadelphia	65	45	8	2	1	166	33	16
Pittsburgh	35	15	9		2	75	81	13
Reading	6	2	0		0	3	4	1
EAST NORTH CENTRAL								
Ohio:								
Cincinnati	1	4	3		1	24	7	3
Cleveland	83	22	6	2	1	285	142	10
Columbus	23	2	3	1	0	12	1	3
Toledo	63	4	4		0	22	4	3
Indiana:								
Fort Wayne	3	1	1		0	3	0	5
Indianapolis	5	2	1		1	63	5	10
South Bend	1	1	0		0	3	0	1
Terre Haute	0	0	0		0	3	0	1
Illinois:								
Chicago	223	78	78	2	4	768	64	30
Springfield	17	0	1		0	1	2	5

City reports for week ended June 27, 1931—Continued

Division, State, and city	Chicken pox, cases reported	Diphtheria		Influenza		Measles, cases reported	Mumps, cases reported	Pneumonia, deaths reported
		Cases, estimated expectancy	Cases reported	Cases reported	Deaths reported			
EAST NORTH CENTRAL—contd.								
Michigan:								
Detroit	77	36	22	1	0	51	34	8
Flint	26	1	0		0	1	6	0
Grand Rapids	2	0	0		1	42	0	1
Wisconsin:								
Kenosha	3	0	0		0	3	47	0
Madison	4	0	1			3	18	
Milwaukee	111	9	2	2	2	257	95	6
Racine	8	1	1		0	0	15	0
Superior	13	0	0		0	0	0	1
WEST NORTH CENTRAL								
Minnesota:								
Duluth	18	0	0		0	0	0	2
Minneapolis	26	9	5		0	43	5	3
St. Paul	67	7	0		0	50	0	1
Iowa:								
Davenport	3	0	0			0	0	
Des Moines	0	1	0			0	0	
Sioux City	5	1	0			2	4	
Waterloo	0	0	0			2	0	
Missouri:								
Kansas City	3	2	5		0	44	0	2
St. Joseph	0	0	0		0	4	1	0
St. Louis	10	22	10			4	11	1
North Dakota:								
Fargo	0	0	0		0		4	1
Grand Forks	0	0	0			0	0	
South Dakota:								
Aberdeen	4	0	0			0	0	
Sioux Falls	0	0	0			0	0	
Nebraska:								
Omaha	10	2	2		0	3	4	0
Kansas:								
Topeka	2	1	0		0	3	34	0
Wichita	0	0	0		0	0	2	3
SOUTH ATLANTIC								
Delaware:								
Wilmington	2	1	3		0	6	4	3
Maryland:								
Baltimore	21	13	8		1	123	24	18
Cumberland	0	0	0		0	2	0	0
Frederick	0	0	0		0	6	0	0
District of Columbia:								
Washington	17	6	8	1	0	32	0	5
Virginia:								
Lynchburg	3	0	0		0	0	1	2
Norfolk	2	0	1		0	4	0	3
Richmond	0	1	1		0	18	0	0
Roanoke	4	0	0		0	3	0	0
West Virginia:								
Charleston	0	0	0		0	1	2	3
Wheeling	3	0	1		0	2	0	1
North Carolina:								
Raleigh	1	0	0		0	15	0	1
Wilmington	3	0	0		0	1	0	1
Winston-Salem	1	0	0		0	54	2	0
South Carolina:								
Charleston	0	0	0	11	0	0	0	2
Columbia	0	0	0		0	1	3	7
Greenville	0	0	0		0	0	0	0
Georgia:								
Atlanta	1	1	0	1	1	13	0	6
Brunswick	0	0	0		0	0	1	0
Savannah	2	0	1		0	18	9	2

City reports for week ended June 27, 1931—Continued

Division, State, and city	Chicken pox, cases reported	Diphtheria		Influenza		Measles, cases reported	Mumps, cases reported	Pneumonia, deaths reported
		Cases, estimated expectancy	Cases reported	Cases reported	Deaths reported			
SOUTH ATLANTIC—continued								
Florida:								
Miami	3	1	2		0	16	0	3
St. Petersburg		0			0			0
Tampa	0	1	1		1	4	0	0
EAST SOUTH CENTRAL								
Kentucky:								
Covington	0	0	1		0	0	0	2
Tennessee:								
Memphis	4	0	0		1	74	0	7
Nashville	0	0	0		0	23	0	3
Alabama:								
Birmingham	0	1	0		0	1	0	9
Mobile	0	0	2		0	0	0	1
Montgomery	0	0	1			3	0	
WEST SOUTH CENTRAL								
Arkansas:								
Fort Smith	1	0	0			0	0	
Little Rock	0	0	0		0	0	0	5
Louisiana:								
New Orleans	0	5	15	1	1	1	0	8
Shreveport	0	0	0		0	1	1	1
Oklahoma:								
Muskogee	1	0	0		0	1	0	0
Texas:								
Dallas	0	3	1	1	1	1	1	5
Fort Worth	3	1	3		1	1	0	0
Galveston	0	0	0		0	0	0	1
Houston	1	2	4		0	5	0	5
San Antonio	0	2	0		0	6	0	1
MOUNTAIN								
Montana:								
Billings	1	0	0		0	13	0	0
Great Falls	6	0	0		0	3	0	0
Helena	0	1	0		0	0	0	0
Missoula	0	0	0		0	0	0	0
Idaho:								
Boise	0	0	0		0	0	0	0
Colorado:								
Denver	17	7	1		0	32	17	2
Pueblo	2	1	0		0	6	0	0
New Mexico:								
Albuquerque	10	0	0		0	0	0	0
Utah:								
Salt Lake City	34	3	0		0	0	2	0
Nevada:								
Reno	0	0	0		0	1	0	2
PACIFIC								
Washington:								
Seattle	21	2	0			14	14	
Spokane	8	2	2			1	0	
Tacoma	8	1	1		0	0	4	1
Oregon:								
Portland	8	5	1		0	1	1	4
Salem	4	1	0		0	0	4	0
California:								
Los Angeles	25	29	22	5	0	51	9	10
Sacramento	2	1	0		0	43	0	3
San Francisco	17	10	1	3	1	76	1	3

