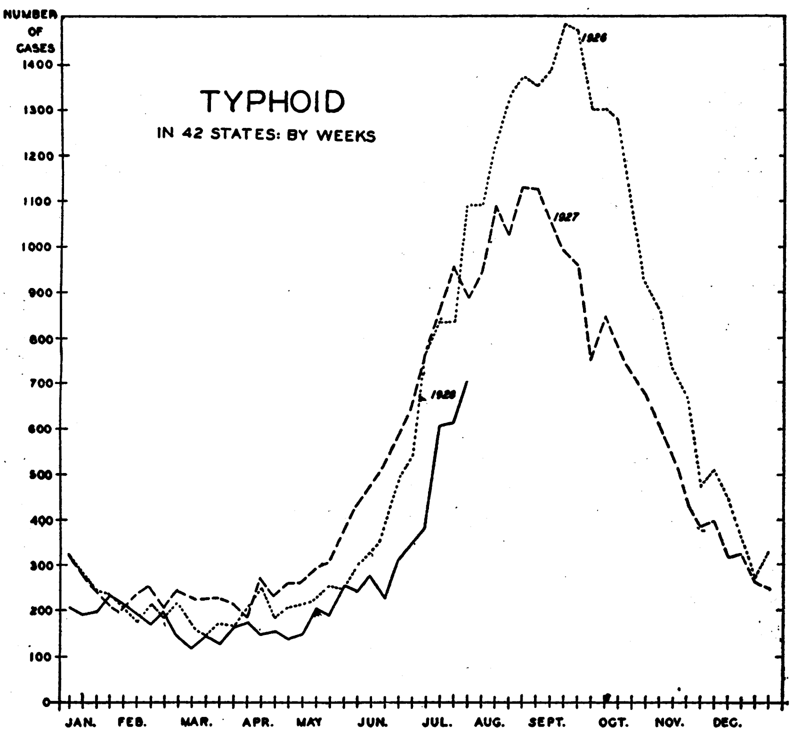
CONTENTS

PUBLIC HEALTH REPORTS

VOL. 43 SEPTEMBER 7, 1928 NO. 36

PREVALENCE OF TYPHOID FEVER IN THE UNITED STATES

Typhoid fever is one of the few diseases which are usually most prevalent during the summer months. This year the number of



cases of typhoid fever in the United States has been unusually small. The following table gives a comparison of the numbers of cases reported by 41 States for the eight weeks from July 1 to August 25, 1928, and the corresponding period of the years 1927 and 1926:

Numbers of cases of typhoid fever reported

Week ended—	1928	Corresponding week	
		1927	1926
July 7, 1928	389	785	774
July 14, 1928	608	870	835
July 21, 1928	614	959	831
July 28, 1928	705	890	1,086
Aug. 4, 1928	791	946	1,089
Aug. 11, 1928	910	1,088	1,215
Aug. 18, 1928	938	1,022	1,326
Aug. 25, 1928	866	1,130	1,371
Total, 8 weeks	5,821	7,690	8,527

The accompanying graph shows the number of cases reported by 41 States for the years 1926 to 1928.

HEALTH HAZARDS IN CHROMIUM PLATING[1]

By J. J. Bloomfield, *Assistant Physical Chemist, United States Public Health Service,* and William Blum, *Chemist, United States Bureau of Standards*

I. INTRODUCTION

The increase in occupational diseases in the past few years has been associated, to a large extent, with changes in the methods of industry. The application of our growing knowledge of chemistry to industrial processes has been the means of introducing certain new hazards to health, since in many instances the chemicals involved in the new processes are of such a nature as to constitute a source of injury unless precautionary measures are exercised. As an outstanding example of such rather new chemical hazards, we may cite the extensive use of benzol in industry and the pernicious effect of this substance on the health of individuals exposed to even low concentrations of its vapors. Recently, however, there has been a tendency on the part of industry to recognize the existence of certain hazards and to take steps for diminishing them. The present study presents an example of the increased interest manifested with respect to such hazards.

As a result of the research carried out by various laboratories, including the United States Bureau of Standards, on the electrodeposition of chromium from chromic acid baths, chromium plating

[1] Read at the Institute of Chemistry at Northwestern University, Aug. 9, 1928.

has now come into commercial operation, and tremendous interest and activity have developed in this field. It has generally been recognized that the spray of chromic acid produced during the process of plating may be injurious to the workers, and in most plants employers have attempted to ameliorate conditions by the installation of local exhaust ventilation. Because of the growth of chromium plating in certain industries, many inquiries have been addressed to the United States Bureau of Standards and the United States Public Health Service concerning the possible health hazards involved in this process and the preventive measures to be followed in eliminating them. For this reason it was decided to conduct a preliminary investigation in order to ascertain the extent of the hazard involved in chromium plating and the steps which have been or might be taken to alleviate conditions. It is believed that this study has yielded sufficient data to warrant certain tentative recommendations. If future conditions should justify it, a more exhaustive investigation of the subject may be undertaken subsequently.

Practically all of the chromium-plating baths now used, have chromic acid as their principal constituent, which may be present in concentrations from 200 to 500 g/L (27 to 67 oz./gal.). In addition there are present small amounts of some other anion, such as the sulphate ion, introduced either as sulphuric acid or a sulphate. Variable amounts of trivalent chromium and of trivalent iron (derived from iron tanks or anodes) are likely to be present in the used baths, either in true or colloidal solution. Lead anodes are generally employed, which produce at least small amounts of lead chromate and lead peroxide upon their surface, and possibly in suspension in the baths.

Oxygen is evolved on the insoluble anodes and considerable hydrogen is liberated on the cathodes. These gases tend to carry into the surrounding air a fine mist or spray of the liquid present in the tank. As preliminary observations indicated that the only constituent of this spray that is likely to be injurious is the chromic acid, the investigation resolved itself into a study of the concentrations of chromic acid in the air above the tanks, and their effects upon the health of the operators.

II. EFFECT OF CHROMIUM COMPOUNDS ON HEALTH

The injuries caused by chromates have been given considerable attention during the past 100 years. Just as in phosphorus poisoning, the lesions develop in places where they are easily detected and, therefore, from early days they have attracted the attention of physicians. Dr. Alice Hamilton, in her book, Industrial Poisons in the United States (1), gives an excellent summary of this type of poisoning, and much of the following has been taken from that book.

In 1827, Cumming, of Glasgow (2), wrote about "chrome holes"—i. e., ulcers which develop chiefly on the hands and arms of bichromate workers. Papules appear first, which change to pustules, and finally to deep and penetrating ulcers or "sloughs." There is a consensus of medical opinion (3) that bichromate solutions do not attack the unbroken skin. The slightest break in continuity, however, especially where the skin is thin, as over the knuckles or between the fingers, suffices to start the destructive process which, once it has begun, will penetrate gradually through the soft tissues unless means are taken to prevent further contact with the solution. The ulcer is characteristically sluggish, the edges are indurated markedly and underlined, clear-cut, looking as if punched out, hence the name "chrome hole." The center has a scab resting on the slough, and the floor under this is gray.

A very common site for this ulcerated process is on the septum of the nose. The cartilaginous framework of the nose consists of five pieces—the two upper and the two lower lateral cartilages and the cartilage of the septum. The limitation of the perforation to the cartilage of the septum is accounted for by the fact that the mucous membrane covering it is adherent, forming the perichondrium, and is far less vascular than the mucous membrane lining the rest of the nasal fossæ. Once the mucous membrane is destroyed, the blood supply to the cartilage is cut off, and necrosis ensues. The ulceration having progressed upward as far as the junction of the septum with the ethmoid and backward to the vomer, becomes arrested. Healing then takes place, the bone never being attacked, and the cicatrix usually becomes covered with an echthymatous crust of mucus. In no instance is the anterior of the lower border of the septum destroyed. Consequently, the rigidity of the parts is maintained, and deformity, so prominent in other ulcerated processes attacking the nose, is absent. The onset of the morbid process is ushered in by sneezing and the ordinary symptoms of nasal catarrh. The pain accompanying the ulceration appears to be insignificant; at any rate it is never severe enough to necessitate absence from work or to call for medical treatment. The only apparent inconvenience which results is the formation of plugs of mucus in the nasal passages. Other sites where ulcers may appear are the roots of the finger nails, the knuckles, and the eyelids. Ulcers may form also on the edge of the nostrils, on the toes, if the shoes become soaked with chromic acid or chromates, and, rarely, in the throat. The ulceration is slow, gradual, and not very painful.

Bécourt and Chevallier, in 1851 (4), apparently without any knowledge of Cumming's paper, noted what was to them a new disease of the skin, occurring in some chrome works near Paris.

They wrote to physicians in other countries asking if such things had ever been seen elsewhere and received an answer from Isaac Tyson of Baltimore, in 1852, confirming their observations and saying that the Maryland workmen protected themselves by tying a wet sponge over nose and mouth. Ducatel (5), of the University of Maryland, added details as to the character of chrome ulcers and said that Baer, of Baltimore, had seen 20 cases, caused by chromates, which healed only when the work was given up. A little later, in 1869, Delpech (6), showed that not only the bichromates but the chromates could cause ulceration and that the ulcers might have their seat on the conjunctiva. Bronchial catarrh was also noted by Delpech, but as a rarer symptom.

Wutzdorff (5) says that similar lesions were found in 1889 by the German factory inspectors, among workers in the newly opened chromate works in Griesheim. A good deal of attention was directed to the subject during the military maneuvers in 1894, when 84 men in Anhalt, who were called to the colors, were found to be unfitted for service because of chrome ulcers. Leymann (7) examined 722 workmen who were in contact with chromates and found ulcers and perforation of the septum in 253, or 35 per cent; respiratory disease in 8.8 per cent; and digestive disorders in 12.3 per cent.

In 1911, K. B. Lehmann and R. Fischer made a thorough study of the use of chromates in German industry (8). They found these compounds to be comparatively harmless. The form of poisoning which occurs is local only, and any systemic symptoms are extremely rare. Even the local lesions were not then either frequent or severe. Fischer found that sickness with loss of time affected only 8.5 per cent of the force per year. Perforation of the septum was common but not disabling.

In 1902, in England, Legge (9) found perforation of the septum in 71.6 per cent of 176 workmen, and ulceration without perforation in 11.3 per cent. Some men seem to be immune, while others develop ulcers after 7 weeks (1 case) or 2 to 3 months (2 cases). In 1916, Mitchell (10) presented figures which showed a great improvement in English chrome works; for an examination carried out during three years, and covering 846 men, revealed only 175 cases of chrome sores, or in 20 per cent. Mitchell believes that healing can be brought about in three weeks under proper treatment.

The latest article on chromate poisoning comes from Italy. In 1919, Ranelletti (11) described cases among workers in a chemical plant where large quantities of potassium bichromate were used. Among 69 operatives he saw 38 with ulceration of the nasal septum, six of them having complete perforation. There was first an area of hyperemia, then a yellowish gray spot appeared, and here excavation began into the mucosa and finally through the cartilage, the opening being round or oval, smooth, and whitish yellow. There was never any attempt at repair, no hyperemic reaction; the loss of tissue was permanent. The process was painless and the victim was often unaware that he had a perforated septum, although a catarrhal rhinitis may have preceded it. Such a rhinitis usually occurred after a month or two of exposure, and in a few more weeks ulceration set in.

There is very little in the literature about systemic poisoning from the chromates. Leymann believes that such does occur and describes a case of nephritis in a man who inhaled much chromate dust. Gilman Thompson discusses the subject and describes some instances from his own practice. On the other hand, Lehmann fed animals for months with doses far larger than any workman could ingest, and there was absolutely no effect to be found on the kidneys or the lungs.

Preventive measures which have been suggested in the chromate industry are the use of inclosed machines for the grinding of raw materials, and efficient local exhaust ventilation. Where dust or spray is evolved in the process, efficient ventilating systems are very necessary. Respirators, impermeable gloves, anointing the face, hands, and nose with vaseline, proper working suits and caps, frequent baths, and changes of clothing upon cessation of work are recommended. Most important is frequent medical inspection with prompt treatment of the slightest skin affections as soon as they occur. Without such medical inspection it does not seem possible to prevent the occurrence of chrome ulcers and their development.

From the preceding discussion of the literature on chromium poisoning, it is rather obvious that any injury arising from contact with chromic acid solution or spray does not develop into a constitutional disease, and especially does not induce any disease of the kidneys. Ulceration and perforation of the nasal septum, as well as the formation of chrome holes on other parts of the body, are not in themselves a grave matter and very seldom are severe enough to necessitate absence from work. However, these chrome lesions are very slow to heal and at times impair the efficiency of the worker and serve to lower the general morale. Of late years injury from chromium compounds has been recognized as an occupational disease by several States in this country, and as such is compensable. Provisions for the prevention of chrome ulceration and other diseases caused by contact with chromates are specified in Austria, Germany, and England. Hence it was felt that any additional data that could be obtained which would shed some light on the extent of the hazards in the chromium-plating industry and which would yield definite information regarding the best remedial measures to be followed would be of great value and interest at this time.

III. METHODS USED IN THE PRESENT STUDY

The plan of this study was to make a brief investigation of the conditions in a few representative plants engaged in chromium plating to determine the actual concentrations of chromic acid in the air above the plating tanks, and to find, by means of physical examination, the effect of this quantity of chromic acid on the condition of the workers. In the time available, only six plants, employing 27 workers as chromium platers, were investigated. However, the number of persons exposed to the acid spray was about 100, since other persons necessary for the work of plating were housed in the chromium plating room and hence were exposed in some degree to the same hazards. In each plant a workroom survey form, primarily designed for this study, was filled in. From the copy of this form, given in the appendix, it may be observed that provision is made for noting all of the salient features of the workroom which might have a bearing on the problem. On the back of this form, space is provided for recording the results of the ventilation measurements and of the determinations of chromic acid.

(*a*) *Air velocity.*—In measuring the exhaust ventilation, a vane anemometer and a kata thermometer were utilized. In most instances the exhaust duct used in connection with the removal of the chromic acid mist was only an inch or two (2.5 to 5 centimeters) in width, while the smallest vane anemometer available is one with a circular face about 3 inches (7.5 centimeters) in diameter. For this reason the anemometer was used only to check the kata thermometer observations by determining with it the total volume of air exhausted by the suction fan at its outlet side. In all instances the volume of air issuing on the pressure side of the fan, as computed from the anemometer readings, checked closely the volume of air exhausted at the ventilating ducts as computed from the kata thermometer readings.

A detailed description of the nature and use of the kata thermometer (12) is given in the appendix. This instrument is a special form of thermometer so designed as to enable the time required for it to fall from one temperature to another to be accurately observed. From the time so required the rate of cooling of the bulb per unit area per second can be calculated by the use of a single factor (the so-called "kata factor"), which depends on the size and shape of the bulb and is marked on each instrument. In turn, the rate of cooling gives a direct indication of the cooling power of the surrounding air. The cooling power of the air as measured by the dry kata thermometer (usually abbreviated into *dry kata cooling power*) depends upon (*a*) the difference in temperature between the thermometer and the surrounding air, and (*b*) the rate of movement of the air ("air velocity"). Hence it is possible, by the use of an appropriate formula, to calculate the velocity of the surrounding air when the cooling power of the air and its temperature have been measured.

(*b*) *Air sampling.*—Sampling the atmosphere for chromic acid spray was accomplished by the impinger apparatus (14), depicted in Figure 1. In this apparatus the air is drawn, by any appropriate

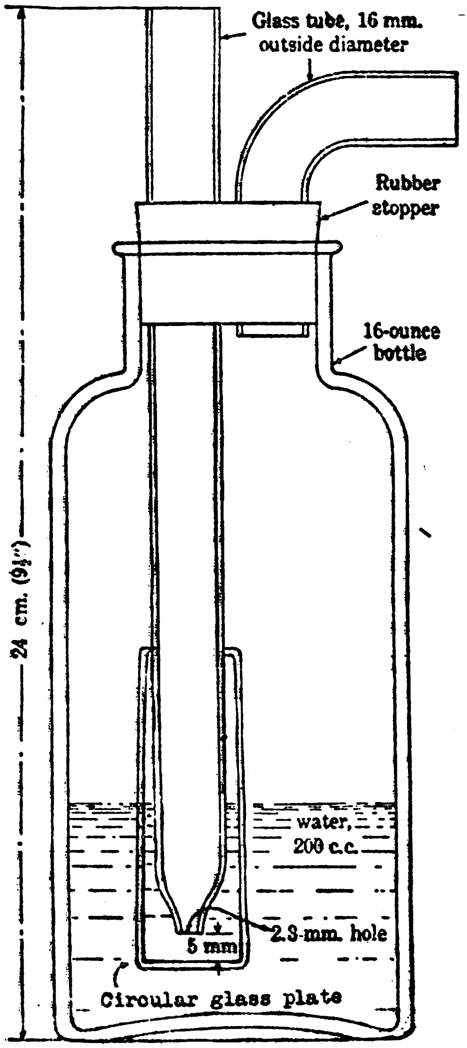


FIG. 1.—Details of impinger with glass tube and nozzle

source of suction, through a specified aperture, in such a way that it impinges with a high velocity against a glass plate which is supported by glass rods at a fixed distance from the aperture. The bottle may contain water or any other suitable absorbent solution. For these measurements it contained 200 c. c. of normal sodium hydroxide solution. The impinging tube and plate were of one piece. It and the sampling bottles were made of Pyrex glass. The rubber stoppers were coated with paraffin to preclude the possibility of contaminating the sample by the action of chromic acid on the rubber. The air samples were of various sizes, usually between 0.5 and 5 cubic meters, depending on the concentration of chromic acid encountered. They were taken, in nearly all instances, above the plating tanks, near the point where the operator stands, and at breathing level.

Prior to the adoption of the impinger apparatus for sampling purposes, another device that is used extensively for gas absorption was tried, and comparative tests of the two devices were made. This gas-absorption device sampled air at a rate of 1 liter a minute; close contact of the air and alkali solution was obtained by the passage of the air through a sintered-glass plate at the bottom of the absorption flask. The impinger apparatus, when sampling air at 35 liters a minute, gave results that were concordant with those by the other method, and as the impinger enables one to sample large volumes of air in a short period of time, it is the device best adapted for field study. In order to satisfy ourselves still further that, with this high rate of flow—namely, 35 liters a minute—all the chromic acid mist in the air sample was absorbed, tests were made with two impinger bottles in series. Analyses of the solutions showed no trace of chromic acid in the second bottle.

Any suitable source of suction may be employed. In our tests this was provided by a No. 1 Hancock air ejector, operated by compressed air at a pressure of about 25 pounds per square inch (1.8 kg./cm.^{2}). The volume of air was computed from readings of a vacuum gauge attached to a T tube between the ejector and the impinger. Before these tests, the apparatus was calibrated against a dry gas meter.

(*c*) *Air analysis.*—The determinations of the absorbed chromic acid were made by the usual iodometric method. Potassium iodide solution was added to 50 c. c. of the alkaline solution from the absorption bottle. It was then acidified with hydrochloric acid and the liberated iodine was titrated with approximately 0.01 N sodium thiosulphate, with starch as an indicator. The thiosulphate solution was standardized against potassium dichromate. As an additional check, in those instances in which the amount of chromic acid in the sample was so small as to make the titration of doubtful accuracy, the hematoxylin method (15) was used. In this method a 5-c. c. portion of the alkaline absorbent was employed. One drop of methyl red was added, and the solution was acidified with acetic acid to a faint yellow (about pH 6). One drop of a 1 per cent aqueous solution of hematoxylin was then added, and the solution was brought to boiling. A distinct violet coloration appeared if even traces of chromic acid were present. By comparison with color standards, freshly prepared from a stock bichromate solution, it was possible to detect and estimate as little as 0.01 mg. CrO_3 in a 5-c. c. sample of the solution. The results agreed closely with those secured by the iodometric method in those samples to which both methods could be applied. The concentration of chromic acid was expressed in milligrams per 10 cubic meters. (This volume represents approximately the amount of air breathed by a worker in eight hours.)

(*d*) *Physical examination of operators.*—In connection with this investigation, 23 workers were examined by Asst. Surg. R. C. Green, of the United States Public Health Service. The data were recorded on a form shown in the appendix. This form consists of two pages. The first is devoted to an industrial or occupational history of the worker, including his previous and present employment, in order to ascertain the bearing of his former employment on his present physical condition. On the second page are recorded the personal history and physical examination data. As shown in the preceding review of the literature, the most common site of injury is the nasal septum. Ulceration of other parts of the body also occurs if the chromic acid comes in contact with broken skin. For these reasons the nose and exposed parts of the body were especially observed. Examinations of the throats and lungs were also made in order to learn whether any injury had been done to the upper respiratory tract.

IV. RESULTS OF SURVEY

(*a*) *Methods of ventilation.*—In practically all of the plating rooms visited the method of removing the acid mist was by drawing air laterally across the tanks. Previous experience has shown that, for plating tanks, vertical ventilation as employed in most chemical hoods is ineffective, as it draws the spray directly past the face of the operator who is working over the tank.

Table 1.—*Summary of ventilation in chromium plating plants*

Plant code	Number of chromium-plating tanks	Size of plating tanks	Distance of CrO_3 solution from top of tank	Type of ventilation in use	Fan-operation data	Average air velocity at duct in f. p. m.	Remarks
			Inches				
A	1	16×12×12 inches deep	2	Duct 2 inches in width, 6 inches back of tank and extending full length of tank.	Sturtevant, type D, ⅛ H. P., at 1,140 R. P. M.	1,700	
B	4	27×20×20 inches deep	8	Duct 1 inch in width at back of tanks and full length of tanks.	45-inch Universal I. L. G. fan, 4 H. P., at 685 R. P. M.	2,300	
C	1	100×50×36 inches deep	4	Duct 1 inch in width all around tank; fan connections at end of tank.	No. 45 Am. blower fan, 15 H. P., at 1,755 R. P. M.	670	Fan not wide open. Solution so close to top of tank that higher velocity pulls acid into fan.
D	5	72×36×36 inches deep	3	Duct 1 inch in width all around tank; fan connection back of tank.	No. 55 Sirocco, at 1,800 R. P. M.	550	Compressed air header used occasionally to direct fumes toward exhaust duct.
E	10	72×36×36 inches deep	2	2 ducts, 1 inch in width, in center of tank.	No. 50 Am. blower, 15 H. P., at 840 R. P. M.	2,300	Duct does not quite cover entire length of tank.
F	1	66×42×36 inches deep	2	2-inch duct back of tank at false back in hood, also 9-inch circular pipe at top of hood.	No. 30 Sirocco blower, type E, 2 H. P. motor, at 1,160 R. P. M.	1,100	Pipe at top of hood pulls spray upward, while slot at back of hood pulls spray away from operative.

Table 1 presents a summary of the type and degree of ventilation encountered in the chromium plating rooms of the six plants visited. The average air velocity at the exhaust ducts under operating conditions varies from 550 to 2,300 f. p. m. (feet per minute), or 165 to 700 meters per minute. In all cases the mist was removed by means of a narrow slot, extending either the full length of the tank at the back or at other sides of the tank. In one plant compressed air was used to direct the spray toward the duct located at the back of the tank. This is not a practical procedure, since our observations indicate that, with such an arrangement, the spray of acid is usually dispersed in all directions into the room. In another plant two ventilating ducts were located in the center of the tank, pulling acid mist away from the two sides of the tank to the center—i. e., away from the operators plating at each side of the tank. Each duct was 1 inch in width and extended nearly the entire length of the tank. The air velocity was about 2,300 f. p. m. at each duct. Owing to the fact that the plating solution was too near the top of the tank in most plants, much liquid was sucked into the duct and some acid spray escaped into the room. All our observations indicate that it is very important to have the solution at least 8 inches (20 centimeters) below the top of the tank, and that the ventilating duct should be flush with the top of the tank. Such a scheme will allow the larger acid droplets to fall back into the solution, and will also give ample time for the finer spray to be directed to the exhaust duct by the movement of the air at the surface. It was very interesting to note that in one plant where the solution was near the top of the tank a small amount of chromic acid was found in the air at the worker's position, whereas in another plant, with practically the same type of ventilation and the same air velocity at the ventilating duct, but with the solution 8 inches below the top of the exhaust duct, no trace of chromic acid was present in the air.

The distance at which a given velocity of air produces effective ventilation was estimated from readings with a kata thermometer at different points. In one plant it was found that, with an initial air velocity at the duct of 2,300 f. p. m., the lateral velocity 6 inches from the duct was only 360 f. p. m., and 12 inches away it was 175 f. p. m. It is obvious, therefore, that there is a practical limit to the width of the tank that can be ventilated from a single duct. General observations indicate that for duct velocities up to 2,000 f. p. m. this width should not exceed about 18 inches.

While it is not possible from this brief study to specify in detail a system of ventilation that is adapted to any particular plant or conditions, the most important features of a satisfactory plant are illustrated in Figures 2 and 3.

(*b*) *Efficiency of ventilation.*—Table 2 presents a summary of the concentrations of chromic acid in the air at the plating tanks under

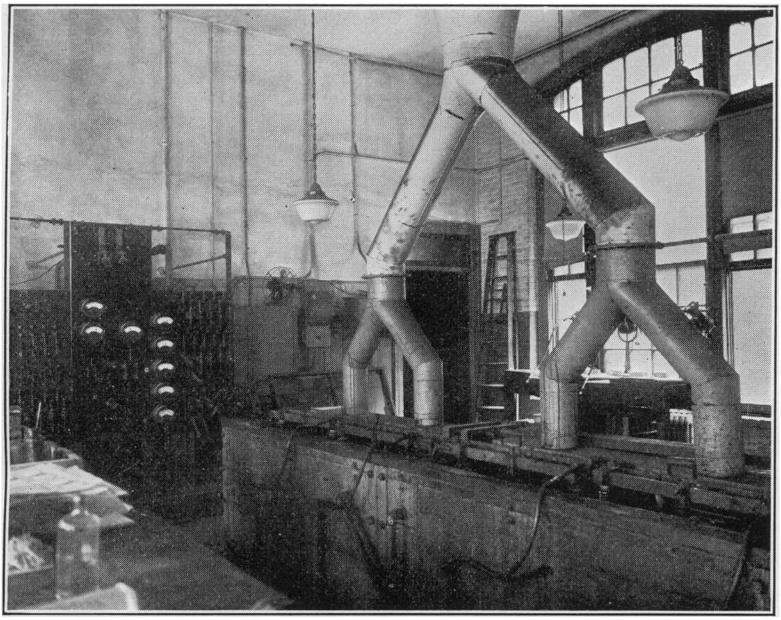


Fig. 2.—Typical ventilation system for chromium plating. A large vertical sheet-iron flue, leading to a suction fan, divides into four smaller flues, each of which is connected with a horizontal chamber with a narrow slot or duct along the upper edge of each plating tank

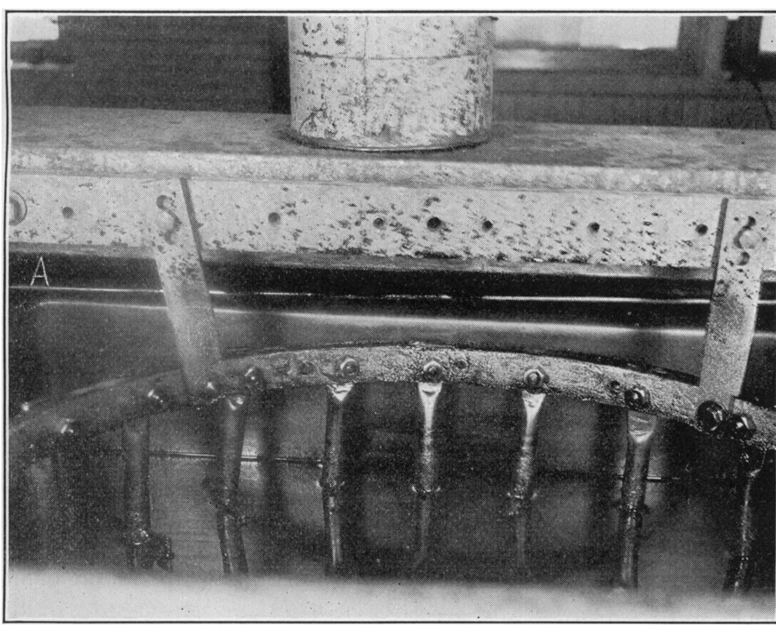


Fig. 3.—Position of ventilating duct. The duct (A) is about 1 inch wide and extends the full length of the plating tank. The solution in the latter is about 8 inches below the duct

different conditions. Although only six plants were visited, it was possible to obtain samples under widely different conditions of exhaust ventilation. This was accomplished by varying the degree of suction at the exhaust ducts, either by an adjustable blast gate or by a rheostat in series with the motor driving the fan. In such cases sampling was first done under existing operating conditions; and then, in order to study the relation between the degree of ventilation and the amount of chromic acid in the air, samples were taken under different local exhaust conditions. In all, 48 samples were obtained, but only 39 of these are recorded in Table 2. Nine samples were not included, since they represented unusual or accidental conditions.

TABLE 2.—*Chromic acid content of air during chromium plating*

Number of air samples	Current, in amperes	Current density, amperes per square foot	Average air velocity at exhaust ducts in f. p. m.	Average chromic acid concentration in milligrams per 10 cubic meters	Remarks
1	300	300	1,700	0	Plant A. Continuous plating.
2	300	300	450	25.6	
4	200	200	450	24.5	
1	100	100	450	30.7	
4	300	300	None.	69.0	
1	200	200	None.	50.0	
1	100	100	None.	53.0	
1	500	250	2,300	42.4	Plant B. Continuous plating. Raised anode acted as baffle.
1	500	250	2,300	0	
1	500	250	1,600	0	
2	500	250	610	13.2	
2	4,000	150	670	2.8	Plant C. Plating intermittent. Only about 15 minutes out of every hour. Sampling continuous, however.
1	4,000	150	150	15.0	
3	1,200	150	550	3.9	Plant B. Plating intermittent.
2	1,200	150	None.	55.7	
4	1,100	100	2,300	1.2	Plant E. Acid solution too near top of tank. Exhaust duct does not cover entire length of tank.
5	300	100	1,100	21.9	Plant F. Continuous plating. Acid solution too near top of tank. Strong counter drafts to local exhaust.
1	300	100	500	34.1	
2	300	100	----------	0	General room air away from tank. About 40 air changes an hour in room.

TABLE 3.—*Relation between air velocity, current density, and concentration of chromic acid in the air*

urrent density, amperes per square foot	Average air velocity at exhaust ducts, f. p. m.	Average concentration of chromic acid, milligrams per 10 cubic meters of air
250-300	2,300	0
	1,700	0
	1,600	0
	610	13.2
	450	25.6
	None.	69.0
100-200	670	2.8
	550	3.9
	450	25.7
	150	15.0
	None.	53.6

A better picture of the relation between the air velocity at the exhaust ducts and the concentration of acid in the air is given in Table 3 and Figure 4, which are based on the data presented in Table 2. The data indicate that there may be a relation between the current density and the amount of chromic acid present under the same conditions of ventilation. For this reason our results were divided into two parts—namely, those at a current density of 250 to 300 and those at 100 to 200 amperes per square foot of plating surface. The data are not sufficiently numerous to fit the exact shape of the curves. They indicate, however, that in the plants visited it was necessary to have a duct velocity of about 1,000 f. p. m. to remove practically all the chromic acid at the lower current densities, and a

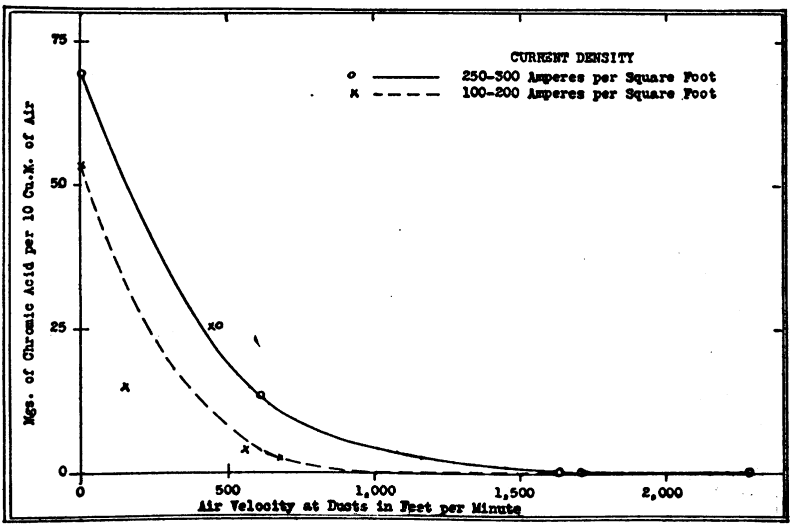


FIG. 4.—Relation between air velocity of local exhaust system and amount of chromic acid in air for different current densities

somewhat higher velocity at higher current densities. In order to insure a reasonable factor of safety, it is desirable to have a duct velocity of about 2,000 f. p. m. The results shown in Tables 2 and 3 are not always the same for practically the same degree and type of ventilation. Lower average concentrations of chromic acid were found at those tanks where plating was intermittent.

(c) *Results of physical examinations.*—Twenty-three workers, employed in six plants, were examined, in order to learn the effect of chromic acid exposure on their health. In certain instances it was possible only to approximate the extent of the chromic acid exposure of these workers, since the ventilation measured by us was not always the same as that in use at the plant throughout the worker's employment as a plater. From the workroom survey and the industrial history of the worker it was possible in most instances to make a fair approximation of the amount of acid mist to which each person was exposed daily during the time employed in the plating room. In some cases, where a worker had been but recently hired, the estimated degree of exposure was more than an approximation, since the present system of ventilation was operating at the time when the employee first commenced work in the plating room.