City reports for week ended June 27, 1931—Continued

Division, State, and city	Scarlet fever		Smallpox			Tuberculosis, deaths reported	Typhoid fever			Whooping cough, cases reported	Deaths, all causes
	Cases, estimated expectancy	Cases reported	Cases, estimated expectancy	Cases reported	Deaths reported		Cases, estimated expectancy	Cases reported	Deaths reported		
NEW ENGLAND											
Maine:											
Portland	1	3	0	0	0	0	0	0	0	1	18
New Hampshire:											
Concord	0	0	0	0	0	1	0	0	0	0	7
Vermont:											
Barre	0	0	0	0	0	0	0	0	0	3	----
Burlington	0	1	0	6	0	0	0	0	0	0	4
Massachusetts:											
Boston	45	57	0	0	0	18	2	0	0	38	198
Fall River	2	6	0	0	0	4	1	0	0	7	13
Springfield	3	7	0	0	0	0	0	0	0	4	22
Worcester	7	12	0	0	0	4	0	0	0	4	----
Rhode Island:											
Pawtucket	1	----	0	----	----	----	0	----	----	----	----
Providence	5	9	0	0	0	1	0	0	0	0	63
Connecticut:											
Bridgeport	5	1	0	0	0	1	0	0	0	0	31
Hartford	2	----	0	----	----	----	0	----	----	----	----
New Haven	2	1	0	0	0	1	1	0	0	2	39
MIDDLE ATLANTIC											
New York:											
Buffalo	17	16	0	2	0	7	1	0	0	14	137
New York	103	195	0	0	0	107	11	6	1	221	1,410
Rochester	6	15	0	0	0	3	0	0	0	3	63
Syracuse	5	14	0	0	0	2	0	0	0	16	52
New Jersey:											
Camden	4	2	0	0	0	1	0	0	0	1	27
Newark	15	8	0	0	0	8	0	1	0	93	89
Trenton	2	4	0	0	0	2	0	0	0	1	35
Pennsylvania:											
Philadelphia	56	119	0	0	0	26	2	1	0	67	402
Pittsburgh	20	61	0	0	0	14	0	0	0	59	156
Reading	2	1	0	0	0	2	0	0	0	1	27
EAST NORTH CENTRAL											
Ohio:											
Cincinnati	8	23	1	0	0	10	1	0	0	7	147
Cleveland	26	23	0	0	0	18	1	1	0	51	190
Columbus	4	4	1	1	0	5	1	0	0	2	71
Toledo	10	4	0	1	0	2	0	1	1	34	63
Indiana:											
Fort Wayne	1	0	1	0	0	2	0	0	0	1	34
Indianapolis	6	10	5	5	0	3	0	0	0	38	----
South Bend	2	2	0	1	0	0	0	2	0	1	16
Terre Haute	1	1	0	0	0	0	0	0	0	1	15
Illinois:											
Chicago	82	164	1	0	0	55	2	1	0	77	681
Springfield	2	1	0	1	0	1	0	4	0	3	34
Michigan:											
Detroit	69	125	1	0	0	23	1	2	0	129	270
Flint	8	14	1	0	0	2	0	0	0	3	10
Grand Rapids	6	5	0	0	0	2	0	0	0	7	37
Wisconsin:											
Kenosha	0	4	0	0	0	0	0	0	0	2	6
Madison	2	0	0	0	----	----	0	1	----	0	----
Milwaukee	19	15	0	0	0	4	1	0	0	27	99
Racine	2	4	0	0	0	3	0	0	0	16	9
Superior	2	0	0	0	0	1	0	0	0	0	8
WEST NORTH CENTRAL											
Minnesota:											
Duluth	6	0	0	0	0	2	0	0	0	0	22
Minneapolis	20	9	2	0	0	4	0	1	0	3	97
St. Paul	12	5	0	2	0	2	1	1	0	31	61
Iowa:											
Davenport	0	2	1	10	----	----	0	0	----	0	----
Des Moines	3	2	1	7	----	----	0	0	----	0	53
Sioux City	1	1	1	1	----	----	0	0	----	6	----
Waterloo	1	0	0	0	----	----	0	0	----	6	----

City reports for week ended June 27, 1931—Continued

Division, State, and city	Scarlet fever		Smallpox			Tuberculosis, deaths reported	Typhoid fever			Whooping cough, cases reported	Deaths, all causes
	Cases, estimated expectancy	Cases reported	Cases, estimated expectancy	Cases reported	Deaths reported		Cases, estimated expectancy	Cases reported	Deaths reported		
WEST NORTH CENTRAL—CON.											
Missouri:											
Kansas City	5	1	0	0	0	7	0	0	0	14	11
St. Joseph	0	0	1	0	0	0	0	0	0	7	8
St. Louis	14	22	1	2	0	17	2	3	0	48	294
North Dakota:											
Fargo	1	0	0	0	0	0	0	0	0	3	7
Grand Forks	0	0	0	0	----	----	0	0	----	0	----
South Dakota:											
Aberdeen	1	0	0	0	----	----	0	0	----	0	----
Sioux Falls	0	0	0	2	----	----	0	0	----	0	9
Nebraska:											
Omaha	2	3	2	4	0	1	0	0	0	6	44
Kansas:											
Topeka	1	0	0	0	0	0	0	0	1	8	12
Wichita	2	0	0	1	0	1	0	0	0	3	24
SOUTH ATLANTIC											
Delaware:											
Wilmington	2	1	0	0	0	1	0	0	0	5	20
Maryland:											
Baltimore	23	19	0	0	0	16	2	0	0	64	215
Cumberland	0	3	0	0	0	1	0	0	0	0	7
Frederick	0	0	0	0	0	0	0	0	0	0	4
District of Columbia:											
Washington	11	8	1	0	0	5	1	0	0	15	127
Virginia:											
Lynchburg	1	0	0	0	0	0	1	1	0	1	10
Norfolk	1	0	0	0	0	3	0	1	0	1	----
Richmond	1	3	0	0	0	4	1	2	0	3	40
Roanoke	0	0	0	0	0	0	0	0	0	0	12
West Virginia:											
Charleston	0	1	1	0	0	0	1	1	0	6	36
Wheeling	1	0	0	0	0	0	0	0	0	1	11
North Carolina:											
Raleigh	0	1	0	0	0	0	0	1	0	12	13
Wilmington	0	0	0	0	0	0	0	0	0	6	8
Winston-Salem	0	3	0	0	0	2	0	1	0	10	14
South Carolina:											
Charleston	0	0	0	0	0	0	1	0	0	0	18
Columbia	0	1	0	0	0	2	2	1	0	2	47
Greenville	0	0	0	0	0	0	1	0	0	1	----
Georgia:											
Atlanta	3	7	2	6	0	2	0	0	0	0	65
Brunswick	0	0	0	0	0	1	0	0	0	0	3
Savannah	0	0	0	0	0	2	1	0	0	4	37
Florida:											
Miami	0	0	0	0	0	0	0	0	0	2	17
St. Petersburg	0	----	0	----	0	0	0	----	0	----	7
Tampa	0	0	0	0	0	0	1	1	0	1	27
EAST SOUTH CENTRAL											
Kentucky:											
Covington	0	3	0	0	0	0	0	0	0	1	13
Tennessee:											
Memphis	2	4	0	3	0	8	3	4	1	44	79
Nashville	1	1	0	0	0	0	2	1	0	0	51
Alabama:											
Birmingham	1	0	1	0	0	8	1	0	0	14	62
Mobile	0	0	0	0	0	0	2	0	0	0	17
Montgomery	0	3	0	0	----	----	0	1	----	0	----
WEST SOUTH CENTRAL											
Arkansas:											
Fort Smith	0	1	6	1	----	----	1	0	----	2	----
Little Rock	0	0	0	0	0	2	1	0	0	0	----
Louisiana:											
New Orleans	4	6	0	1	0	12	3	3	0	1	126
Shreveport	1	0	0	0	0	1	0	2	0	3	24