TABLE 4.—*Occupational history and clinical findings of workers employed in plants engaged in chromium plating*

Case No.	Occupation	Months employed in chromium plating room	Hours per day over tank	Approximate CrO_3 exposure in milligrams per 10 cubic meters	Perforated septum[1]	Ulcerated septum[1]	Inflamed mucosa[1]	Nose bleed	Chrome holes	Remarks
1	Chromium plater	6½	4	15.0	++	−	++	+	+	
2	do	20	4	28.0	++	−	+	+	+	
3	Foreman plater	7	2	25.0	−	++	++	+	−	
4	do	8½	3	25.0	−	++	++	+	−	
5	Chromium plater	3½	4	56.0	−	++	++	+	+	
6	do	¾	7	1.2	−	−	++	+	+	
7	do	¼	7	1.2	−	−	++	+	−	
8	do	7	7	1.2	−	−	++	+	−	
9	do	3	7	1.2	−	−	++	−	+	
10	do	36	4	2.0	−	−	++	−	−	
11	do	5	6	1.2	−	−	+	+	+	
12	do	¾	6	1.2	−	−	+	−	−	
13	do	12	4	28.0	−	−	−	−	−	Used vaseline in nose.
14	do	⅔	2	28.0	−	−	−	−	−	
15	Nickel plater	1½	0	(2)	------	+	+	+	−	Cyanide burns.
16	Racker	8	0	(2)	+	−	+	+	−	
17	do	¾	0	(2)	−	−	+	−	−	
18	do	¾	0	(2)	−	−	+	−	−	
19	Wiper	1¼	0	(2)	−	−	+	−	−	
20	Foreman	0	0	0	−	−	+	−	−	Work in other departments of factory.
21	do	0	0	0	−	−	+	−	−	
22	Clerk	0	0	0	−	−	−	−	−	
23	Inspector	0	0	0	−	−	+	−	−	

[1] ++ marked; + slight; − negative. [2] Unknown.

Of the 23 persons examined, 4 who were never in a plating room were selected as controls. Five other workers were examined who were not chromium platers, but were engaged in work in connection with the plating and were located 10 feet or more away from the plating tanks. Table 4 presents a summary of the occupational history and clinical findings of these 23 workers. Their length of service ranged from one week to three years, and the time spent daily over the plating tanks varied from zero to seven hours. The approximate daily exposure of the workers employed in the plating rooms varied from an amount less than 1 milligram to about 56 milligrams of chromic acid per 10 cubic meters of air. This table shows that out of 19 persons employed in the plating rooms, 3, or 16 per cent, had perforated nasal septa, the holes varying from 1 to 4 centimeters in diameter. One of the workers having a perforated septum was not a plater but was engaged as a helper some 10 feet away from the tanks. Twenty-one per cent of the workers examined had ulcerated septa, a condition which will in time lead to perforation if preventive measures are not taken at once. Forty-seven per cent of the workers had marked inflammation of the mucosa, while 42 per cent had slight inflammation. Fifty-eight per cent of the persons working in the plating rooms suffered from frequent nosebleeds, and their mucosa bled easily on touch. Of 14 workers actually engaged in plating operations, 6, or 43 per cent, had chrome holes, from 1 to 5 apiece, most of them being on the hands. This ulcerated condition is not caused by exposure to acid mist, but by contact of the broken skin with the acid solution. Only two platers showed negative results upon examination. One of these had worked about 20 days intermittently, with only about two hours a day over the tank; and the other person had taken the precautionary measures of anointing his nasal passage with vaseline and of washing his hands frequently.

It is very striking to note that those persons not engaged in chromium plating but at work not far from the tanks, and exposed to only a small amount of acid mist for but a week or two, already showed some injury to the nasal passage, the nature of which indicated that chromic acid was the causative agent. The history of each person examined yielded information which was indicative of whether any other factor might have caused the condition of the worker as revealed by our physical examination. A study of four workers not engaged in any capacity that would bring them in contact with chromic acid mist or solution, showed negative results for nasal damage or ulceration of any kind on the exposed parts of the body. Three of the four persons examined had slight inflammation of the mucosa, a condition quite common in most city dwellers, especially those inhabiting lower altitude areas.

From the foregoing discussion of the clinical findings it is rather obvious that exposure to even small amounts of acid mist for a short period of time is attended by some injury to the nasal septum and that contact with the solution produces chrome ulcers or holes on the hands and other parts of the body. Table 4 indicates that wherever adequate hygienic precautions have not been taken the persons longest in service show the most severe injury to the nasal septum and have the greatest number of chromium ulcers. It was observed during the course of the investigation that some persons were very careful not to spill any chromic acid on themselves, while others were very careless in this respect. In some rooms the floor near the plating tanks was practically dry, while in other plants the raised wooden floor was soaked with chromic acid drippings, a condition conducive to ulceration of the feet, in case rubber boots or overshoes are not worn.

Besides providing sufficient exhaust ventilation for the removal of acid mist, of the type and degree mentioned in an earlier portion of this paper, it is essential that hygienic measures should be practiced. Periodic medical examination of the workers and treatment, by the plant physician, of lesions contracted in the work are very important. Several methods of treatment are given by Kober and Hayhurst (3) in their book on Industrial Health, the chief of which consists of washing the affected parts with a 5 per cent solution of sodium bisulphite, or cleaning the injured part with hydrogen peroxide solution and treating with an ointment containing ichthyol applied under an absolutely waterproof plaster. In a recent address in Toronto to the American Electroplaters' Society, Dr. J. G. Cunningham, director of the department of industrial sanitation of the Province of Ontario, made similar recommendations and suggested the use of a dilute solution of sodium thiosulphate as a wash. Davidson (16), in a recent paper on the treatment of chemical burns, recommends the application of a few drops of ammonium polysulphide solution on the chromic acid cores, in an effort to convert the chromic acid into the less active tissue irritant, chromium hydroxide.

V. CONCLUSIONS AND RECOMMENDATIONS

Even though this survey was not extensive, the results obtained in different plants were so consistent, and agreed so well with previously recorded experiences upon the effects of chromic acid and chromates, that the following conclusions and recommendations appear warranted:

1. Natural ventilation is seldom, if ever, adequate to remove the chromic acid spray produced during chromium plating.
2. Vertical ventilation, such as is commonly used in chemical hoods, is ineffective because it draws the chromic acid spray past the face of the operator who is working over the tanks.
3. It is feasible by a properly designed system of transverse ventilation, with an adequate air velocity, to reduce the content of chromic acid to less than 1 milligram in 10 cubic meters of air.
4. Continuous daily exposure to concentrations of chromic acid greater than 1 milligram in 10 cubic meters is likely to cause definite injury to the nasal tissues of the operators.
5. The most efficient method of ventilation is to draw the air laterally across the top of the plating tanks into ducts from 1 to 2 inches wide and extending fully along one or more sides of the tank.
6. To be effective, the duct should not be required to draw the air a lateral distance of more than 18 inches. For wider tanks there should be ducts on both sides, or else two ducts in the center.

7. The level of the plating solution should be at least 8 inches below the top of the tank and the duct should be at the top of the tank.

8. For effective ventilation it is necessary to have an air velocity at the duct of about 2,000 feet per minute.

9. Care should be taken to avoid obstacles to the air current, such as large projecting anodes or racks.

10. A hood surrounding one or more sides of the tank may be advantageous in protecting against disturbance by other air currents, such as those from open windows or from other fans.

11. The air velocity in the duct can be measured by means of a kata thermometer.

12. A vane anemometer is usually too large to measure the air velocity in the duct. It may, however, be used to measure the air velocity at the outlet of the exhaust flue, from which measurement the volume of air and hence its velocity in the duct may be computed.

13. The air may be sampled as rapidly as 35 liters per minute by means of an exhaust and an impinger bottle containing normal sodium hydroxide solution.

14. The amount of chromic acid absorbed from the air can be determined by titration with iodide and thiosulphate, or, if present in minute amounts, by a colorimetric test with hematoxylin.

15. The operators should guard against injury to the nasal tissues by applying to them, several times daily, vaseline or mentholatum salve.

16. Rubber boots, gloves, and aprons should be used when feasible, to prevent contact of chromic acid with any abraded skin.

17. If gloves are not used, the hands should be washed frequently with water, and all cuts or abrasions greased with a mixture of three parts vaseline and one part lanolin.

18. All floors near the plating tanks should be frequently washed down.

19. Operators should have periodic medical examinations, with prompt treatment of the slightest skin or nose affections.

20. Such treatment should include washing with bisulphite, ammonium polysulphide, or thiosulphate solution, application of an ointment, and a waterproof covering.

VI. SUMMARY

This investigation included a study in six chromium plating plants of the kind and degree of ventilation and its efficiency as judged from the content of chromic acid in the air above the plating tanks. Twenty-three workers whose occupational history was known were examined for evidences of injury due to chromic acid. The results showed that, of 14 persons actually engaged in chromium plating, 2 had perforated nasal septa, and all but 2 showed some inflammation

of the nasal tissue. No evidence was found of digestive disorders or of damage to the lungs or respiratory tract.

The results show that there is a real, though not critical, hazard in chromium plating. This hazard can be reduced and practically eliminated by proper ventilation and sanitary measures.

VII. ACKNOWLEDGMENTS

The authors desire to express their appreciation for the service rendered by Asst. Surg. R. C. Green, of the United States Public Health Service, who conducted the physical examinations, and that given by G. E. Renfro, of the United States Bureau of Standards, who assisted with the measurements of ventilation and the analyses of solutions.

As the number of plants and operators examined was so limited, it is not advisable to list the names of the firms who cooperated in this investigation. We desire, however, to acknowledge their valuable assistance.

VIII. APPENDIX

BIBLIOGRAPHY

(1) Hamilton, Alice: Industrial Poisons in the United States. The Macmillan Co., New York, 1925.
(2) Cumming: Edinburgh Med. and Surg. Jour. (1827), **26**, 134.
(3) Kober, Geo. M., and Hayhurst, Emery R.: Industrial Health. P. Blakiston's Sons & Co., Philadelphia, 1924.
(4) Bécourt and Chevallier: Ann. d'hyg. publ. (1863), **20**, 83.
(5) See Wutzdorff: Arb. a. d. kaiserl. Gesundheitsamt. (1897), **13**, 328.
(6) Delpech: Ann. d'hyg. publ. (1869), **26**, 5.
(7) Leymann: See Rambousek, J. Industrial Poisoning (tr. by Legge, T. M. London, **913**, 55).
(8) Lehmann, K. B.: Ztrlbl. f. Gewerbehyg. (1914), **2**, 193.
(9) Legge, T. M.: See Oliver's Dangerous Trades, London (1902), 447.
(10) Mitchell, Dugald: Jour. State Med. (1916), **24**, 18.
(11) Ranelletti: Abstr. from Il Policlinico (1919); in Il Lavoro, 1920, **12**, 19.
(12) Hill, Leonard: The Science of Ventilation and Open-Air Treatment, Part 1. Medical Research Council; Special Report Series, No. 32, London.
(13) Wyatt, S.: Atmospheric Conditions in Cotton Weaving. (Textile Series No. 6.) Reports of the Industrial Fatigue Research Board, No. 21. Medical Research Council, London.
(14) Greenburg, Leonard: Studies on the Industrial Dust Problem. III. Comparative Field Studies of the Palmer Apparatus, the Konimeter, and the Impinger Methods for Sampling Aerial Dust. Pub. Health Rep. **40**, 31 (July 31, 1925), pp. 1591–1603.
(15) Z. Anal. Chem., **2**, p. 390.
(16) Davidson, Edward C.: The Treatment of Chemical Burns. Trans. of the 15th Safety Congress, National Safety Council, October 26, 1926.

WORKROOM SURVEY FORM

No. ......

UNITED STATES PUBLIC HEALTH SERVICE

OFFICE OF INDUSTRIAL HYGIENE AND SANITATION

1. City .... Establishment .... Date ....
   Type of building .... Shop .... Location ....
   Size ....
2. Ventilation—Natural ....
   Area of openings ....
   Artificial ....
   Temp. ....
   Dry ....
   Wet.......................... Remarks..........................
   Hum. ....
3. No. of plating and cleaning tanks.......................... Artificial ventilation ....
   No. of chromium plating tanks .... Size ....
   Artificial ventilation .... When installed ....
   No. of years Cr plating carried on ....
   No. of Cr platers ....
   Type of work plated..........................

Sketch of room:

....
....
....
....
....
....
....

[Face of workroom survey form]

4. Air samples:

Sample No.	Sampling time	Volume of sample, cu. m.	Cc. of $Na_2S_2O_3$ titer	Conversion factor	Mgs. CrO_3 per cu. m. of air	Mgs. CrO_3 by hematoxylin	Average air vel. at hoods f. p. m.	Size of hood openings	Plating tank data				Remarks (fan operation data)
									Conc. of CrO_3	Temp.	Current density	Current in amps.	

[Back of workroom survey form]

PHYSICAL EXAMINATION FORM

1. *Industrial history*

Name........................ Occupation.................................. Plant.............
Address.. Age.......... Race.......... Sex..........
Birthplace................ How long in U. S........... No. yrs. employed as Cr plater...........
Room in which employed............................ Hrs. per day.......... Hrs. per week........
History of previous employment in this plant:

Occupation Length of Service Room

1. ....
2. ....
3. ....

History of previous employment in other plants:

Occupation Length of service CrO_3 exposure

1. ....
2. ....
3. ....

Do you wear gloves?................. Mask?.................. Wash daily?..................
Bathe weekly?.................. Anoint face, hands, and nasal passage with vaseline or oil?........
Change clothing in plant?..
Wash skin with any neutralizing chemical solutions?.......................................
Actual time spent over chromium tank..
How long has present ventilation system been installed?....................................

2. *Personal history*

Have you ever had an operation performed on the nose?......................................
Any nasal trouble before working in chromium plating room?.................................
Any nasal trouble since working in chromium plating room?............. Nosebleed?...............
Appetite?.................................. Loss of wt.?..
Any throat trouble?......................... Digestive disorders?................................

3. *Physical examination*

Skin condition:
Ulcers..
Open wounds...
Eczema..
Nasal examination:
Septum perforated.............................Size of perforation...............................
Ulcers........................ Inflammation...................... Bloody mucosa...............
General chest findings...
....
....
....
....

INSTRUCTIONS FOR USING THE KATA THERMOMETER (13)

The observations dealt with in this report were taken by means of the kata thermometer, an instrument designed to measure its own rate of cooling at a temperature approximately that of the human body. The kata thermometer has an alcohol reservoir in the form of a cylindrical bulb about 1½ inches long and ¾ inch in diameter. The stem, which is graduated in tenths of a degree from 95° to 100° F., has at the top a small bulb which acts as a safety overflow when the thermometer is heated.

Readings may be taken with the kata used both as a dry-bulb and as a wet-bulb thermometer. Dry readings are taken by immersing the large bulb of the kata thermometer in water having a temperature of about 180° F., until an unbroken column of the alcohol has risen halfway up the safety bulb. The alcohol rises slowly when first the reservoir is immersed in hot water, but this slow movement is followed by a sudden rise, and care is necessary in order to avoid fracture of the safety bulb. The instrument is cooled for a minute so as to enable the glass to get into equilibrium. Then the thermometer is reheated, and after bulb and stem have been wiped dry the kata is placed in the desired position, preferably suspended from a stand. The time in seconds which is occupied by the thermometric liquid in falling from 100° to 95° F.—i. e., through a range of temperature approximating that of the human body—is noted by means of a stop watch. From three to five readings are, as a rule, sufficient for calculating an average rate of fall, from which the rate of cooling is estimated, though a larger number of observations of rates of fall is advisable when the kata thermometer is used in positions where puffs of wind alternate with calm intervals. The same procedure is followed when "wet readings" are taken, excepting that a tightly fitting cover of lisle is stretched over the reservoir of the kata thermometer. Excess of moisture is removed before the instrument is suspended for observation.

The average time of fall thus obtained gives an indication of the rapidity with which heat is lost by the particular instrument used; but, owing to such variables as the thickness of the glass and slight variations in surface area, two different instruments would give different times of fall, even under identical circumstances and methods of experiment. Readings are standardized, so that the rate of heat loss can be expressed in heat units per unit area per second, by using a "kata factor" ascertained for each instrument before it leaves the maker. This factor, which is stamped on the stem near to the top bulb, is found by determining the water equivalent of the thermometer, and actually represents the amount of heat in milli-calories per square centimeter of surface required to raise the thermometer from 95° F. to 100° F. Hence, by dividing the factor by the number of seconds taken by the fluid in falling through this range of temperature, the rate of heat loss in milli-calories per square centimeter per second is obtained.