City reports for week ended June 27, 1931—Continued

Division, State, and city	Scarlet fever		Smallpox			Tuberculosis, deaths reported	Typhoid fever			Whooping cough, cases reported	Deaths, all causes
	Cases, estimated expectancy	Cases reported	Cases, estimated expectancy	Cases reported	Deaths reported		Cases, estimated expectancy	Cases reported	Deaths reported		
WEST SOUTH CENTRAL—contd.											
Oklahoma:											
Muskogee	0	0	1	0	0	0	1	0	0	1	----
Texas:											
Dallas	2	2	1	7	0	3	1	3	0	16	67
Fort Worth	0	1	1	1	0	2	1	0	0	0	33
Galveston	0	0	0	0	0	1	0	1	0	0	15
Houston	1	0	1	0	0	2	1	6	0	0	63
San Antonio	0	0	0	0	0	9	1	1	0	4	55
MOUNTAIN											
Montana:											
Billings	0	0	0	0	0	0	0	0	0	5	3
Great Falls	0	0	0	0	0	0	0	1	0	4	6
Helena	0	0	0	1	0	0	0	0	0	0	4
Missoula	0	1	0	0	0	0	0	0	0	0	7
Idaho:											
Boise	0	0	0	7	0	0	0	0	0	1	5
Colorado:											
Denver	7	7	0	0	0	6	1	0	0	47	66
Pueblo	0	0	0	0	0	1	0	4	0	3	11
New Mexico:											
Albuquerque	1	0	0	0	0	4	0	1	0	1	10
Utah:											
Salt Lake City	2	3	0	0	0	0	0	1	0	18	24
Nevada:											
Reno	0	0	0	0	0	0	0	0	0	0	4
PACIFIC											
Washington:											
Seattle	5	7	1	0	--------	--------	0	0	--------	32	--------
Spokane	3	0	4	2	--------	--------	0	0	--------	2	--------
Tacoma	2	2	1	0	0	1	0	0	0	3	25
Oregon:											
Portland	4	1	7	3	0	2	0	0	0	0	57
Salem	1	1	0	0	0	0	0	0	0	0	--------
California:											
Los Angeles	23	14	4	1	0	28	2	2	0	30	273
Sacramento	2	0	1	0	0	2	0	4	0	3	30
San Francisco	12	6	0	0	0	10	0	1	0	13	109

Division, State, and city	Meningococcus meningitis		Lethargic encephalitis		Pellagra		Poliomyelitis (infantile paralysis)		
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases, estimated expectancy	Cases	Deaths
NEW ENGLAND									
Massachusetts:									
Boston	0	0	0	0	0	0	0	1	0
Worcester	1	0	0	0	0	0	0	0	0
MIDDLE ATLANTIC									
New York:									
New York City	10	3	1	2	0	0	1	6	1
New Jersey:									
Newark	1	0	0	0	0	0	0	0	0
Pennsylvania:									
Philadelphia	3	1	0	0	0	0	0	0	0
Pittsburgh	5	1	0	1	0	0	0	0	0

City reports for week ended June 27, 1931—Continued

Division, State, and city	Meningococcus meningitis		Lethargic encephalitis		Pellagra		Poliomyelitis (infantile paralysis)		
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases, estimated expectancy	Cases	Deaths
EAST NORTH CENTRAL									
Ohio:									
Cincinnati	3	2	0	0	0	0	0	0	0
Indiana:									
Indianapolis	1	2	0	0	0	0	0	1	1
Illinois:									
Chicago	5	3	1	0	0	0	0	1	2
Michigan:									
Detroit	0	0	1	0	0	0	1	0	0
Grand Rapids	0	0	2	0	0	0	0	0	0
WEST NORTH CENTRAL									
Minnesota:									
St. Paul	0	0	0	0	0	0	0	1	0
Missouri:									
Kansas City	0	0	0	0	1	1	0	0	0
St. Louis	2	0	0	0	0	0	0	0	0
SOUTH ATLANTIC									
Maryland:									
Baltimore [1]	2	0	0	0	0	0	0	0	0
North Carolina:									
Raleigh	0	0	0	0	1	0	0	1	0
Wilmington	0	0	0	0	1	0	0	0	0
South Carolina:									
Charleston	0	0	0	0	0	3	0	0	0
Columbia	2	0	0	0	0	2	0	0	0
Georgia:									
Atlanta [1]	0	0	0	0	1	1	0	1	1
Savannah [1]	0	0	0	0	2	0	0	0	0
Florida:									
St. Petersburg	0	1	0	0	0	0	0	0	0
Tampa	0	0	0	0	0	0	0	1	0
EAST SOUTH CENTRAL									
Tennessee:									
Nashville	2	3	0	0	0	0	0	0	0
Alabama:									
Birmingham	0	0	0	0	1	1	0	0	0
Mobile	0	0	0	0	1	0	0	0	0
WEST SOUTH CENTRAL									
Arkansas:									
Little Rock	0	0	0	0	0	1	0	0	0
Louisiana:									
Shreveport	0	0	0	0	0	1	0	0	
Oklahoma:									
Muskogee	1	1	0	0	0	0	0	0	0
Texas:									
Dallas	0	0	0	0	3	1	0	0	0
Houston	0	1	0	0	0	0	0	0	0
MOUNTAIN									
New Mexico:									
Albuquerque	0	0	0	0	1	0	0	0	0
Utah:									
Salt Lake	1	0	0	0	0	0	0	0	0
PACIFIC									
California:									
Los Angeles	1	1	0	0	0	0	0	0	0
San Francisco	0	0	1	0	0	0	0	0	0

[1] Typhus fever, 1 death and 2 cases; 1 death at Baltimore, Md.; 1 case at Atlanta, Ga.; and 1 case at Savannah, Ga.

The following tables give the rates per 100,000 population, for 98 cities for the 5-week period ended June 27, 1931, compared with those for a like period ended June 28, 1930. The population figures used in computing the rates are estimated midyear populations for 1930 and 1931, respectively, derived from the 1930 census. The 98 cities reporting cases have an estimated aggregate population of more than 33,000,000. The 91 cities reporting deaths have more than 31,500,000 estimated population.

Summary of weekly reports from cities, May 24 to June 27, 1931—Annual rates per 100,000 population, compared with rates for the corresponding period of 1930 [1]

DIPHTHERIA CASE RATES

	Week ended—									
	May 30, 1931	May 31, 1930	June 6, 1931	June 7, 1930	June 13, 1931	June 14, 1930	June 20, 1931	June 21, 1930	June 27, 1931	June 28, 1930
98 cities	59	76	67	75	54	78	66	66	[2] 54	65
New England	50	56	46	94	41	39	41	39	[2] 76	68
Middle Atlantic	58	67	74	68	55	78	65	77	47	62
East North Central	81	110	75	112	64	128	89	92	72	97
West North Central	54	77	55	52	61	60	52	35	42	72
South Atlantic	41	60	39	54	49	44	43	36	45	26
East South Central	17	36	12	12	17	12	6	12	23	12
West South Central	54	49	68	38	27	80	85	80	68	35
Mountain	52	44	191	18	35	35	26	9	9	0
Pacific	37	67	49	65	53	36	71	47	51	55

MEASLES CASE RATES

98 cities	1,114	911	1,096	934	876	815	723	642	[2] 572	489
New England	935	1,558	933	1,596	601	1,546	635	1,144	[2] 491	832
Middle Atlantic	1,187	940	1,101	1,021	838	1,033	663	776	511	607
East North Central	1,304	524	1,446	512	1,304	453	1,178	377	921	331
West North Central	641	525	817	420	448	370	331	302	296	269
South Atlantic	2,089	793	1,473	523	1,102	397	766	411	591	256
East South Central	1,047	335	1,140	371	820	161	844	239	588	227
West South Central	294	453	254	115	149	94	88	77	47	17
Mountain	461	5,674	870	5,665	705	3,410	609	2,687	479	1,454
Pacific	492	1,397	511	1,903	580	1,340	302	1,069	362	798

SCARLET FEVER CASE RATES

98 cities	306	182	310	208	269	188	221	141	[2] 168	107
New England	351	307	414	252	291	218	272	126	[2] 260	135
Middle Atlantic	304	162	355	186	318	147	280	112	194	85
East North Central	438	264	422	293	386	301	310	226	240	182
West North Central	291	213	258	265	168	238	132	151	78	99
South Atlantic	239	126	197	170	122	158	77	106	93	68
East South Central	297	72	151	96	169	48	93	60	64	54
West South Central	51	14	41	73	88	35	30	98	30	38
Mountain	165	97	104	194	96	132	78	203	96	62
Pacific	110	71	86	93	80	97	57	73	57	49

[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, 1931 and 1930, respectively.

[2] Pawtucket, R. I., and Hartford, Conn., not included.

Summary of weekly reports from cities, May 24 to June 27, 1931—Annual rates per 100,000 population, compared with rates for the corresponding period of 1930—Continued

SMALLPOX CASE RATES

	Week ended—									
	May 30, 1931	May 31, 1930	June 6, 1931	June 7, 1930	June 13, 1931	June 14, 1930	June 20, 1931	June 21, 1930	June 27, 1931	June 28, 1930
98 cities	15	15	14	20	10	14	7	10	[2] 8	13
New England	0	0	0	0	0	0	5	0	[2] 0	0
Middle Atlantic	1	1	0	1	1	0	0	0	1	0
East North Central	11	12	16	8	12	11	5	7	5	10
West North Central	88	56	42	118	36	54	29	31	19	52
South Atlantic	24	10	18	4	0	8	14	2	12	10
East South Central	6	30	17	30	23	36	12	18	17	6
West South Central	37	14	41	21	24	21	20	24	30	21
Mountain	26	62	26	62	17	35	0	35	70	53
Pacific	12	49	33	59	25	49	16	36	6	43

TYPHOID FEVER CASE RATES

98 cities	7	7	6	8	7	9	9	8	[2] 10	13
New England	2	12	2	5	0	10	10	0	[2] 0	10
Middle Atlantic	8	3	5	6	7	8	12	4	4	5
East North Central	2	2	1	4	4	4	4	2	6	10
West North Central	4	10	10	10	4	6	6	8	10	14
South Atlantic	22	14	20	22	14	16	14	24	16	40
East South Central	12	36	17	12	17	24	12	48	35	60
West South Central	7	21	10	35	24	17	14	24	54	31
Mountain	17	9	17	0	9	9	0	9	52	35
Pacific	2	8	4	[illegible]	12	16	10	6	14	4

INFLUENZA DEATH RATES

91 cities	7	4	6	5	4	6	7	4	[2] 4	8
New England	10	0	2	0	0	2	7	2	[2] 3	0
Middle Atlantic	3	4	5	4	4	5	8	5	2	2
East North Central	5	4	2	4	4	6	5	4	6	2
West North Central	9	3	6	12	6	15	6	0	0	0
South Atlantic	18	4	14	10	6	2	4	2	6	6
East South Central	19	32	38	13	13	13	0	13	6	13
West South Central	14	4	10	11	3	25	14	7	7	11
Mountain	17	18	0	9	0	0	9	0	0	0
Pacific	5	2	7	2	5	5	5	0	2	2

PNEUMONIA DEATH RATES

91 cities	101	78	86	83	75	83	70	72	[2] 67	66
New England	111	97	120	80	60	89	65	75	[2] 57	53
Middle Atlantic	109	89	102	100	88	96	72	78	76	71
East North Central	75	53	59	58	60	66	60	52	51	56
West North Central	133	69	138	132	71	78	106	111	38	87
South Atlantic	132	90	77	102	83	80	89	70	103	72
East South Central	183	97	76	71	145	97	82	117	139	91
West South Central	128	121	86	78	79	100	76	64	90	85
Mountain	70	79	87	115	70	88	78	132	35	79
Pacific	43	52	48	32	43	57	34	60	41	45

[2] Pawtucket, R. I., and Hartford, Conn., not included.

FOREIGN AND INSULAR

CANADA

Provinces—Communicable diseases—Week ended June 20, 1931.—The Department of Pensions and National Health of Canada reports cases of certain communicable diseases for the week ended June 20, 1931, as follows:

Province	Cerebro-spinal fever	Influenza	Polio-myelitis	Small-pox	Typhoid fever
Prince Edward Island [1]					
Nova Scotia [1]					
New Brunswick					5
Quebec					6
Ontario	4	1		3	5
Manitoba					1
Saskatchewan	1			18	
Alberta [1]					
British Columbia			1		3
Total	5	1	1	21	20

[1] No case of any disease included in the table was reported during the week.