Example.—Suppose that the average of five readings of the time taken by the column to fall from 100° F. to 95° F. is 91 seconds, and that the kata factor marked on the stem of the instrument is 476. Then 476 is divided by 91, giving 5.2, which is taken to represent the cooling power of the air at that time and place.

It should be noted that, when the temperature of the air exceeds 95° F., the cooling power can not be estimated, and is in fact zero or even a negative quantity. Even at somewhat lower temperatures the estimation is difficult, owing to the long time required by the column to fall. In such instances it is generally sufficient to note that the cooling power is less than a specified value (such as 2).

For the calculation of "air velocity," the *temperature* as well as the cooling power of the air is required. It is, in fact, generally desirable, whenever kata readings are made, to obtain simultaneous readings of the temperature (if possible both dry and wet bulb) both inside the building in the same part of it where the kata is used, and outside the building in the open air.

To obtain the air velocity (in feet per minute) the cooling power of the air (determined as described above) is divided by the difference between 97.7 and the observed temperature in degrees Fahrenheit. The resulting quotient, $\frac{H}{\theta}$, is then applied to the formulæ given below:

For air velocities greater than 8 but less than 200 feet per minute—

$$\frac{H}{\theta}=(0.11+0.016\sqrt{V})$$

and for air velocities greater than 200 feet per minute—

$$\frac{H}{\theta}=(0.072+0.019\sqrt{V})$$

where H=dry kata cooling power (found by dividing the kata factor by the time in seconds taken by the fluid in falling from 100° to 95° F.), $\theta=(97.7-t)$ where t=air temperature in degrees Fahrenheit, and V=air velocity in feet per minute.

Similar formulæ hold in regard to wet kata cooling power and air velocity, but these lend themselves much less easily to calculation, and are chiefly of interest in connection with body comfort.

PUBLIC HEALTH ENGINEERING ABSTRACTS

The Swimming Pools in the Houston Public Schools. T. O. Woolley. Proceedings of Tenth Texas Water Works Short School, January, 1928, pp. 111–115. (Abstract by H. N. Old.)

An account is given here of the supervision maintained over the eight school swimming pools operated by the city in connection with the high school system.

During the 11 months from February 1 to December 31, 1927, 156,106 swimmers used these pools, indicating that swimming is one of the major physical activities of the school work. A period of 45 minutes, the same as for a recitation period, is allowed, and some of the pools have a record of 50 swimmers per period through the entire day.

In the following quotation from this article an excellent idea may be obtained of the care that is exercised in the operation of these pools: "It is the duty of the engineer to complete the preparation of the swimming pool and dressing rooms for a class at least 15 minutes before the first morning class assembles, so that the principal or physical education instructor may inspect it and have corrections made of any defects. The pool will be ready for use when the water is clear, the sediment removed from the bottom by vacuum, the excess chlorine between 0.15 and 0.4 p. p. m. as ascertained by the orthotolidine test, the temperature of the water 70° F. (never below 65° nor over 75°), the scum gutter flushed, and the foot bath cleaned with hose and mop. When the pool is in use, the engineer will run the filter 10 hours per day, with the alum pot and chlorinator filled and properly adjusted. The filter will be backwashed when the pressure gauges register a difference of 5 pounds. The engineer will empty, scrub, and refill the pool when the laboratory reports a bacterial count of 100 or more and the colon confirmation is positive. If the colon confirmation is negative, a bacterial count of 200 is allowed." [This report is furnished to the principal by the supervisor of hygienics.]

"The engineer will keep a daily record of excess chlorine (orthotolidine test), hours of filtration, vacuum cleanings, and water changes. The engineer will take a water specimen from the pool on Tuesday morning and Friday evening of each week and deliver it to the city laboratory in a sterile container furnished by the laboratory."

The swimming pool instructor is charged with the responsibility of enforcing rather drastic rules regarding personal hygiene relative to the students desirous of using the pools.

Of considerable interest is the statement that on several occasions there has been maintained a pool with bathing load of from 2,000 to 3,000 per month for two months with no water change. Change of water is considered necessary only upon results of laboratory tests.

New Pasteurization Method. Anon. (N. Y. Prod. Rev. and Amer. Creamery, 64 (1927), No. 23, p. 787.) *Experiment Station Record,* U. S. Dept. of Agriculture, vol. 58, No. 7, May, 1928, pp. 671–672.

"It is reported that Dr. (H.) Stassano, of the Pasteur Institute, Paris, has invented a new method of pasteurizing milk and cream that is quite efficient. Under this new system the milk with the cream is pumped through a system of tubes 1 mm. thick, where it is pasteurized at a temperature below 75° C. Pasteurization is completed in about 10 seconds. It is claimed that the milk retains all of its original characteristics and is more completely sterilized than by the old method. There is no pasteurized taste to the milk, and cream rises as in raw milk. No losses occur due to evaporation, and it is as suitable for cheese making as raw milk. When cooled to 20° after pasteurizing, it will keep as well as though cooled to 3°."

The Properties of the Bactericidal Substance in Milk. F. S. Jones. *Journal Experimental Medicine,* vol. 47, No. 6, June 1, 1928, pp. 877–888. (Abstract by P. R. Carter.)

Several workers have established the fact that fresh raw milk will inhibit for a time the growth of a variety of organisms. Many views have been advanced in explanation of this phenomenon. From the work done by the author and others, it is concluded that there exists in cows' milk a substance which is capable of restraining the growth of certain bacteria for definite periods. With the aim of obtaining more information about the principle, observations were made on (1) the time of maximum concentration; (2) distribution in the quarters of the udder; (3) reactivation; (4) filtrability; (5) effect of absorbents; (6) effect of desiccation. From these observations the following conclusions were reached: The substance is present in the colostrum and milk of the first few days of lactation as well as later. Its concentration varies in the secretion from various quarters of the same cow. Its activity is diminished by heat and can not be restored again by the addition of active milk. The principle is present in whey and readily passes through the coarsest Berkefeld filter, although a considerable portion is retained by N candles. The finest filter (W) completely retains it. It is absorbed by animal charcoal but not by kaolin, kieselguhr, or bolus alba. It can be desiccated, and its presence has been demonstrated in one brand of dried milk.

Bacterial Flora of Ground Market Meats.—J. C. Geiger, F. E. Greer, and J. L White. *American Journal of Public Health and the Nation's Health,* vol. 18, No. 5, May, 1928, pp. 602–606. (Abstract by C. T. Butterfield.)

A description of an apparent instance of food poisoning occurring at a banquet given at a Chicago hotel attended by 1,600 persons is given. The epidemiological and laboratory methods followed are included. Crab meat was thought to be the source of the trouble. An organism (probably belonging to the *Salmonella suipestifer* group—physical, serological, and cultural characteristics of the organism are given) was isolated which killed experimental animals.

In following up the investigation a survey of the bacteriological content of ground market meats was made. One hundred cultures were isolated from the meats examined. Sixty-two were found to belong to the *S. suipestifer* group, two gave reactions for *S. icteroides*, and the remainder were classed with the *B. proteus* and Cloacæ groups.

The authors conclude that the findings seem to indicate unsatisfactory sanitary methods of handling the foods in question and that they may be responsible for outbreaks of a gastrointestinal nature.

High Bacterial Counts in Pasteurized Milk. Harry A. Harding and Archibald R. Ward. *The Public Health Journal* (official organ of the Canadian Public Health Association), vol. 19, No. 4, April, 1928, pp. 162–167. (Abstract by R. S. Smith.)

The authors state that much of the confusion regarding the significance of the high bacterial counts is due to the fact that such counts may be produced by a number of different causes. The authors first discuss variations in the laboratory. Reference is made to the authors' previous statements relative to unreliability of plate counts. The authors call the readers' attention to statements relative to variation in plate counts in the Standard Methods of Milk Analysis.

The authors state that the available information indicates that raw milk reaches the milk plants in the larger cities with an average bacterial plate count of somewhat under 1,000,000 during colder months and considerably above 1,000,000 during the hot weather. Occasionally a given milk supply is well seeded with germs, which are even more resistant to heat than are the acid forms. Under such conditions the bacterial reduction due to pasteurization will not be 95 per cent, and in extreme cases it may not be 50 per cent. Both the total number and the kinds of bacteria present in raw milk have an appreciable influence upon the bacterial count of the pasteurized product. Little work has yet been done to locate the sources from which the heat-resistant germs enter the milk.

The authors next discuss germ life from plant equipment. After customary washing of milk-handling machinery during warm weather, a marked development of germ life takes place on the moist surfaces during the night, so that on the following morning the equipment is fairly heavily seeded. The authors state that germs possessing ability to grow at pasteurizing temperatures are present in much of the ordinary raw-milk supply. While they have the ability to grow at pasteurizing temperatures, they do not grow with sufficient rapidity to become a serious problem. Commercially these germs seem to be more inclined to cause high counts in pasteurized milks which have been prepared with special regard to cleanliness and handling.

The authors finally conclude that the bacterial content of the raw milk exerts a more important influence upon the bacterial count and keeping quality of the milk after pasteurization than was earlier appreciated. A raw-milk supply of fine quality is a necessary prerequisite for a pasteurized milk of fine keeping quality.

Thermal Death Point of Streptococci. Wm. H. Park. *American Journal of Public Health and the Nation's Health*, vol. 18, No. 6, June, 1928, pp. 710–714. (Abstract by C. T. Butterfield.)

Earlier work is reviewed, particularly that of Ayers. The methods employed in maintaining exact temperature and time of exposure periods and the laboratory procedure are given. Two hundred strains of hemolytic streptococci, pathogenic for man, obtained from septic sore throat, tonsilitis, scarlet fever, mastoiditis, erysipelas, and other sources, were studied. All were killed after 30 minutes at 140° F. Most of them were killed at 136° F. or less. Nonhemolytic streptococci, believed to be now pathogenic for man, were more resistant, requiring in some instances 145° F. for 90 minutes. Cultures of *B. melitensis* and *B. abortus* were killed at 140° F. in 10 minutes.

The Disposal of Effluents from Beet-Sugar Factories. A. J. V. Underwood. *Industrial Chemist and Chemical Manufacturer* (London), vol. 3, No. 29, June, 1927, pp. 260–265. (Abstract by D. E. Kepner.)

"The waste disposal problems which confront so many industries present particular difficulties and burdens to the beet-sugar industry. The manufacture of beet sugar being limited to about three months of the year, a heavier charge is thrown on the cost of production for a given capital expenditure than is the case in industries which are employed throughout the year. This consideration assumes especial importance in view of the large quantities of water used and waste produced in the manufacture of beet sugar.

"The location of beet-sugar factories in agricultural districts and on streams of comparative purity renders any contamination of the stream more noticeable and more significant than that which is caused by factories situated in industrial areas in the neighborhood of streams which have already reached a high degree of pollution.

"During the early part of the period for which the sugar factory is working, the flow of many streams is low, and this may require greater storage facilities for the effluent or a higher degree of purity. The lower temperatures at this time of the year also affect adversely the activity of bacteria and the efficiency of biological methods of purification. In extreme cases, where a stream is frozen over, further difficulties are introduced, since it has been shown that in such cases the dissolved oxygen content of an unpolluted stream may fall to as low as 40 per cent of saturation."

Four different wastes are produced by beet-sugar factories. Beet carrying and washing water, amounting to about 2 m. g. d. per 1,000 tons of beets treated daily, is the least objectionable, containing some suspended mineral matter and ordinarily but 20 to 50 p. p. m. sugar, and having an oxygen consumed value of about 340 p. p. m. This is treated successfully by plain sedimentation for six to eight hours, and by precipitation with lime.

Diffuser battery and pulp press waters, together amounting to 300,000 g. p. d. per 1,000 tons of beets, are more objectionable and more difficult to treat. Combined, these carry 0.6 to 0.8 per cent of sugar and an equal amount of other organic matter. Among methods used with some success in treating these are: Addition of lime, followed by carbonation, with or without the mixing in of beet carrying and washing water; plain sedimentation and land irrigation; septic tanks with or without the use of lime; contact beds; trickling filters; fermentation with or without lime to neutralize the butyric acid formed; and activated sludge. Each process has definite limitations.

Filter-press lime sludge is readily disposed of by application to land, preferably treated previously with quicklime.

Steffens waste water, the production of which is limited to the United States, is quite objectionable, having an oxygen-consuming power of 3,000 p. p. m. and containing all the mineral salts of the beets which may be toxic to fish.

The Design of Settling Basins for Sewage Treatment Plants. Karl Imhoff. *Water Works*, vol. 67, No. 6, June, 1928, pp. 229–231. (Abstract by C. G. Gillespie.)

This is an excellent review of an attempt at scientific determination of settling-basin periods. At present there are no generally recognized rules. Prior to 1903 it was the theory that velocity governed sedimentation, but it was found that below a certain low limit of velocity all basins work alike. In 1903 Steuernagel proposed designing on the basis of flowing-through time, not velocity. This method has been commonly used since. In 1918 Schulz contended, as a result of experiments on beet-sugar grit, that settling basins should be designed on the basis of surface area; that depth and volume were immaterial. On granular material he found the settling velocity practically constant, regardless of depth. This is not true of flocculent substances such as sewage, in which the particles grow larger as they settle through the basin. Settling basins for sewage or flocculent sludge must be designed on flowing-through time, and for a waste of granular sludge on a surface-area basis.

Grit basins are designed with flat bottoms and for a velocity of 1 foot per second; the length depends on the volume of sand to be removed. They are used only in large plants or with combined systems. In large plants sludge is handled by draining the basin and removing the sand with grab buckets.

Settling tanks: The use of Imhoff cones is helpful in determining the optimum period of sedimentation. Velocity in ordinary deep tanks, like Imhoff tanks, need never be considered. From the curve of per cent efficiency obtained from settling glass experiments, the flowing-through period for any desired efficiency is obtained for the particular sewage. The error in this is that the tanks are actually deeper than the glasses, but no way is offered for taking the effect of depth into account, except in case of granular sludge. The most favorable tanks for granular sludges are very shallow basins with maximum surface area. For floccular sludge the opposite is required; here motion of water upward is even of advantage, as it brings the sludge upward through a sort of floating filter, where it is entrained.

Sludges are so variable that it is not easy to predict performance of settling basins. The experimental unit should be the same depth as the tank to be built.

Basins are classified as "ordinary," in which the sludge remains under water until it begins to rise and is periodically emptied and cleaned every two weeks, requiring reserve units; "hopper-bottomed" basins, in which the sludge is removed every couple of days; "basins with cleaning machines," such as Fidler scrapers, Dorr thickeners, Hurd endless-chain scrapers; "earthen lagoons," usable only with nonputrescible sludge; "flat underdrained settling basins," like sludge-drying beds, operated alternately (these are only possible on granular material; with municipal sewage the depths must not exceed 4 to 16 inches; sludge is removed in a dry state); and "two-story settling basins," e. g., Imhoff tanks.

Research on the Mechanism of the Activated Sludge Process. A. Seiser. Gesundh. Ing. 51, 253–9, 273–6 (1928). Abstract by Wayne L. Denman in *Chemical Abstracts*, vol. 22, No. 12, June 20, 1928, p. 2225.

"The real mechanism of activated sludge is a combination of the properties of the sludge and of the organisms. In the case of bovine serums, peptone, sugar, and aspartic acid, as much disappears in the first stages through absorption as through biological decomposition. Of the N-containing compounds tested, serum was the most strongly, peptone less strongly, and the Na salt of aspartic acid the least adsorbed. The decomposition of albumin was nearly identical with that of globulin. These two show no distinctive difference in regard to the putrescibility test. For the serums it was determined that the decrease of the permanganate consumption approximately parallels the organic N. The addition of a good source of energy (sugar) to aspartic acid promotes the fixation of N, while the lack of sugar promotes the formation of NH_3. Nitrification and NO_3 reduction are functions of the intensity of aeration. A lack of air results in a reduction of the oxidized N. The salt content has little effect on the activated sludge process. Ferrous compounds are quickly oxidized and promote activation during aeration in compounds with protective colloids."