Quebec Province—Communicable diseases—Week ended June 27, 1931.—The Bureau of Health of the Province of Quebec, Canada, reports cases of certain communicable diseases for the week ended June 27, 1931, as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	2	Ophthalmia neonatorum	4
Chicken pox	36	Puerperal septicemia	2
Diphtheria	30	Scarlet fever	63
Erysipelas	2	Tuberculosis	94
German measles	2	Typhoid fever	15
Measles	208	Whooping cough	11
Mumps	9		

CHINA

Shanghai—Meningitis.—Meningitis has been reported in Shanghai, China, as follows:

Week ended—	Cases	Deaths	Week ended—	Cases	Deaths
May 30, 1931		6	June 13, 1931	3	9
June 6, 1931	5	7	June 20, 1931	1	6

CUBA

Habana—Communicable diseases—Four weeks ended June 20, 1931.—During the four weeks ended June 20, 1931, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Chicken pox	25		Scarlet fever	1	
Diphtheria	10	2	Tuberculosis	26	9
Malaria	2		Typhoid fever [1]	33	4
Measles	73	1			

[1] Many of these cases are from the Island of Cuba, outside of Habana.

DENMARK

Communicable diseases—April, 1931.—During the month of April, 1931, cases of certain communicable diseases were reported in Denmark as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	6	Paratyphoid fever	3
Chicken pox	41	Puerperal fever	20
Diphtheria and croup	291	Scabies	758
Erysipelas	283	Scarlet fever	139
German measles	19	Syphilis	140
Influenza	9,595	Tetanus	4
Lethargic encephalitis	5	Typhoid fever	4
Measles	1,514	Undulant fever (Bac. abort. Bang.)	52
Mumps	492	Whooping cough	1,492

TRINIDAD

Port of Spain—Vital statistics—May, 1930, 1931.—The following statistics for the month of May, 1930 and 1931, are taken from a report issued by the public health department of Port of Spain, Trinidad:

	May			May	
	1930	1931		1930	1931
Number of births	151	160	Death rate per 1,000 population	20.1	17.7
Birth rate per 1,000 population	26.4	27.4	Deaths under 1 year	16	12
Number of deaths	115	103	Deaths under 1 year per 1,000 births	106	75

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

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

CHOLERA

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

Place		Dec. 14, 1930–Jan. 10, 1931	Jan. 11–Feb. 7, 1931	Feb. 8–Mar. 7, 1931	Mar. 8–Apr. 4, 1931	Week ended— April, 1931			May, 1931					June, 1931				July 4, 1931
						11	18	25	2	9	16	23	30	6	13	20	27	
Ceylon: Colombo	C				1								1	1				
	D												1	1				
China: Canton	C					1						2				1		
	D											1						
India	C	10,687	15,334	11,544	8,968	3,161	3,067	2,668	2,566	3,242	3,013							
	D	5,689	8,123	6,131	4,550	1,571	1,550	1,360	1,286	1,806	1,598							
Bombay	C		21			2												
	D		9			1												
Calcutta	C	28	121	170	436	95	82	62	71	72	89	49	55	94	74	50		
	D	20	86	112	256	55	51	26	44	39	44	34	32	57	47	26		
Karikal	C	1		9	12	10	8	1		10		1	1					
	D			8	12	5	8	1		5		1	1					
Madras	C	201	99	72	20	3	1	4	18	18	23	11		3	6			
	D	67	47	29	10	5	1	3	5	6	8	2	1		1			
Negapatam	D		3	3														
Rangoon	C	1											2			2		
	D	1	1										1			1		
Tuticorin	C	1	1	1														
Vizagapatam	C																1	
India (French):																		
Chandernagor	C	2	1	5	7	3	2	1		3		1			1			
	D	3	1	5	6	3	2			3		1			1			
Pondicherry	C	31	19	100	100	5	3	5	11	3	8	2	4	1	1	1		
	D	21	11	34	18	1	3				3		4	1	1	1		
India (Portuguese)	C	1																
Indo-China (see also table below):																		
Pnompenh	C		4	9		1	1							1				
	D		2	5	1			1		2				1				
Saigon and Cholon	C	9	6	4	5	2	3	7	15	25	23	34	22	18	16	14	13	
	D	4	3	4	5		3	6	13	20	18	25	13	9	14	9	9	

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

CHOLERA—Continued

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

Place		Dec. 14, 1930–Jan. 10, 1931	Jan. 11–Feb. 7, 1931	Feb. 8–Mar. 7, 1931	Mar. 8–Apr. 4, 1931	Week ended— April, 1931			May, 1931					June, 1931				July 4, 1931
						11	18	25	2	9	16	23	30	6	13	20	27	
Persia: Rafsanjan [1]	C									31	1	4						
	D									12		2						
Philippine Islands: [2]																		
Iloilo	C	1	2															
	D	1	2															
Provinces—																		
Capiz	C		59	186	48		3	8	18	11	3		3	4				
	D		47	146	41		3	8	13	11	3		1	4				
Iloilo	C	28	145	95	7									8	7	5	6	24
	D	22	110	65	4									6	5	6	4	22
Masbate	C				21													
	D				9													
Negros, Occidental	C	120	90	4													2	
	D	97	56	4													1	
Negros, Oriental	C		1															
	D		1															
Pampanga	C									1								
Samar	C	17																
	D	9																
Siam	C	2	3	1	10	1	1	1	13	11					1	3		
	D	2	1		2				4	3					1	1		
Ayudhaya District	C				1													
Bangkok	C	2	3	2	3	1		1	1	1	1	1						
	D	2	1	1	2			1	1			1						
Bismulok Province	C				8													
	D				2													
On vessel:																		
S. S. Arankola, at Rangoon from Calcutta	C												1					
S. S. City of Eastborne, at Calcutta from Cocanada	C													1				
S. S. Tairea, at Penang from Calcutta	C														1			

Place		December, 1930	January, 1931			February, 1931			March, 1931			April, 1931			May, 1931		
			1-10	11-20	21-31	1-10	11-20	21-28	1-10	11-20	21-31	1-10	11-20	21-31	1-10	11-20	21-31
Indo-China (French) (see also table above):																	
Cambodia [2]	C	28	7	19	36	71	35	19	14		65					44	40
Cochin-China [2]	C	8	7	4	13	5	5	19	39		33				1	52	75

[1] From May 11 to 30, 1931, 109 cases of cholera and 57 deaths were reported at Rafsanjan, in Kerman District, Persia.
[2] Figures for cholera in the Philippine Islands are subject to correction.
[3] Reports incomplete.

PLAGUE

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

Place		Dec. 14, 1930-Jan. 10, 1931	Jan. 11-Feb. 7, 1931	Feb. 8-Mar. 7, 1931	Mar. 8-Apr. 4, 1931	Week ended—											
						April, 1931			May, 1931					June, 1931			
						11	18	25	2	9	16	23	30	6	13	20	27
Algeria:																	
Algiers	C	1	2	1	1												
	D				1												
Bone	C		1											1			
Constantine, vicinity of	C	50	1	1													
	D		1														
Philippeville	C	1															
	D	1															
Argentina:																	
Cordoba Province	C		1	2													
Entre Rios Province—Diamante	C			2													
Jujuy Province—Palpala	C		1	1													
Santa Fe	C			2													
Belgian Congo	C				2										1		
	D				2										1		

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

PLAGUE—Continued

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

Place		Dec. 14, 1930–Jan. 10, 1931	Jan. 11–Feb. 7, 1931	Feb. 8–Mar. 7, 1931	Mar. 8–Apr. 4, 1931	Week ended—											
						April, 1931			May, 1931					June, 1931			
						11	18	25	2	9	16	23	30	6	13	20	27
British East Africa (see also table below):																	
Tanganyika	C	2		22	8			3	15	17	5						
	D	2		4	1			10	11	11	2						
Uganda	C	67	25	15	19	8	3	10	14	11	33						
	D	67	24	15	19	8	3	9	12	11	26						
Ceylon: Colombo	C	9	8	11	8	1	3			1							
	D	9	6	13	7	1	2			1							
Plague-infected rats			2	3	4		1					5					
China: Amoy	C									1							
	D									1							
Dutch East Indies:																	
Batavia and West Java	C	239	180	141	84	19	24	20	11	18	12						
	D	238	168	128	80	18	23	20	10	18	12						
East Java and Madura	C		4	1	4			1		1							
	D		4	1	4			1		1							
Java and Madura	D	615	427	376	277	58	73	70	42	47	41	46	42				
Egypt:																	
Alexandria	C	3	1	2	1										2	3	1
	D															3	1
Plague-infected rats		1	1	1													
Assiout	C	7	26	41	18	5	16	8	3	4	5	8	1	4		5	
	D	1	6	11	6		11	4	2	2	4	1					
Beni-Suef	C		1					10	2	3		2					
	D		1					3		1		2					
Cairo	C				1												
Deirout	C		21	16					3	7	1		2	3			
	D		4	4					1	2	2			1			
Gharbieh	C		1												1		
	D		1												1		
Girga	C	7	1		86	31	9	4		1	1	5					
	D	2	1		24	13	3	5	1	1	1						
Kena	C				5			3				1					
	D				2			1				1					
Manfalut	C	23	30	15	17												
	D	5	6	5	3												

Minieh	C		2		3		1			5		1		3			
	D		1		2					2		1		1			
Port Said	C														1	1	
Hawaii Territory: Hamakua—Plague-infected rats												1					
India	C	3,740	5,335	5,457	9,139	2,503	1,603	1,258	778	434	139						
	D	2,226	3,422	3,661	7,037	1,980	1,377	1,092	750	385	143						
Bassein	C	2	4	1					1			1					
	D	1	3	1					1			1					
Bombay	C		1	1	4	4	4	1	2	5		1	1				
	D		1	1	3	4	4		3	4	1	1					
Plague-infected rats		38	34	32	70	34	43	30	30	26	30	17	21	10	10	10	
Calcutta	C					1	1										
	D					1	1										
Madras Presidency	C	220	312	74	28	3				1	1						
	D	154	182	46	21	2					1						
Rangoon	C	2	2		1	1				1			1		1		
	D	1	1		1	1				1			1		1		
Plague-infected rats		2	4	8	7	1	3			1	1	3	2		3		
Indo-China (see also table below): Pnompenh	C	1	7	1										1		1	
	D	1	7	4	6	2	1	1						1		1	
Iraq:																	
Baghdad	C		5	3	8		5	10	8	7	10	4	2	10	6	1	6
	D		4	2	5		2	5	1	3	4	2		1	4	1	3
Maudhan	C												2				
Madagascar (see also table below): Tamatave	C	2	9														
Morocco	C	19	13														
	D	8	4														
Nigeria: Lagos	C	5	1			2	2	1									
	D	5	1			2	2	1									
Plague-infected rats		5				3	3										
Peru (see table below).																	
Senegal (see table below).																	
Siam	C		4	18	31	1				1							
	D		2	14	7	1				1							
Bangkok	C	3	8	6	29												
	D	3	8	5	6												
Nagara Rajsima	C	17	9	7	1												
	D	10	10	6													
Syria: Beirut	C	1	1	1													
Tripolitania	C		8	1	1												
	D		3														
Tunisia: Tunis	C	13	1	14	10	5	7		4	7		8	1				
	D			7	4	4	2		2	3							
Union of Socialist Soviet Republics:																	
Gouranduz	D		28														
Transcaucasia—Karabakh	C		6														
Union of South Africa:																	
Cape Province	C					2	1										
Orange Free State	C	2	P	1	6	1	1					1					
	D	2		1	1	1	1										
On vessel: S. S. Marionga. Thermiotis at Avonmouth	C	1															

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

PLAGUE—Continued

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

Place		Jan., 1931	Feb., 1931	Mar., 1931	Apr., 1931	May, 1931	June, 1931
British East Africa (see also table above):							
Kenya	C	69	21	7	345	209	
Indo-China (see also table above)	C			4	2		1
Madagascar (see also table above):							
Ambositra Province	C	100	92	70	30		
	D	96	88	66	29		
Antisirabe Province	C	66	84	83	48		
	D	57	79	74	47		
Miarinarivo Province	C	28	31	19	6		
	D	26	29	19	6		
Moramanga Province	C	7	7	1			
	D	5	7	1			
Tananarive Province	C	92	145	90	41		
	D	89	139	81	40		
Peru	C	29	12				
	D	8	6				
Senegal:							
Baol [1]	C					4	
	D					3	
Dakar [1]	C				2	63	64
	D				1	49	56
Louga [1]	C			14	1	5	
	D			6		2	
Rufisque [1]	C		2			1	2
Thies [1]	C						12
	D						3
Tivaouane [1]	C				4	19	3
	D					11	2

[1] Reports incomplete.

SMALLPOX

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

Place		Dec. 14, 1930–Jan. 10, 1931	Jan. 11–Feb. 7, 1931	Feb. 8–Mar. 7, 1931	Mar. 8–Apr. 4, 1931	Week ended— April, 1931			May, 1931					June, 1931			
						11	18	25	2	9	16	23	30	6	13	20	27
Algeria:																	
Algiers	C	1	1	1	2		2					1				1	
Bone	C		1														
Constantine	C				1					1							
Arabia: Aden	C		1	1													
Belgian Congo	C	79	50														
Belgium	C			1													
Brazil: Porto Alegre (alastrim)	C		3	7	49	20	19	8	6	2	4	7					
	D			1	1												