DEATHS DURING WEEK ENDED AUGUST 25, 1928

Summary of information received by telegraph from industrial insurance companies for the week ended August 25, 1928, and corresponding week of 1927. (From the Weekly Health Index, August 29, 1928, issued by the Bureau of the Census, Department of Commerce)

	Week ended Aug. 25, 1928	Corresponding week, 1927
Policies in force	71,607,396	68,242,444
Number of death claims	11,342	10,689
Death claims per 1,000 policies in force, annual rate	8.3	8.2

Deaths from all causes in certain large cities of the United States during the week ended August 25, 1928, infant mortality, annual death rate, and comparison with corresponding week of 1927. (From the Weekly Health Index, August 29, 1928, issued by the Bureau of the Census, Department of Commerce)

City	Week ended Aug. 25, 1928		Annual death rate per 1,000, corresponding week, 1927	Deaths under 1 year		Infant mortality rate, week ended Aug. 25, 1928 [2]
	Total deaths	Death rate [1]		Week ended Aug. 25, 1928	Corresponding week, 1927	
Total (70 cities)	6,188	10.5	9.8	703	681	57
Akron	36			2	1	22
Albany [3]	27	11.7	14.4	4	4	82
Atlanta	76	15.6	13.0	9	9	
White	40		8.9	4	6	
Colored	36	(4)	22.6	5	3	
Baltimore [3]	177	11.1	11.5	28	29	89
White	139		9.7	20	22	80
Colored	38	(4)	21.6	8	7	125
Birmingham	65	15.3	15.6	13	16	111
White	35		11.0	8	8	110
Colored	30	(4)	22.8	5	8	113
Boston	152	9.9	10.9	14	26	39
Bridgeport	40			2	4	37
Buffalo	123	11.6	10.2	18	17	77
Cambridge	27	11.2	8.8	3	2	53
Camden	20	7.7	11.4	4	3	64
Canton	14	6.3	12.0	0	6	0
Chicago [3]	537	8.9	9.5	63	50	54
Cincinnati	163	20.6	14.7	15	11	91
Cleveland	173	9.0	8.8	22	26	60
Columbus	77	13.5	12.5	7	8	65
Dallas	53	12.7	5.9	3	3	
White	39		4.2	2	1	
Colored	14	(4)	17.1	1	2	
Dayton	35	9.9	8.9	5	4	83
Denver	60	10.7	13.9	10	7	
Des Moines	19	6.5	9.5	3	6	50
Detroit	251	9.5	7.5	40	35	62
Duluth	15	6.7	7.3	2	1	47
El Paso	33	14.6	10.1	7	7	
Erie	24			5	2	103
Fall River [3]	17	6.6	6.7	1	4	17
Flint	18	6.3	8.8	8	7	102
Fort Worth	32	10.0	7.3	4	2	
White	23		6.5	4	1	
Colored	9	(4)	13.3	0	1	
Grand Rapids	20	6.4	6.8	0	1	0
Houston	52			6	5	
Indianapolis	89	12.2	10.3	12	11	91
White	75		10.0	11	10	96
Colored	14	(4)	12.8	1	1	61
Jersey City	53	8.5	9.9	11	9	82
Kansas City, Kans	31	13.7	11.5	4	1	84
White	26		11.4	4	1	99
Colored	5	(4)	12.3	0	0	0

1 Annual rate per 1,000 population.
2 Deaths under 1 year per 1,000 births. Cities left blank are not in the registration area for births.
3 Deaths for week ended Friday, Aug. 24, 1928.
4 In the cities for which deaths are shown by color the colored population in 1920 constituted the following percentages of the total population: Atlanta, 31; Baltimore, 15; Birmingham, 39; Dallas, 15; Fort Worth, 14; Indianapolis, 11; Kansas City, Kans., 14; Knoxville, 15; Louisville, 17; Memphis, 38; Nashville, 30; New Orleans, 26; Richmond, 32; and Washington, D. C., 25.

Deaths from all causes in certain large cities of the United States during the week ended August 25, 1928, infant mortality, annual death rate, and comparison with corresponding week of 1927. (From the Weekly Health Index, August 29, 1928, issued by the Bureau of the Census, Department of Commerce)—Continued

City	Week ended Aug. 25, 1928		Annual death rate per 1,000, corresponding week, 1927	Deaths under 1 year		Infant mortality rate, week ended Aug. 25, 1928
	Total deaths	Death rate		Week ended Aug. 25, 1928	Corresponding week, 1927	
Kansas City, Mo.	84	11.2	11.3	7	11	49
Knoxville	25	12.4	10.7	5	0	109
White	19		11.0	5	0	121
Colored	6	(4)	8.5	0	0	0
Los Angeles	221			18	17	51
Louisville	60	9.5	11.2	7	7	59
White	56		10.2	6	5	57
Colored	4	(4)	17.1	1	2	69
Lowell	21	10.0	14.2	2	6	42
Lynn	22	10.9	15.4	2	3	50
Memphis	70	19.2	18.4	8	4	94
White	37		16.3	8	2	150
Colored	33	(4)	22.2	0	2	0
Milwaukee	81	7.8	9.5	8	7	36
Minneapolis	68	7.8	8.5	9	7	54
Nashville	38	14.3	14.4	7	4	110
White	25		10.0	6	1	128
Colored	13	(4)	25.5	1	3	60
New Bedford	19	8.3	8.7	5	1	108
New Haven	33	9.2	6.2	2	2	28
New Orleans	158	19.2	15.4	21	14	102
White	94		11.8	14	6	102
Colored	64	(4)	25.5	7	8	102
New York	1,184	10.3	8.8	142	113	57
Bronx Borough	164	9.0	6.9	6	8	18
Brooklyn Borough	381	8.6	8.0	47	54	47
Manhattan Borough	477	14.2	11.2	74	41	88
Queens Borough	127	7.8	7.0	10	8	40
Richmond Borough	35	12.1	13.5	5	2	90
Newark, N. J	87	9.6	9.9	10	10	51
Oakland	49	9.3	9.9	3	2	33
Oklahoma City	34			4	2	
Omaha	56	13.1	11.2	7	6	81
Paterson	22	7.9	10.5	2	4	35
Philadelphia	380	9.6	9.2	30	47	40
Pittsburgh	150	11.7	10.5	23	28	75
Portland, Oreg	54			2	8	21
Providence	62	11.3	9.3	8	4	70
Richmond	39	10.5	10.1	7	2	91
White	18		9.6	2	2	41
Colored	21	(4)	11.3	5	0	184
Rochester	84	13.4	8.7	7	10	57
St. Louis	209	12.9	7.7	13	9	43
St. Paul	37	7.7	7.1	0	2	0
Salt Lake City [3]	19	7.2	9.6	2	2	33
San Antonio	49	11.7	15.0	4	8	
San Diego	32	14.0	17.6	2	4	38
San Francisco	150	13.4	12.7	3	10	19
Schenectady	18	10.1	10.1	1	4	31
Seattle	62	8.5	6.9	3	2	31
Somerville	13	6.6	9.2	1	2	35
Spokane	32	15.3	8.6	0	1	0
Springfield, Mass	19	6.6	7.1	3	1	48
Syracuse	35	9.2	10.3	4	3	49
Tacoma	19	9.0	8.8	2	1	51
Toledo	64	10.7	8.2	3	6	29
Trenton	30	11.3	11.8	3	2	51
Utica	25	12.5	15.6	2	4	45
Washington, D. C	126	11.9	9.0	17	5	97
White	72		7.5	9	4	74
Colored	54	(4)	13.4	8	1	148
Waterbury	23			4	4	119
Wilmington, Del.	20	8.1	9.9	0	3	0
Worcester	38	10.1	14.9	4	8	49
Yonkers	16	6.9	7.9	4	1	91
Youngstown	26	7.8	7.7	0	6	0

[3] Deaths for week ended Friday, Aug. 24, 1928.

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

PREVALENCE OF DISEASE

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

UNITED STATES

CURRENT WEEKLY STATE REPORTS

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

Reports for Weeks Ended September 1, 1928, and September 3, 1927

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended September 1, 1928, and September 3, 1927

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Sept. 1, 1928	Week ended Sept. 3, 1927	Week ended Sept. 1, 1928	Week ended Sept. 3, 1927	Week ended Sept. 1, 1928	Week ended Sept. 3, 1927	Week ended Sept. 1, 1928	Week ended Sept. 3, 1927
New England States:								
Maine	2	1			53	6	0	0
New Hampshire	2				2		0	
Vermont					1		0	0
Massachusetts	34	35	5	9	42	29	1	1
Rhode Island	3	5			25	1	0	0
Connecticut	10	8	5	2	13	4	2	0
Middle Atlantic States:								
New York	102	145	[1] 4	[1] 6	88	31	29	4
New Jersey	52	49	2	9	32	6	7	0
Pennsylvania	105	170			91	104	7	4
East North Central States:								
Ohio	51		7		61		3	
Indiana	7	17	1	7	6	6	0	0
Illinois	68	84	4	3	24	12	4	6
Michigan	39	46	1		29	11	3	1
Wisconsin		23	4	9	4	66	1	5
West North Central States:								
Minnesota	16	29			4	4	2	0
Iowa	3	9				2	2	0
Missouri [2]	13	10	1		3	9	0	1
North Dakota	6	2				5	2	0
South Dakota		4			10	3	0	0
Nebraska		1			1	1	0	0
Kansas	5	11	1	2	6	10	0	0
South Atlantic States:								
Delaware						2	0	0
Maryland [3]	12	34	3	3	15	9	1	0
District of Columbia	12	11		1			0	0
Virginia								
West Virginia	3	22		1	4	7	0	1
North Carolina	49	78			34	134	2	1
South Carolina	46	40	281	170	10	37	0	0
Georgia	14	43	120	18	4	9	1	0
Florida	8	13	12	5		6	0	1
East South Central States:								
Kentucky	5						0	
Tennessee	8	15	7	14		49	0	3
Alabama	25	48	81	6	7	9	2	1
Mississippi	6	25						
West South Central States:								
Arkansas	6	15	25	34		8	0	0
Louisiana	9	23	50	11	4	4	0	0
Oklahoma [4]	17	29	14	14	1	10	1	1
Texas	20	32	20	30		6	0	0
Mountain States:								
Montana		6			2	1	2	0
Idaho					2		1	
Wyoming	4						0	0
Colorado	4	14				3	2	0

[1] New York City only.
[2] Figures for 1928 are exclusive of Kansas City and St. Louis.
[3] Week ended Friday.
[4] Figures for 1928 are exclusive of Oklahoma City and Tulsa, and for 1927 are exclusive of Tulsa.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended September 1, 1928, and September 3, 1927—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Sept. 1, 1928	Week ended Sept. 3, 1927	Week ended Sept. 1, 1928	Week ended Sept. 3, 1927	Week ended Sept. 1, 1928	Week ended Sept. 3, 1927	Week ended Sept. 1, 1928	Week ended Sept. 3, 1927
Mountain States—Continued.								
New Mexico	3	3				2	0	0
Arizona						1	0	0
Utah [3]	1	5		2	2	2	0	0
Pacific States:								
Washington	3	18			11	29	2	0
Oregon	3	9	2	6	2	10	2	1
California	33	92	7	5	19	25	2	1

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Sept. 1, 1928	Week ended Sept. 3, 1927	Week ended Sept. 1, 1928	Week ended Sept. 3, 1927	Week ended Sept. 1, 1928	Week ended Sept. 3, 1927	Week ended Sept. 1, 1928	Week ended Sept. 3, 1927
New England States:								
Maine	1	6	8	13	0	0	5	9
New Hampshire	1		2		0		0	
Vermont	0	0	3	6	0	0	0	0
Massachusetts	37	60	58	69	1	0	6	13
Rhode Island	0	2	4	7	0	0	4	7
Connecticut	4	19	7	3	0	0	4	3
Middle Atlantic States:								
New York	88	85	23	68	0	0	36	60
New Jersey	5	23	18	19	0	0	26	16
Pennsylvania	9	49	64	114	1	0	48	96
East North Central States:								
Ohio [5]	31	73	30		1		38	
Indiana	0	7	13	28	3	12	15	10
Illinois	8	25	45	74	60	4	30	53
Michigan	1	15	52	87	8	23	17	25
Wisconsin	1	4	23	47	4	11	2	7
West North Central States:								
Minnesota	8	9	28	32	4	0	5	2
Iowa	0	3	11	10	0	2	1	4
Missouri [2]	0	6	14	32	11	4	34	24
North Dakota	11	2	16	40	0	0	1	4
South Dakota	9	1	22	4	1	3	1	2
Nebraska	0	3	7	15	5	0	2	4
Kansas	3	9	20	43	6	0	33	20
South Atlantic States:								
Delaware	1	1	0	1	0	0	0	3
Maryland [3]	35	0	8	14	0	0	48	37
District of Columbia	3	0	1	13	0	0	1	5
Virginia								
West Virginia	20	16	23	46	1	8	27	57
North Carolina	4	3	33	35	9	6	36	56
South Carolina	2	2	7	14	0	5	72	104
Georgia	0	3	16	16	0		79	119
Florida	2	1	3	2	0	4	5	8
East South Central States:								
Kentucky	3		23		0		31	
Tennessee	4	0	10	28	1	0	60	74
Alabama	1	0	8	19	0	1	87	91
Mississippi	1	1	8	15	0	0	35	32
West South Central States:								
Arkansas	0	1	0	5	2	0	86	67
Louisiana	0	1	2	3	0	0	46	44
Oklahoma [4]	0	6	17	15	4	12	93	94
Texas	5	28	10	25	0	1	13	22
Mountain States:								
Montana	8	0	6	8	4	0	4	3
Idaho	6		0		0		1	
Wyoming	0	0	6	3	1	0	0	1
Colorado	0	1	12	11	0	0	4	13
New Mexico	0	5	7	8	0	0	8	10
Arizona	0	0	0	2	0	0	1	3
Utah [3]	0	1	6	2	0	5	3	5
Pacific States:								
Washington	16	7	7	11	8	10	9	8
Oregon	1	7	7	5	9	9	3	9
California	5	58	31	36	4	7	45	9

[2] Figures for 1928 are exclusive of Kansas City and St. Louis.
[3] Week ended Friday.
[4] Figures for 1928 are exclusive of Oklahoma City and Tulsa, and for 1927 are exclusive of Tulsa.
[5] Week ended Sept.

SUMMARY OF MONTHLY REPORTS FROM STATES

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

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
July, 1928										
Idaho	2	10			5		1	15	32	2
Illinois	31	312	197	13	379	6	10	405	88	86
Indiana	1	46			247		0	103	104	19
Maryland	1	48	10	3	197	0	16	55	6	61
Minnesota	14	92	12		57		6	191	5	4
Mississippi	1	43	2, 576	15, 055	374	2, 696	16	26	2	343
Montana	6	6			71		3	13	64	17
North Carolina	4	62			270		10	64	58	268
Oklahoma [1]	3	35	124	551	36	64	2	21	103	166
Oregon	2	32	31	1	67		5	20	119	14
Pennsylvania	16	391		1	2, 688	2	8	390	37	155
Virginia	2	42	436	150	572	80	17	69	13	196
Washington	7	27	19		62		31	52	82	18
West Virginia	1	21	53		68		6	53	33	52

[1] Exclusive of Oklahoma City and Tulsa.

July, 1928	Cases
Chicken pox:	
Idaho	11
Illinois	551
Indiana	43
Maryland	63
Minnesota	131
Mississippi	200
Montana	15
North Carolina	68
Oklahoma [1]	2
Oregon	36
Pennsylvania	363
Virginia	125
Washington	176
West Virginia	31
Dengue:	
Mississippi	348
Dysentery:	
Illinois	24
Maryland	27
Minnesota	1
Mississippi (amebic)	132
Mississippi (bacillary)	2, 597
Oklahoma [1]	167
Virginia	900
German measles:	
Illinois	22
Maryland	26
North Carolina	5
Pennsylvania	103
Washington	19
Hookworm disease:	
Maryland	1
Mississippi	343
Virginia	10
Impetigo contagiosa:	
Maryland	11
Oregon	3
Washington	1
Lead poisoning:	
Illinois	5
Lethargic encephalitis:	
Illinois	11
Maryland	2
Oregon	1
Pennsylvania	7
Washington	3
Mumps:	
Illinois	248
Indiana	19
Maryland	74
Mississippi	341
Montana	17
Oklahoma [1]	19
Oregon	28
Pennsylvania	527
Washington	76
Ophthalmia neonatorum:	
Illinois	36
Mississippi	9
Montana	1
Oklahoma [1]	1
Pennsylvania	11
Paratyphoid fever:	
Idaho	1
Illinois	1
Puerperal fever:	
Illinois	9
Mississippi	98
Pennsylvania	8
Rabies in animals:	
Illinois	29
Maryland	4
Mississippi	6
Rabies in man:	
Illinois	4
Pennsylvania	1

[1] Exclusive of Oklahoma City and Tulsa.

	Cases
Rocky Mountain spotted or tick fever:	
Montana	8
Oregon	1
Washington	1
Scabies:	
Oregon	4
Washington	2
Septic sore throat:	
Illinois	10
Maryland	10
Minnesota	22
Montana	4
North Carolina	6
Oklahoma [1]	6
Oregon	4
Tetanus:	
Illinois	11
Maryland	11
Minnesota	1
Oklahoma [1]	1
Pennsylvania	17
Trachoma:	
Illinois	13
Minnesota	3
Mississippi	12
North Carolina	1
Oklahoma [1]	3
Tularaemia:	
Illinois	1
Minnesota	1
Montana	1
Undulant (malta) fever:	
Maryland	1
Montana	1
Oregon	6
Virginia	1
Vincent's angina:	
Maryland	3
Whooping cough:	
Idaho	5
Illinois	921
Indiana	82
Maryland	498
Minnesota	192
Mississippi	954
Montana	11
North Carolina	461
Oklahoma [1]	77
Oregon	6
Pennsylvania	1,377
Virginia	290
Washington	62
West Virginia	30

[1] Exclusive of Oklahoma City and Tulsa.