British East Africa (see also table below):																	
Tanganyika	C	84	70	91	8												
	D	4	5	13	3												
British South Africa: Southern Rhodesia	C	18	13														
Canada:																	
Alberta	C	19	7	1													
British Columbia	C	3	2	8													
Manitoba	C		1	1													
Winnipeg	C	1		1							4						
Nova Scotia	C		1		1												
Ontario	C	17	49	29	9	4		6	7	17	5		3		4	3	14
Kingston	C	6	1	1				2	3								
North Bay	C	2		1													
Ottawa	C	2	3	1												1	
Sault Ste. Marie	C	1	30	2		3	1				1						
Toronto	C				2		4			1						1	
Quebec	C		2														
Saskatchewan	C		38	63	58	5	16	3	22	7	15	18	8	7	16	18	13
Regina	C			1	2			2		2							
Canary Islands: Las Palmas	C				1												
Chile: Chanaral	C												1				
China:																	
Amoy	C				1				2	2	1	1	2	1	2		
	D				1				1	1		1	1	1	1		
Canton	C			3	7	1	2	1				1	2			1	
Chungking	C	2															
Foochow	C	P	P	P	P	P			P				P				
Hong Kong	C	1	1	9	2		1	2					1				
	D			3	2			1		1			1				
Manchuria—																	
Harbin	C		1	4	2					1	1		1				
Kwantung—Dairen	C	1			2			1	1	1			1				
Nanking	C	P	P	P	P	P	P	P	P	P	P	P					
Shanghai—																	
Foreigners only	C	14	12	16	6	2	1	2	2	1	4	1	1	2		2	
Including natives	D	11	13	14	10	2	7	4	5	1		3	3	1	5	4	3
Swatow	D	5	7	13	26	2											
Tientsin	C		1							2							
Chosen (see table below).																	
Colombia: Cali	D									1							
Dutch East Indies:																	
Batavia and West Java	C	4	29	2	1						1						
	D	2	2	1													
East Java and Madura	C												1				
Finland	C						1										
France (see table below).																	
Great Britain:																	
England and Wales	C	665	958	745	795	177	163	212	192	186	166	111	107	83	94	62	
Bradford	C	1	4	1	2	1		1	4	1	3	1	3			5	
Leeds	C	2			1		1	1		1		1					
London	C	161	140	98	147	51	39	84	53	66	44	37	36	25	50	31	

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

SMALLPOX—Continued

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

Place		Dec. 14, 1930–Jan. 10, 1931	Jan. 11–Feb. 7, 1931	Feb. 8–Mar. 7, 1931	Mar. 8–Apr. 4, 1931	Week ended— April, 1931			May, 1931					June, 1931			
						11	18	25	2	9	16	23	30	6	13	20	27
Great Britain—Continued.																	
England and Wales—Continued.																	
London and Great Towns	C	560	693	683	554	142	126	162	128	139	108	84	72	57	84	49	
	D			1		1		1						1			
Sheffield	C		3	32	10	4	2	1									
Stoke-on-Trent	C		1	1													
Greece (see table below).																	
Honduras:																	
Amapala	C			1													
Ocotopeque and Gracias districts	C			P													
Puerto Castilla	C	4	11	3													
Tegucigalpa	C							1									
Tela	C					1											
India	C	5,623	9,623	12,222	11,791	3,980	3,749	3,468	3,068	3,422	2,836						
	D	1,381	2,245	2,660	2,261	807	684	680	752	709	572						
Bassein	C												1				
Bombay	C	2	7	6	10	2	2	1	3	3		6	1		2		
	D	2	1	3	4	1			4	1	1	1	1		1		
Calcutta	C	59	143	251	283	101	60	61	65	24	30	19	16	14	19	14	
	D	40	100	188	203	78	42	50	54	18	25	17	15	12	18	11	
Cochin	C	15	29	59	46	10	11	12	6	3							
	D	1		3													
Karachi	C		3	4	4		5		1							2	
	D		2		2											1	
Madras	C	4	16	8	22	12	4	1	2	1	3	3	1			1	
	D			1	3	2	1	1	1		1	5					
Moulmein	C		2														
Negapatam	C					1	1		1							2	
Rangoon	C			4	3	2	2	1	6	7	5		1		1	4	
	D				1				1	2	1	1	1		1		
Vizagapatam	C		1	8	2	2	2	4	2			5	1	2	1		
	D			2	1	1		1				1			1		

India (French):																	
Chandernagor	C	5	9	12	14	3	1	4	2	3		4					
	D	3	1	1	2	3	1	2	1	3		2					
Karikal	C	3	5	19	3		1	1	2	1	1	1	1	1			
	D	2	4	18			1		2	1	1	1	1	1			
Pondicherry Province	C	34	45	19	14	3			3	1	2	7	1	3	2	1	
	D	32	45	19	14	3	3		3	1	2	7	1	3	2	1	
India (Portuguese)	C	4	5	14	8		19	2				3					
	D			3	3		4	2				1					
Indo-China (see also table below):																	
Pnompenh	C	2	1		1							1		2			
	D		1									1					
Saigon and Cholon	C		6	4	8	1					1		1				
	D		4	1	8	1					1						
Iraq:																	
Baghdad	C			9				1	1			1	2		1		
	D												2				
Basrah	C												2		1		
Mosul Liwa	C	1	3	5													
	D			1													
Ivory Coast (see table below).																	
Japan:																	
Kobe	C			2													
Taiwan	C		1														
Mexico (see also table below):																	
Jalisco (State)—Guadalajara	D		1		1				1	1		1			1		
Mexico City and surrounding territory	C	10		23	33	17	9	11	6	4	10	10	21	5	4		
	D	6	1	8	22	4	6	4		4	3	2	2	4	3		
Monterrey	C													1			
Torreon	C						1				1					1	2
	D						2									1	1
Vera Cruz	C			3	2		1		1	1							
Morocco (see table below).																	
Nicaragua: Porto Cabezas	C	2															
Nigeria: Lagos	C		2		2												
Panama Canal Zone	C																
Poland	C	25		1									3	1	1		
Portugal: Lisbon	C	72	103	40	52	8	18	11	19	19	14	16	18	5	17	12	
Siam	C	1	4	2				1				3					
	D	1															
Spain	C	P	P	P	P												
Straits Settlements	C	6	7	2	4	1		1									
	D	3	1	1	1	1	1	1									
Sudan (Anglo-Egyptian)	C	64	11	97	8				3		3		1				
	D	6	7	10	2								1				
Sudan (French) (see table below).																	
Syria (see table below).																	
Tunisia: Tunis	C	17	8		4												
Turkey (see table below).																	
Union of South Africa:																	
Cape Province	C	P	P	P	P	P	P	P		P	P						
Orange Free State	C		P	P	P	P	P	P		P	P	P					
Transvaal	C	P	P	P	P												

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

SMALLPOX—Continued

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

Place		Dec. 14, 1930–Jan. 10, 1931	Jan. 11–Feb. 7, 1931	Feb. 8–Mar. 7, 1931	Mar. 8–Apr. 4, 1931	Week ended— April, 1931			May, 1931					June, 1931			
						11	18	25	2	9	16	23	30	6	13	20	27
Upper Volta	C	4		18	3		3			1	2		85	11		1	
	D	2			1								1				
On vessel:																	
S. S. Clan Mactoggart at Suez	C			2													
S. S. Muncaster Castle at Manila from Hong Kong	C	1															
S. S. Mahteran at Suez from Calcutta	C		1														
S. S. Clan Buchanan at Suez	C			2													
S. S. Rotterdam at Naples from Venice	C				1												
S. S. Clan McTavish at Manila from Chittagong	C						1										
S. S. Benevue at Sydney from Shanghai	C		1														
S. S. Clan MacBrayne at Cochin	C			1													
S. S. Chilka at Rangoon	C			1													
S. S. Taif (pilgrim ship) at Suakin from Jeddah	C								1								
S. S. Talodi at Soakim	C										1						