GENERAL CURRENT SUMMARY AND WEEKLY REPORTS FROM CITIES

The 98 cities reporting cases used in the following table are situated in all parts of the country and have an estimated aggregate population of more than 31,535,000. The estimated population of the 92 cities reporting deaths is more than 30,835,000. The estimated expectancy is based on the experience of the last nine years, excluding epidemics.

Weeks ended August 18, 1928, and August 20, 1927

	1928	1927	Estimated expectancy
Cases reported			
Diphtheria:			
43 States	758	994	
98 cities	329	478	486
Measles:			
42 States	775	805	
98 cities	217	191	
Poliomyelitis:			
44 States	278	383	
Scarlet fever:			
43 States	602	937	
98 cities	183	298	260
Smallpox:			
43 States	103	177	
98 cities	3	31	17
Typhoid fever:			
43 States	1,001	1,055	
98 cities	165	221	201
Deaths reported			
Influenza and pneumonia:			
92 cities	340	283	
Smallpox:			
92 cities	0	0	

City reports for week ended August 18, 1928

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

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

Division, State, and city	Population July 1, 1926, estimated	Chicken pox, cases reported	Diphtheria		Influenza		Measles, cases reported	Mumps, cases reported	Pneumonia, deaths reported
			Cases, estimated expectancy	Cases reported	Cases reported	Deaths reported			
NEW ENGLAND									
Maine:									
Portland	76,400	0	1	0	0	0	1	0	1
New Hampshire:									
Concord	[1] 22,546	0	0	0	0	0	0	0	2
Manchester	84,000	0	0	0	0	0	0	0	0
Vermont:									
Barre	[1] 10,008	0	0	0	0	0	0	0	0
Burlington	[1] 24,089	0	0	0	0	0	0	0	0
Massachusetts:									
Boston	787,000	5	27	13	2	0	4	0	8
Fall River	131,000	0	1	2	0	0	0	0	1
Springfield	145,000	0	1	1	0	0	5	0	0
Worcester	193,000	8	3	1	0	0	1	1	0
Rhode Island:									
Pawtucket	71,000	0	0	1	0	0	0	0	0
Providence	275,000	0	4	0	0	1	13	0	0
Connecticut:									
Bridgeport	(2)	0	4	1	1	0	2	0	1
Hartford	164,000	0	2	2	0	0	1	0	0
New Haven	182,000	0	1	0	0	0	1	0	3
MIDDLE ATLANTIC									
New York:									
Buffalo	544,000	6	9	5	-------	0	2	1	3
New York	5,924,000	9	93	69	1	0	41	0	96
Rochester	321,000	0	4	4	-------	0	1	2	4
Syracuse	185,000	2	2	0	-------	0	1	4	1
New Jersey:									
Camden	131,000	1	2	2	0	0	0	1	1
Newark	459,000	5	6	12	0	0	7	1	7
Trenton	134,000	0	2	0	0	0	0	0	1
Pennsylvania:									
Philadelphia	2,008,000	8	33	13	0	0	21	2	12
Pittsburgh	637,000	3	13	7	0	0	6	5	11
Reading	114,000	0	2	0	0	0	3	0	0
EAST NORTH CENTRAL									
Ohio:									
Cincinnati	411,000	2	4	4	0	1	1	0	4
Cleveland	960,000	6	22	12	0	0	28	1	7
Columbus	285,000	1	2	3	0	0	3	0	0
Toledo	295,000	0	5	1	1	1	7	0	4
Indiana:									
Fort Wayne	99,900	0	1	0	0	0	0	0	1
Indianapolis	367,000	0	3	3	0	0	3	2	8
South Bend	81,700	0	0	0	0	0	0	0	0
Terre Haute	71,900	0	1	1	0	0	0	0	0
Illinois:									
Chicago	3,048,000	18	43	44	3	1	8	11	29
Springfield	64,700	0	0	0	1	1	1	1	0

[1] Estimated, July 1, 1925.

[2] No estimate made.

City reports for week ended August 18, 1928—Continued

Division, State, and city	Population July 1, 1926, estimated	Chicken pox, cases reported	Diphtheria		Influenza		Measles, cases reported	Mumps, cases reported	Pneumonia, deaths reported
			Cases, estimated expectancy	Cases reported	Cases reported	Deaths reported			
EAST NORTH CENTRAL—continued									
Michigan:									
Detroit	[3] 1,242,044	4	28	20	1	3	8	4	7
Flint	136,000	6	3	1	0	0	0	2	2
Grand Rapids	156,000	0	1	0	0	0	3	1	2
Wisconsin:									
Kenosha	52,700	0	0	0	0	0	0	0	0
Milwaukee	517,000	4	8	2	0	0	4	1	3
Racine	69,400	-------	1	-------	-------	-------	-------	-------	-------
Superior	[1] 39,671	0	1	1	0	0	1	0	1
WEST NORTH CENTRAL									
Minnesota:									
Duluth	113,000	0	0	0	0	0	0	0	1
Minneapolis	434,000	5	11	3	0	0	2	3	3
St. Paul	248,000	2	9	1	0	0	0	3	2
Iowa:									
Davenport	[1] 52,469	0	1	0	0	-------	0	0	-------
Des Moines	146,000	0	1	2	0	-------	0	0	-------
Sioux City	78,000	1	1	0	0	-------	0	1	-------
Waterloo	36,900	0	0	0	0	-------	0	3	-------
Missouri:									
Kansas City	375,000	1	2	1	0	0	3	1	6
St. Joseph	78,400	0	0	0	0	0	0	0	1
St. Louis	830,000	1	18	20	0	0	4	1	-------
North Dakota:									
Fargo	[1] 26,403	0	1	0	0	0	0	0	0
Grand Forks	[1] 14,811	0	0	0	0	-------	0	0	-------
South Dakota:									
Sioux Falls	[1] 30,127	0	0	0	0	-------	0	0	-------
Nebraska:									
Lincoln	62,000	3	1	0	0	0	0	6	0
Omaha	216,000	1	3	4	0	0	0	0	1
Kansas:									
Topeka	56,500	0	1	0	0	0	2	2	0
Wichita	92,500	0	0	0	0	0	0	1	1
SOUTH ATLANTIC									
Delaware:									
Wilmington	124,000	0	0	0	0	0	1	0	0
Maryland:									
Baltimore	808,000	0	13	9	0	0	4	5	9
Cumberland	[1] 33,741	0	1	0	0	0	0	0	0
Frederick	[1] 12,035	0	0	1	0	0	0	0	0
District of Columbia:									
Washington	528,000	1	5	10	0	0	7	0	9
Virginia:									
Lynchburg	[3] 38,493	1	1	0	0	0	0	1	0
Norfolk	174,000	0	1	1	0	0	0	0	0
Richmond	189,000	0	6	3	0	0	1	0	3
Roanoke	61,900	0	2	1	0	0	0	0	0
West Virginia:									
Charleston	50,700	0	1	0	0	0	0	0	1
Wheeling	[1] 56,208	1	0	0	0	0	3	0	0
North Carolina:									
Raleigh	[1] 30,371	0	0	1	0	0	0	0	1
Wilmington	37,700	0	0	0	0	0	0	0	0
Winston-Salem	71,800	0	1	1	0	0	0	0	1
South Carolina:									
Charleston	74,100	0	1	0	10	0	0	0	0
Columbia	41,800	0	1	2	0	0	0	2	0
Greenville	[1] 27,311	-------	0	-------	-------	-------	-------	-------	-------
Georgia:									
Atlanta	(2)	0	2	4	5	0	0	0	5
Brunswick	[1] 16,809	-------	0	-------	-------	-------	-------	-------	-------
Savannah	94,900	0	0	0	0	0	0	2	1
Florida:									
Miami	[3] 131,286	0	2	0	0	0	1	3	1
St. Petersburg	47,629	-------	0	-------	-------	0	-------	-------	1
Tampa	102,000	0	1	3	4	0	1	0	1

[1] Estimated, July 1, 1925.

[3] Special census.

City reports for week ended August 18, 1928—Continued

Division, State, and city	Population July 1, 1926, estimated	Chicken pox, cases reported	Diphtheria		Influenza		Measles, cases reported	Mumps, cases reported	Pneumonia, deaths reported
			Cases, estimated expectancy	Cases reported	Cases reported	Deaths reported			
EAST SOUTH CENTRAL									
Kentucky:									
Covington	58,500	0	0	0	0	0	0	0	2
Louisville	311,000	0	2	1	2	0	0	0	12
Tennessee:									
Memphis	177,000	1	3	1	0	0	0	0	2
Nashville	137,000	0	1	3	0	0	2	0	3
Alabama:									
Birmingham	211,000	0	2	2	1	0	2	1	3
Mobile	66,800	0	0	1	1	0	0	0	0
Montgomery	47,000	0	0	0	0	-------	0	0	-------
WEST SOUTH CENTRAL									
Arkansas:									
Fort Smith	[1] 31,643	0	0	0	0	-------	0	1	-------
Little Rock	75,900	0	1	1	0	0	0	0	0
Louisiana:									
New Orleans	419,000	0	5	2	5	5	3	0	8
Shreveport	59,500	0	1	0	0	0	1	1	1
Oklahoma:									
Oklahoma City	(2)	0	1	0	0	0	0	0	1
Texas:									
Dallas	203,000	0	4	4	0	0	3	0	2
Fort Worth	159,000	0	2	0	0	0	0	0	2
Galveston	49,100	0	0	0	0	0	0	0	1
Houston	[1] 164,954	0	2	3	0	2	0	0	1
San Antonio	205,000	0	1	1	0	0	0	0	1
MOUNTAIN									
Montana:									
Billings	[1] 17,971	0	0	0	0	0	0	0	1
Great Falls	[1] 29,883	5	0	0	0	0	1	0	1
Helena	[1] 12,037	0	0	0	0	0	0	0	0
Missoula	[1] 12,668	0	0	0	0	0	0	0	0
Idaho:									
Boise	[1] 23,042	0	1	0	0	0	0	0	0
Colorado:									
Denver	285,000	3	9	3	-------	0	2	8	4
Pueblo	43,900	2	1	0	0	0	0	0	0
New Mexico:									
Albuquerque	[1] 21,000	0	0	0	0	0	0	0	0
Utah:									
Salt Lake City	133,000	3	2	0	0	0	2	0	1
Nevada:									
Reno	[1] 12,665	0	0	0	0	0	0	0	0
PACIFIC									
Washington:									
Seattle	(2)	3	2	0	0	-------	0	2	-------
Spokane	109,000	6	2	0	0	-------	0	0	-------
Tacoma	106,000	2	1	0	0	0	0	2	0
Oregon:									
Portland	[1] 282,383	2	4	1	0	0	3	1	2
California:									
Los Angeles	(2)	9	26	15	3	1	1	8	14
Sacramento	73,400	5	1	0	0	0	2	0	2
San Francisco	567,000	4	10	3	2	2	0	4	2

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

City reports for week ended August 18, 1928—Continued

Division, State, and city	Scarlet fever: Cases, estimated expectancy	Scarlet fever: Cases reported	Smallpox: Cases, estimated expectancy	Smallpox: Cases reported	Smallpox: Deaths reported	Tuberculosis, deaths reported	Typhoid fever: Cases, estimated expectancy	Typhoid fever: Cases reported	Typhoid fever: Deaths reported	Whooping cough, cases reported	Deaths, all causes
NEW ENGLAND											
Maine:											
Portland	0	3	0	0	0	0	1	1	0	0	19
New Hampshire:											
Concord	0	0	0	0	0	0	0	0	0	0	8
Manchester	1	0	0	0	0	0	0	0	0	0	11
Vermont:											
Barre	0	0	0	0	0	0	0	0	0	3	3
Burlington	0	4	0	0	0	0	0	0	0	0	7
Massachusetts:											
Boston	15	8	0	0	0	10	4	0	0	27	171
Fall River	0	3	0	0	0	1	1	1	0	2	23
Springfield	1	1	0	0	0	0	0	0	0	6	24
Worcester	2	0	0	0	0	3	0	0	0	5	36
Rhode Island:											
Pawtucket	0	0	0	0	0	0	0	0	0	0	8
Providence	2	2	0	0	0	4	1	1	0	0	48
Connecticut:											
Bridgeport	2	0	0	0	0	1	0	1	0	2	24
Hartford	1	0	0	0	0	1	1	2	0	5	21
New Haven	1	0	0	0	0	0	2	1	0	5	42
MIDDLE ATLANTIC											
New York:											
Buffalo	5	8	0	0	0	14	2	0	0	24	106
New York	28	15	0	0	0	92	36	29	3	74	1,212
Rochester	2	1	0	0	0	3	1	0	0	14	53
Syracuse	3	0	0	0	0	2	1	0	0	13	51
New Jersey:											
Camden	1	0	1	0	0	1	1	2	1	0	24
Newark	4	3	0	0	0	6	2	1	0	24	87
Trenton	0	1	0	0	0	2	1	0	0	0	29
Pennsylvania:											
Philadelphia	18	8	0	0	0	26	11	0	0	91	411
Pittsburgh	8	6	0	0	0	10	2	2	2	21	131
Reading	0	0	0	0	0	0	1	0	1	32	18
EAST NORTH CENTRAL											
Ohio:											
Cincinnati	4	1	0	0	0	6	2	3	0	27	126
Cleveland	11	1	0	0	0	16	5	2	0	58	180
Columbus	2	2	0	0	0	1	0	0	0	12	61
Toledo	4	0	0	0	0	4	2	1	0	26	50
Indiana:											
Fort Wayne	0	0	0	0	0	0	1	0	0	1	27
Indianapolis	1	1	1	1	0	0	1	5	0	7	76
South Bend	1	1	0	0	0	0	0	0	0	1	8
Terre Haute	0	0	0	0	0	1	0	2	0	0	16
Illinois:											
Chicago	24	18	1	0	0	49	6	6	0	109	670
Springfield	0	0	0	0	0	1	1	1	0	9	19
Michigan:											
Detroit	23	18	2	0	0	22	5	6	0	216	222
Flint	3	3	0	1	0	2	1	1	0	4	29
Grand Rapids	3	0	0	0	0	1	0	0	0	3	4
Wisconsin:											
Kenosha	0	0	0	0	0	1	0	0	0	5	10
Milwaukee	6	10	1	0	0	5	1	0	0	113	88
Racine	1	----	0	----	----	----	0	----	----	----	----
Superior	1	1	0	0	0	0	0	2	0	0	4
WEST NORTH CENTRAL											
Minnesota:											
Duluth	3	2	0	0	0	3	1	2	0	1	30
Minneapolis	12	3	1	0	0	5	1	5	0	6	80
St. Paul	5	5	1	0	0	5	1	2	0	17	49

City reports for week ended August 18, 1928—Continued

Division, State, and city	Scarlet fever: Cases, estimated expectancy	Scarlet fever: Cases reported	Smallpox: Cases, estimated expectancy	Smallpox: Cases reported	Smallpox: Deaths reported	Tuberculosis, deaths reported	Typhoid fever: Cases, estimated expectancy	Typhoid fever: Cases reported	Typhoid fever: Deaths reported	Whooping cough, cases reported	Deaths, all causes
WEST NORTH CENTRAL—con.											
Iowa:											
Davenport	0	0	0	0	--------	--------	0	0	--------	1	--------
Des Moines	2	3	0	0	--------	--------	0	0	--------	0	35
Sioux City	0	0	0	0	--------	--------	0	0	--------	0	--------
Waterloo	0	0	0	0	--------	--------	0	0	--------	2	--------
Missouri:											
Kansas City	2	2	0	0	0	4	3	1	0	2	81
St. Joseph	0	0	0	0	0	1	1	0	0	0	25
St. Louis	7	10	0	0	0	10	7	7	0	11	190
North Dakota:											
Fargo	1	5	0	0	0	0	0	0	0	2	3
Grand Forks	2	0	0	0	--------	--------	0	0	--------	0	--------
South Dakota:											
Sioux Falls	0	2	0	0	--------	--------	0	0	--------	0	--------
Nebraska:											
Lincoln	0	2	0	2	0	0	0	0	0	17	16
Omaha	1	1	0	0	0	2	0	3	1	2	43
Kansas:											
Topeka	1	2		0	0	0	1	0	0	6	7
Wichita	1	1	0	0	0	0	2	1	0	18	28
SOUTH ATLANTIC											
Delaware:											
Wilmington	0	0	0	0	0	0	0	0	0	2	16
Maryland:											
Baltimore	6	3	0	0	0	15	10	3	0	124	184
Cumberland	1	0	0	0	0	2	2	0	0	0	11
Frederick	0	0	0	0	0	0	0	2	0	0	3
District of Columbia:											
Washington	3	1	0	0	0	7	5	3	1	10	95
Virginia:											
Lynchburg	0	0	0	0	0	2	1	1	0	0	11
Norfolk	1	2	1	0	0	3	2	0	0	0	--------
Richmond	2	0	0	0	0	3	2	0	0	2	46
Roanoke	1	0	0	0	0	1	2	1	0	0	16
West Virginia:											
Charleston	0	2	0	0	0	2	1	0	0	0	19
Wheeling	1	0	0	0	0	1	0	0	0	0	15
North Carolina:											
Raleigh	1	0	0	0	0	1	0	0	0	0	17
Wilmington	0	0	0	0	0	0	1	0	0	2	6
Winston-Salem	0	0	0	0	0	0	2	2	0	1	19
South Carolina:											
Charleston	0	1	0	0	0	2	2	1	0	0	17
Columbia	0	1	0	0	0	0	1	1	0	1	18
Greenville	0	--------	0	--------	--------	--------	0	--------	--------	--------	--------
Georgia:											
Atlanta	3	0	1	0	0	1	4	4	3	0	58
Brunswick	0	--------	0	--------	--------	--------	0	--------	--------	--------	--------
Savannah	0	1	0	0	0	3	1	0	0	1	33
Florida:											
Miami	0	0	0	0	0	1	0	2	0	0	23
St. Petersburg	0	--------	0	--------	0	0	0	--------	0	--------	7
Tampa	0	0	0	0	0	2	0	0	2	0	29
EAST SOUTH CENTRAL											
Kentucky:											
Covington	0	1	1	0	0	0	0	0	0	0	18
Louisville	1	3	0	0	0	4	5	5	0	1	94
Tennessee:											
Memphis	0	1	0	0	0	3	7	4	2	5	68
Nashville	1	0	0	0	0	4	7	3	1	3	52
Alabama:											
Birmingham	3	0	0	0	0	3	6	4	1	8	78
Mobile	0	0	0	0	0	0	0	2	1	0	20
Montgomery	1	0	0	0	--------	--------	1	1	--------	1	--------

City reports for week ended August 18, 1928—Continued

Division, State, and city	Scarlet fever		Smallpox			Tuberculosis, deaths reported	Typhoid fever			Whooping cough, cases reported	Deaths, all causes
	Cases, estimated expectancy	Cases reported	Cases, estimated expectancy	Cases reported	Deaths reported		Cases, estimated expectancy	Cases reported	Deaths reported		
WEST SOUTH CENTRAL											
Arkansas:											
Fort Smith	0	0	0	0	-------	-------	0	9	-------	0	-------
Little Rock	0	0	0	0	0	4	2	2	0	0	-------
Louisiana:											
New Orleans	2	0	0	0	0	12	5	3	1	7	132
Shreveport	0	0	0	0	0	1	1	7	0	0	25
Oklahoma:											
Oklahoma City	1	1	0	1	0	0	3	6	2	0	26
Texas:											
Dallas	2	2	1	0	0	1	4	3	1	9	52
Fort Worth	1	1	1	0	0	1	0	2	2	0	40
Galveston	0	0	0	0	0	1	0	0	0	0	12
Houston	1	2	0	0	0	5	0	0	0	0	68
San Antonio	0	0	0	0	0	4	2	0	0	0	56
MOUNTAIN											
Montana:											
Billings	0	0	0	0	0	0	0	0	0	2	10
Great Falls	0	0	0	0	0	0	1	1	0	0	9
Helena	0	0	0	0	0	1	0	0	0	0	5
Missoula	0	0	0	0	0	0	1	0	0	0	4
Idaho:											
Boise	0	0	0	0	0	0	0	0	0	0	6
Colorado:											
Denver	3	2	0	0	0	3	2	0	0	25	66
Pueblo	0	1	0	0	0	1	1	1	0	0	9
New Mexico:											
Albuquerque	0	0	0	0	0	2	2	0	0	0	12
Utah:											
Salt Lake City	1	0	0	0	0	0	1	2	0	16	34
Nevada:											
Reno	0	0	0	0	0	0	0	0	0	0	3
PACIFIC											
Washington:											
Seattle	3	0	1	0	-------	-------	2	1	-------	2	-------
Spokane	3	1	1	0	-------	-------	1	0	-------	0	-------
Tacoma	1	0	1	1	0	0	1	1	0	1	26
Oregon:											
Portland	2	1	5	14	0	1	1	2	0	1	-------
California:											
Los Angeles	8	2	2	0	0	22	3	4	0	39	209
Sacramento	1	5	0	0	0	1	2	0	0	9	20
San Francisco	5	6	0	0	0	12	2	4	0	8	127

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									
Maine:									
Portland	0	0	0	0	0	0	0	1	0
Massachusetts:									
Boston [1]	0	0	0	0	0	0	2	12	1
Fall River	0	0	0	0	0	0	1	2	0
Connecticut:									
Hartford	0	0	0	0	0	0	0	2	0

[1] Poliomyelitis: 8 cases nonresident.

City reports for week ended August 18, 1928—**Continued**

Division, State, and city	Meningococcus meningitis		Lethargic encephalitis		Pellagra		Poliomyelitis (infantile paralysis)		
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases, estimated expectancy	Cases	Deaths
MIDDLE ATLANTIC									
New York:									
Buffalo	0	0	0	0	0	0	1	3	1
New York	31	13	2	2	0	0	9	78	18
Syracuse	0	0	0	0	0	0	0	4	0
New Jersey:									
Newark	1	0	0	0	0	0	1	2	0
Trenton	0	0	0	0	0	0	0	1	0
Pennsylvania:									
Philadelphia	1	2	0	1	0	0	1	0	0
EAST NORTH CENTRAL									
Ohio:									
Cleveland	0	0	0	0	0	0	1	6	1
Toledo	1	0	0	0	0	0	0	0	0
Illinois:									
Chicago	7	1	0	1	2	2	3	1	0
Springfield	0	0	0	0	0	0	0	1	0
Michigan:									
Detroit	0	1	1	1	0	0	0	0	0
Wisconsin:									
Milwaukee	1	0	0	0	0	0	1	0	0
WEST NORTH CENTRAL									
Minnesota:									
Minneapolis	0	0	0	0	0	0	0	0	1
Iowa:									
Des Moines	0	0	0	0	0	0	0	2	0
Missouri:									
Kansas City	2	0	0	0	0	0	0	0	0
St. Louis	3	1	0	0	0	0	1	0	0
North Dakota:									
Fargo	0	0	0	0	0	0	0	2	0
SOUTH ATLANTIC									
Maryland:									
Baltimore	0	1	0	0	0	0	1	11	1
Cumberland	0	0	0	0	0	0	0	0	1
District of Columbia:									
Washington	0	0	0	0	0	0	0	3	1
Virginia:									
Richmond	0	0	0	0	0	0	0	1	0
West Virginia:									
Charleston	0	0	0	0	0	0	0	1	0
North Carolina:									
Raleigh	0	0	0	0	0	1	0	0	0
Winston-Salem	0	0	0	0	0	2	0	0	0
South Carolina:									
Charleston [2]	1	0	0	0	2	0	0	0	0
Columbia	0	0	0	0	0	1	0	0	0
Georgia:									
Atlanta	0	0	1	0	0	0	0	0	0
Savannah	0	0	0	0	2	2	0	0	0
Florida:									
Miami	0	0	0	0	0	1	0	0	0
Tampa [2 3]	1	0	0	0	0	0	0	0	0
EAST SOUTH CENTRAL									
Tennessee:									
Memphis [4]	0	0	0	0	1	0	1	0	0
Nashville	0	0	0	0	0	1	0	0	0
Alabama: [3]									
Birmingham	0	0	0	0	3	2	0	0	0
Montgomery	0	0	0	0	1	0	0	0	0

[2] Dengue: 4 cases; 3 at Charleston, S. C., and 1 case at Tampa, Fla.
[3] Typhus fever: 3 cases; 1 case at Tampa, Fla., and 2 cases at Mobile, Ala.
[4] Rabies (in man); 1 case and 1 death at Memphis, Tenn.

City reports for week ended August 18, 1928—Continued

Division, State, and city	Meningococcus meningitis		Lethargic encephalitis		Pellagra		Poliomyelitis (infantile paralysis)		
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases, estimated expectancy	Cases	Deaths
WEST SOUTH CENTRAL									
Louisiana:									
New Orleans	0	0	0	0	3	1	0	0	0
Shreveport	0	0	0	0	0	1	0	0	0
Oklahoma:									
Oklahoma City	0	0	0	0	0	1	0	0	0
Texas:									
Houston	0	0	0	0	0	0	0	1	0
MOUNTAIN									
Montana:									
Billings	0	1	0	0	0	0	0	0	0
Utah:									
Salt Lake	1	0	0	0	0	0	0	0	0
PACIFIC									
Washington:									
Seattle	0	0	0	0	0	0	1	7	0
Spokane	0	0	0	0	0	0	0	1	0
Tacoma	1	0	0	1	0	0	0	1	0
Oregon:									
Portland	2	0	1	0	0	0	0	1	2
California:									
Los Angeles	2	0	0	0	0	1	0	2	0
San Francisco	0	0	0	0	0	0	0	1	0

The following table gives the rates per 100,000 population for 101 cities for the five-week period ended August 18, 1928, compared with those for a like period ended August 20, 1927. The population figures used in computing the rates are approximate estimates as of July 1, 1928 and 1927, respectively, authoritative figures for many of the cities not being available. The 101 cities reporting cases had estimated aggregate populations of approximately 31,657,000 in 1928 and 31,050,000 in 1927. The 95 cities reporting deaths had nearly 30,961,000 estimated population in 1928 and nearly 30,370,000 in 1927. The number of cities included in each group and the estimated aggregate populations are shown in a separate table below.

Summary of weekly reports from cities, July 15 to August 18, 1928—Annual rates per 100,000 population compared with rates for the corresponding period of 1927 [1]

DIPHTHERIA CASE RATES

	Week ended—									
	July 21, 1928	July 23, 1927	July 28, 1928	July 30, 1927	Aug. 4, 1928	Aug. 6, 1927	Aug. 11, 1928	Aug. 13, 1927	Aug. 18, 1928	Aug. 20, 1927
101 cities	69	[2] 92	[3] 67	[3] 94	[4] 65	78	[5] 60	90	[6] 55	80
New England	46	63	46	91	57	63	60	70	48	112
Middle Atlantic	90	105	81	103	67	92	[7] 59	97	55	94
East North Central	77	108	64	102	73	80	73	94	[8] 60	85
West North Central	53	53	58	55	[9] 78	42	[10] 60	67	57	44
South Atlantic	46	[2] 87	61	88	51	65	[11] 49	81	[12] 64	61
East South Central	25	25	50	30	[13] 25	30	10	25	40	51
West South Central	56	124	68	70	40	91	52	91	44	74
Mountain	35	99	62	117	35	134	[14] 36	179	27	54
Pacific	54	65	[3] 57	[3] 121	[3] 84	76	69	107	46	60

MEASLES CASE RATES

	July 21, 1928	July 23, 1927	July 28, 1928	July 30, 1927	Aug. 4, 1928	Aug. 6, 1927	Aug. 11, 1928	Aug. 13, 1927	Aug. 18, 1928	Aug. 20, 1927
101 cities	163	[2] 108	[3] 128	[3] 58	[4] 99	48	[5] 58	28	[6] 36	32
New England	503	198	651	170	526	93	248	63	64	84
Middle Atlantic	203	92	126	45	78	43	[7] 52	28	40	34
East North Central	145	90	83	47	84	29	63	19	[8] 40	13
West North Central	62	48	29	40	[9] 7	34	[10] 16	22	21	22
South Atlantic	89	[2] 140	70	69	56	38	[11] 22	14	[12] 30	27
East South Central	80	25	80	46	[13] 19	10	25	15	20	5
West South Central	4	54	0	58	0	54	4	21	28	41
Mountain	186	99	80	63	97	45	[14] 45	36	44	18
Pacific	20	279	[3] 54	[3] 66	[3] 30	144	20	60	8	71

SCARLET FEVER CASE RATES

	July 21, 1928	July 23, 1927	July 28, 1928	July 30, 1927	Aug. 4, 1928	Aug. 6, 1927	Aug. 11, 1928	Aug. 13, 1927	Aug. 18, 1928	Aug. 20, 1927
101 cities	56	[2] 64	[3] 42	[3] 63	[4] 48	51	[5] 36	57	[6] 30	50
New England	78	100	57	107	53	51	67	93	39	51
Middle Atlantic	33	50	27	39	28	35	[7] 19	39	20	31
East North Central	88	75	56	87	58	75	42	73	[8] 37	78
West North Central	72	79	60	79	[9] 75	61	[10] 70	75	60	63
South Atlantic	28	[2] 40	35	40	42	27	[11] 25	32	[12] 20	41
East South Central	45	30	30	41	[13] 76	51	35	35	25	20
West South Central	32	45	20	25	76	25	36	58	16	50
Mountain	44	99	27	152	27	126	[14] 18	117	27	81
Pacific	79	91	[3] 71	[3] 66	[3] 68	60	38	63	36	42

SMALLPOX CASE RATES

	July 21, 1928	July 23, 1927	July 28, 1928	July 30, 1927	Aug. 4, 1928	Aug. 6, 1927	Aug. 11, 1928	Aug. 13, 1927	Aug. 18, 1928	Aug. 20, 1927
101 cities	4	[2] 10	[3] 2	[3] 5	[4] 3	6	[5] 1	4	[6] 0	5
New England	0	0	0	0	0	0	0	0	0	0
Middle Atlantic	0	0	0	0	0	0	[7] 0	0	0	0
East North Central	3	13	1	9	7	9	1	5	[8] 1	7
West North Central	14	12	4	6	[9] 0	0	[10] 2	4	0	10
South Atlantic	5	[2] 12	0	4	2	9	[11] 2	5	[12] 0	4
East South Central	10	35	25	10	[13] 13	5	0	0	0	25
West South Central	4	8	0	12	0	17	0	0	0	4
Mountain	18	117	18	27	35	18	[14] 0	9	0	18
Pacific	10	21	[3] 3	[3] 10	[3] 10	21	8	24	3	13

[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, 1928 and 1927, respectively.

[2] Norfolk, Va., not included.

[3] Seattle, Wash., and Spokane, Wash., not included.

[4] Kansas City, Mo., Birmingham, Ala., Seattle, Wash., and Spokane, Wash., not included.

[5] Pittsburgh, Pa., Sioux City, Iowa, Lynchburg, Va., Raleigh, N. C., Brunswick, Ga., and Reno, Nev., not included.

[6] Racine, Wis., Greenville, S. C., and Brunswick, Ga., not included.

[7] Pittsburgh, Pa., not included.

[8] Racine, Wis., not included.

[9] Kansas City, Mo., not included.

[10] Sioux City, Iowa, not included.

[11] Lynchburg, Va., Raleigh, N. C., and Brunswick, Ga., not included.

[12] Greenville, S. C., and Brunswick, Ga., not included.

[13] Birmingham, Ala., not included.

[14] Reno, Nev., not included.