Place		December, 1931	January, 1931			February, 1931			March, 1931			April, 1931			May, 1931		
			1–10	11–20	21–31	1–10	11–20	21–28	1–10	11–20	21–31	1–10	11–20	21–30	1–10	11–20	21–31
Indo-China (see also table above)	C	61	47	48	46	95	46	27	125		139	100				17	41
Ivory Coast	C	9															
Sudan (French)	C	139							4		P						
	D	20															
Syria: Beirut	C			1													

Place		Dec., 1930	Jan., 1931	Feb., 1931	Mar., 1931	Apr., 1931	May, 1931
Chosen	C		1		11		
	D		1		3		
France	C		4	16	15		
Greece	C	4		4			3

Place		Dec., 1930	Jan., 1931	Feb., 1931	Mar., 1931	Apr., 1931	May, 1931
Mexico (see also table above)	D	1		3		1	1
Morocco	C	25		4	6	7	49
Turkey	C	116	63	37	1		9
	D	9	7	6			

TYPHUS FEVER

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

Place		Dec. 14, 1930–Jan. 10, 1931	Jan. 11–Feb. 7, 1931	Feb. 8–Mar. 7, 1931	Week ended— March, 1931			April, 1931				May, 1931					June, 1931		
					14	21	28	4	11	18	25	2	9	16	23	30	6	13	20
Algeria:																			
Algiers	C			2			3				2	1	3		1	3	4	4	
Constantine Department	C	6	31	4		1		2	2		6	1	8	3	5	6	6	3	1
Oran	C		3	1							1					2	2		
Australia, Western	C	3						1					1						
Bulgaria	C	1	13	5				9		26	4			5	8	3	11		
	D							2		3				1		3	2		
Chile: Valparaiso	D			1															
China:																			
Canton	C		2		1														
Manchuria—Harbin	C		3	5			3				8								
Shanghai	C		2																
Tientsin	C								1	1									
Chosen (see table below).																			
Czechoslovakia (see table below).																			
Egypt:																			
Alexandria	C									1								1	1
	D																		
Beheira Province	C	1							3	1									
	D	1							2										
Cairo	C	1	1																
Port Said	C		1																
Eritrea: Asmara	C				1														
Great Britain: Scotland	C		1																
Fife County	C															1			
Glasgow	C		2																
	D		1																
Greece (see table below).																			
Guatemala.[1]																			
Iraq: Baghdad	C			5	1		1						2						
	D			1									2						
Irish Free State:																			
Cork County—Skibbereen	C																	1	
Kerry County—Dingle	C												1						
Mayo County—Belmullet	C									1									

[1] On Feb. 27, 1931, the Director General of Public Health of Guatemala reported an unusual outbreak of typhus fever in a small village in Guatemala.

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

TYPHUS FEVER—Continued

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

Place		Dec. 14, 1930–Jan. 10, 1931	Jan. 11–Feb. 7, 1931	Feb. 8–Mar. 7, 1931	Week ended— March, 1931			April, 1931				May, 1931					June, 1931		
					14	21	28	4	11	18	25	2	9	16	23	30	6	13	20
Latvia (see table below).																			
Lithuania (see table below).																			
Mexico (see also table below):																			
Durango	D		1																
Mexico City, including municipalities in Federal District	C	12	39	35	46	66	73	31	67	34	38	31	16	27	17	15	7	12	
	D	10	34	16	20	13	31	20	18	7	17	14	9	7	7	10	4	4	
San Luis Potosi	D			5	1	1	2	1	1	2					1	1			
Morocco	C	8	8	28	2	2	3			1		12		13	29			31	
	D		2	1								1		2	2			2	
Palestine	C	4	2	3	2	1	1	1	1	2		2	2	1	1			2	3
Panama Canal Zone—Balboa	C													1					
Paraguay: Asuncion	D		4	1	1														
Poland	C	63	106	189	62	58	85	82	93	176	140	129	92	81	58	67		48	
	D	3	8	19	4		7	4	8	7	6	7	6	4	5	3		2	
Portugal: Oporto	C		1																
Rumania	C	113	193	152	55	53	52	54	70				63	52	54				
	D	5	16	24	4	5	3	4	8				10	5	3				
Syria	C													1	3				
Tunisia:																			
Sbeitla, vicinity of	C							2	2			10							
	D							1											
Sfax	C						2												
Tunis	C		16	18	5	2	7		2		1	10	12	9	8			64	9
	D												1	2					
Turkey (see table below).																			
Union of South Africa:																			
Cape Province	C	P	P	P	1		P	P	P	P	P		P	P	P				
Municipality of East London	C	3	3				P	P											
Natal	C	P	P	P		1	P	P	P	P	P	P	P		P				
Orange Free State	C	P	P	P	P				P	P	P			P	P				
Transvaal	C	P	P	P	P		P	P	P	P	P		P	P	P				
Yugoslavia (see table below).																			

Place		Dec., 1930	Jan., 1931	Feb., 1931	Mar., 1931	Apr., 1931	May, 1931
Chosen: Seoul	C	1	1		3	4	
Czechoslovakia	C	24	60	26		5	
Greece	C	10	10	17	8	22	6
	D		2	2	1	3	
Latvia	C			12			
Lithuania	C	6	26	3	22	32	10
	D	3	3	1	2	3	
Mexico (see also table above)	D	47					
Turkey	C	2	17	18	15		3
Yugoslavia	C	1	20	12	10	43	14
	D	1	2		1	5	

YELLOW FEVER

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

Place		Dec. 14, 1930–Jan. 10, 1931	Jan. 11–Feb. 7, 1931	Feb. 8–Mar. 7, 1931	Week ended— March, 1931			April, 1931				May, 1931					June, 1931	
					14	21	28	4	11	18	25	2	9	16	23	30	6	13
Brazil:																		
Bahia State	C				1	1												
Ceara State	C		1		2							2		1			1	
	D		1									2		1				
Minas Geraes State	C					2			1		2	2	1		1			
	D					1					1	1	1					
Rio de Janeiro State	C					1								1	1			
	D			1	1	1												
Cambucy	C		3	2	1													
	D		3	1														
Friburgo (imported)	C		1															
Padua	C		2	1														
	D		2	1														
Sergipe State	C																	1
British Cameroons: Mamfe	C													3				
	D													2				