Summary of weekly reports from cities, July 15 to August 18, 1928—Annual rates per 100,000 population compared with rates for the corresponding period of 1927—Continued

TYPHOID FEVER CASE RATES

	Week ended—									
	July 21, 1928	July 23, 1927	July 28, 1928	July 30, 1927	Aug. 4, 1928	Aug. 6, 1927	Aug. 11, 1928	Aug. 13, 1927	Aug. 18, 1928	Aug. 20, 1927
101 cities	18	[2] 20	[3] 22	[3] 21	[4] 22	25	[5] 27	25	[6] 27	37
New England	7	16	11	9	5	7	16	30	16	30
Middle Atlantic	12	8	17	13	17	13	[7] 15	15	17	20
East North Central	7	9	5	11	10	9	14	14	[8] 18	19
West North Central	12	14	23	16	[9] 9	26	[10] 26	22	41	38
South Atlantic	30	[2] 50	35	36	44	58	[11] 49	45	[12] 32	81
East South Central	100	122	120	117	[13] 140	183	175	96	95	218
West South Central	88	54	104	54	60	50	72	87	96	79
Mountain	0	27	27	72	0	45	[14] 9	36	35	27
Pacific	18	16	[3] 17	[3] 24	[3] 27	13	15	10	26	31

INFLUENZA DEATH RATES

	July 21, 1928	July 23, 1927	July 28, 1928	July 30, 1927	Aug. 4, 1928	Aug. 6, 1927	Aug. 11, 1928	Aug. 13, 1927	Aug. 18, 1928	Aug. 20, 1927
95 cities	5	[2] 3	4	3	[15] 6	2	[16] 5	3	[6] 3	4
New England	9	0	5	2	2	0	0	2	2	2
Middle Atlantic	4	4	2	4	6	1	5	2	0	2
East North Central	5	2	6	1	3	0	1	2	[8] 4	2
West North Central	2	2	2	0	[9] 2	2	4	6	0	0
South Atlantic	7	[2] 2	5	2	14	5	[11] 7	4	[12] 0	5
East South Central	0	16	16	11	[13] 0	5	10	5	0	11
West South Central	4	0	12	8	12	4	29	13	29	30
Mountain	9	9	9	0	0	9	[14] 9	0	0	0
Pacific	3	3	0	3	10	3	0	3	10	0

PNEUMONIA DEATH RATES

	July 21, 1928	July 23, 1927	July 28, 1928	July 30, 1927	Aug. 4, 1928	Aug. 6, 1927	Aug. 11, 1928	Aug. 13, 1927	Aug. 18, 1928	Aug. 20, 1927
95 cities	56	[2] 56	43	49	[15] 52	47	[16] 59	55	[6] 55	45
New England	55	56	34	49	57	33	48	77	37	49
Middle Atlantic	60	59	51	56	60	46	72	57	66	47
East North Central	57	55	29	42	31	44	33	41	[8] 42	35
West North Central	26	21	20	17	[9] 43	43	53	43	31	25
South Atlantic	51	[2] 73	84	43	49	52	[11] 58	70	[12] 55	52
East South Central	52	48	105	48	[13] 81	53	110	69	115	69
West South Central	53	64	57	85	86	68	107	55	57	68
Mountain	80	45	80	36	62	54	[14] 72	63	62	36
Pacific	81	72	10	79	78	62	57	55	61	72

[2] Norfolk, Va., not included.
[3] Seattle, Wash., and Spokane, Wash., not included.
[4] Kansas City, Mo., Birmingham, Ala., Seattle, Wash., and Spokane, Wash., not included.
[5] Pittsburgh, Pa., Sioux City, Iowa, Lynchburg, Va., Raleigh, N. C., Brunswick, Ga., and Reno, Nev., not included.
[6] Racine, Wis., Greenville, S. C., and Brunswick, Ga., not included.
[7] Pittsburgh, Pa., not included.
[8] Racine, Wis., not included.
[9] Kansas City, Mo., not included.
[10] Sioux City, Iowa, not included.
[11] Lynchburg, Va., Raleigh, N. C., and Brunswick, Ga., not included.
[12] Greenville, S. C., and Brunswick, Ga., not included.
[13] Birmingham, Ala., not included.
[14] Reno, Nev., not included.

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

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

FOREIGN AND INSULAR

THE FAR EAST

Report for the week ended August 11, 1928.—The following report for the week ended August 11, 1928, was transmitted by the Eastern Bureau of the Health Section of the Secretariat of the League of Nations, located at Singapore, to the headquarters at Geneva.

Plague, cholera, or smallpox was reported at the following ports:

PLAGUE

India.—Bombay, Rangoon.

CHOLERA

India.—Bombay, Calcutta, Madras, Rangoon, Vizagapatam, Negapatam, Tuticorin.

French India.—Pondicherry.

Siam.—Bangkok.

China.—Shanghai, Canton.

SMALLPOX

India.—Bombay, Calcutta, Madras, Rangoon, Negapatam, Moulmein.

French India.—Pondicherry.

Dutch East Indies.—Belawan Deli, Surabaya.

China.—Hong Kong, Shanghai.

CANADA

Provinces—Communicable diseases—Week ended August 11, 1928.—The Canadian Ministry of Health reports cases of certain communicable diseases from seven Provinces of Canada for the week ended August 11, 1928, as follows:

Disease	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	Total
Cerebrospinal fever			2	1	1			4
Influenza				3	1			4
Lethargic encephalitis					1			1
Poliomyelitis					7		2	9
Smallpox		1	9			1		11
Typhoid fever		4	13	26	3		2	48

Quebec—Communicable diseases—Week ended August 18, 1928.—The Provincial Bureau of Health reports cases of certain communicable diseases for the week ended August 18, 1928, as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	1	Poliomyelitis	1
Chicken pox	18	Scarlet fever	41
Diphtheria	35	Smallpox	5
German measles	2	Tuberculosis	46
Measles	6	Typhoid fever	7
Mumps	2	Whooping cough	13

GERMANY

Vital statistics, 1913, and 1925 to 1927.—Figures compiled by the Federal Bureau of Statistics of Germany show an increase in the marriage rate and decreases in the rates for births, deaths, and infant mortality.

The following tables give summaries of the figures:

	1927	1926
Marriages	538, 525	438, 198
Live births	1, 160, 206	1, 227, 900
Stillborn	38, 117	41, 519
Deaths (excluding stillborn)	757, 257	734, 359
Excess of births	402, 949	493, 541

Year	Rates per 1,000 population			Deaths under 1 year per 1,000 births
	Marriages	Live births	Deaths	
1927	8. 5	18. 3	12. 0	97
1926	7. 7	19. 5	11. 7	102
1925	7. 7	20. 7	11. 9	105
1913	7. 8	26. 9	14. 8	151

SWEDEN

Stockholm—Rat extermination.—An extensive campaign for the extermination of rats by poisoning was begun in March, 1928, in Stockholm, Sweden. Poison was distributed in one part of the city at a time, the rats being allowed free passage from house to house for one week after the poison had been distributed. Then all connections between houses were stopped, giving the rats the best opportunities of encountering and eating the poisoned bait. By June 8, of the 399 houses treated with poison only 14 still contained rats. Other measures for rat control are also being taken, as the cleaning of yards, disposal of refuse, and screening of windows.

VIRGIN ISLANDS

Communicable diseases—July, 1928.—During the month of July, 1928, cases of communicable diseases were reported in the Virgin Islands of the United States as follows:

St. Thomas and St. John:	Cases
Gonorrhea	1
Syphilis	3
Tetanus	1
Uncinariasis	1

St. Croix:	Cases
Fish poisoning (barracuda)	2
Gonorrhea	3
Syphilis (secondary)	21
Tetanus	1
Tuberculosis	3

YUGOSLAVIA

Communicable diseases—July, 1928.—During the month of July, 1928, communicable diseases were reported in Yugoslavia as follows:

Diseases	Cases	Deaths	Diseases	Cases	Deaths
Anthrax	98	8	Rabies	1	1
Cerebrospinal meningitis	5	4	Scarlet fever	1, 116	168
Diphtheria	139	16	Tetanus	47	23
Dysentery	97	2	Typhoid fever	220	18
Lethargic encephalitis	1	1	Typhus fever	12	3
Measles	530	25			

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

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

CHOLERA

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

Place		Jan. 15–Feb. 11, 1928	Feb. 12–Mar. 10, 1928	Mar. 11–Apr. 7, 1928	Apr. 8–May 5, 1928	May 6–June 2, 1928	Week ended— June, 1928: 9	June 16	June 23	June 30	July, 1928: 7	July 14	July 21	July 28	August, 1928: 4	Aug. 11	Aug. 18
Ceylon: Colombo	C										1						
	D										1						
China:																	
Canton	C			2		1	1			1	2	2	1	3		2	
	D			2		1	1			1	2	2	1	3		1	
Shanghai	C														2	1	P
Swatow	C									3	7						
India	C	12,391	13,236	21,279	32,564	30,177	7,479	8,174	8,028								
	D	6,750	7,282	11,877	20,432	20,162	5,361	5,355	5,054								
Bassein	D	1	2	51	41	40		8									
Bombay	C	1	1	3		1					4		2				
	D		1	3							3		2	6		1	
Calcutta	C	203	341	664	446	552	135	133	119	75	65	62	48				
	D	112	241	442	428	410	83	85	97	58	45	42	26	20		11	
Madras	C	2	14	10	22	27		3	14	12	13	4	10				
	D	4	18	4	18	16	6	1	5	9	5	3	6	17		99	
Madras Presidency	C	4,681	2,961	1,483		1,314	978										
	D	2,660	1,618	812		675	460										
Negapatam	C	4	4														
	D	6	4		2					13						1	
Rangoon	C	6	29	22	23	7	8	2	4				1				
	D	2	18	16	15	5	5	2	2							2	
Tuticorin	C			10	110											1	
	D			9	71												
Vizagapatam	D											4	1	2		12	
India (French):																	
Chandernagor	C	6	5	7										2	1		
	D	1	5	6										1	1		
Karikal	C	32	6		1										1		
	D	19	5		1										1		
Pondicherry	C	12	33	1	8							1		2	8	1	
	D	10	19	1	8							1		2	6		

Indo-China (see also table below):																	
Pnompenh	C										1	2	1	1			
	D										1	2	1	1			
Saigon	C	4	16	96	116	15	5	1					2				
	D	1	8	59	76	9	1						1				
Tourane	C							1									
	D							1									
Kwangchow-Wan (see table below).																	
Persian Gulf:																	
Island of Henjam	C												1				
Jask	C													1			
Philippine Islands:																	
Cebu port	C													1			
Manila	C											4			1		
Siam	C	200	295	291	349	202	51	49	43	60	58	35	10	60			
	D	139	214	218	234	127	36	30	30	48	39	29	7	48			
Ayudhaya	C						2								1	15	
	D						1									16	
Bangkok	C	101	60	60	74	50	3	3	1		3	5	1		1	1	
	D	66	36	33	35	26		2	2			2	1				
Trad	C							1									
Straits Settlements: Singapore	C	3		2	1												
	D	1		2	1												
On vessel:																	
S. S. Hawaii Maru at Singapore from Saigon, French Indo-China	C			11													

Place		July-September, 1927	October-December, 1927	January-March, 1928	April, 1928	May, 1928			June, 1928			July, 1928	
						1-10	11-20	21-31	1-10	11-20	21-30	1-10	11-20
Indo-China (French) (see also table above):													
Annam	C	3,179	370	389	46	4	26	13	22	8	9	8	5
Cambodia	C	251	337	312	196	34	47	20	28	82	111	92	25
Cochin-China	C	469	391	1,407	933	140	139	125	143	109	77	65	55
Laos	C	246	77										
Tonkin	C	1,297	3	1	6	9	1	16	8	2	1	5	1
Kwangchow-Wan	C	16					16						1

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

PLAGUE

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

Place		Jan. 15–Feb. 11, 1928	Feb. 12–Mar. 10, 1928	Mar. 11–Apr. 7, 1928	Apr. 8–May 5, 1928	May 6–June 2, 1928	Week ended— June, 1928: 9	June 16	June 23	June 30	July, 1928: 7	July 14	July 21	July 28	August, 1928: 4	Aug. 11	Aug. 18	Aug. 25
Algeria (see also table below):																		
Algiers	C				1													
Oran	C					1	2											
Arabia: Aden	C	178	343	651	224	7		1										
	D	104	206	529	191	9		1										
Plague-infected rats		P	P															
Argentina:																		
Avellaneda	C					1												
	D					1												
Buenos Aires	C	2				6			1									
	D					3		1		1								
Cordoba Province	C				5													
Entre Rios	C						2	1		2								
Loreto	C					3												
Rosario	C	4	1			1					1							
Sante Fe	C						7	1	1		1							
Santiago del Estero	C		1				9	1			1							
Suardi	C					2												
Azores: St. Michaels Island	C	8	3	3	5	1	1											
	D	4	1	2	2	1	1											
Bolivia: Valle Grande	C														P			
Brazil:																		
Bahia	C	5	24	28	6	3												
	D	4	19	21	6	3												
Porto Alegre	C		1															
Rio de Janeiro	C	4	3	3														
	D	1	2	3														
Plague-infected rats		1																
British East Africa (see also table below):																		
Tanganyiki	C	2	3										4					
	D	2	3		10						24		3					
Uganda	C	23	13			84	50		55									
	D	18	10			70	42		43									

Canary Islands:																		
Arrecife	C					1												
	D					1												
Lanzarote Village	C					1												
Las Palmas	C	1	1	4														
	D	1	1															
Palma Island	C																	7
	D																	3
Teneriffe	C		10															
	D		4															
Ceylon: Colombo	C	3	11	7	1	4	2											
	D	2	6	5	1	2	2											
Plague-infected rats		5	6															
China:																		
Amoy	C					5						P						
Hong Kong	C				2				1					1				
	D								1									
Dutch East Indies:																		
Celebes—Makassar	C	5	1															
	D	5	1															
Java	D	737	454															
Batavia and West Java	C	137	103	80	47	65	22	16	8	15	6	7						
	D	135	103	80	47	65	22	16	8	15	6	7						
Plague-infected rats				3	7	9	2	1		1			1	1				
East Java and Madura	C	7		4	4						1							
	D	7		4	4													
Kedoe Residency	C				4						P							
Surabaya Residency	C		1	1	1													
	D			1	1													
Ecuador (see also table below):																		
Alausi	C					1												
Egypt:																		
Alexandria	C	2	1			1					2				1	1		
	D	2	1			2												
Amrieh District	C																13	13
Assiout Province	C											1	1					
	D												1					
Beheira	C														1	1		
Beni-Souef	C				12	79	14	3	4	4	11	3	5	6	1	1	1	
	D				3	27	7		2			1	1	3				
Maghagha District	C				1													
	D				1													
Menufia	C					11												
	D					2												
Minieh Province	C				48	76	22	23	21	10	1	11		1				
	D				9	17	9	5	7	3	1	2						
Port Said	C													1	1			1
Sidi Barani	C										10	1		1	10			
	D											7		1	1			
Suez	C	4	13	14	5	3												
	D	2	9		13	1												
Plague-infected rats				2														
Tanta	C					1					1			1	1	1		
	D					1												

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

PLAGUE—Continued

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

Place		Jan. 15–Feb. 11, 1928	Feb. 12–Mar. 10, 1928	Mar. 11–Apr. 7, 1928	Apr. 8–May 5, 1928	May 6–June 2, 1928	Week ended— June, 1928: 9	June 16	June 23	June 30	July, 1928: 7	July 14	July 21	July 28	August, 1928: 4	Aug. 11	Aug. 18	Aug. 25
Greece:																		
Corfu	C							1	14						1			
	D								3									
Patras	C													1		1		
	D											1						
Hawaii Territory: Hawaii:																		
Hamakua District—																		
Hamakua	D		1															
Plague-infected rats						1										1		
Honokaa—Plague-infected rats						1												
Kukuihaele	D															1		
Plague-infected rats													1					
Kukaiau—Plague-infected rats																3		
Paauilo	D													1		1		
India	C	12,652	23,174	26,079	18,518	3,272	127	79	90									
	D	8,521	16,998	20,907	17,074	3,183	143	77	74									
Bassein	D	8	12	22	13	3	12	1	1			1	2					
Bombay	C	14	33	69	43	39	8	3	3									
	D	9	33	61	69	38	5	1	2					1		2		
Calcutta	D	1		2														
Madras Presidency	C	452	271	62	21	12	4	6	29	15	14							
	D	256	212	48	12	6	1	2	15	7	9							
Rangoon	C	35	48	30	16	14	3	8	12	8	9	12						
	D	30	43	26	14	15	3	8	10	7	10	11	10	8		8		
Vizagapatam	D									1								
Indo-China (see also table below).																		
Pnompenh	C										3		1					
	D										3		1					
Saigon	C							5										
	D							1										
Plague-infected rats								2										
Iraq:																		
Baghdad	C	4	2	5	11	13	3	2	3	1				1				
	D	2	2	5	6	3	1	1	1	1								
Plague-infected rats					4	3												
Dulaim Liwa	C	1			1													

Kwangchow-Wan (see table below).																		
Madagascar (see also table below):																		
Tamatave	C					1	1	6	5	8	3							
	D							4		4	3							
Nigeria (see also table below):																		
Lagos	C	10	8	7	17	28	11	10	14	8	15	14	14	10	14	12		
	D	11	8	6	18	28	10	10	14	8	15	14	14	9	15	11		
Plague-infected rats					8	55	10	27	12	8	23							
Paraguay: Asuncion	C							5										
	D							2			2							
Peru (see table below).																		
Portugal: Lisbon	C									1								
Senegal (see also table below):																		
Thies and vicinity	C			8		72	52											
	D			4		40	40											
Siam	C	20	42	33	27	15	1	3	2		3	6						
	D	12	36	30	13	11	2	2	3		2	5						
Ayudhaya	C						2				2							
	D						1				2							
Bangkok	C	2	1	1	4													
	D	2	1	1	2													
Nagara	C					1	2											
Straits Settlements: Singapore	C	1	3	1														
	D	1	2	1														
Syria (see also table below):																		
Beirut	C								1		2	1	1	1				
Tunisia: Bengardane region	C			8														
	D			6														
Turkey: Adalia	C													1				
Union of South Africa:																		
Cape Province	C	1																
	D	1																
Orange Free State	C	5	5	5							P							
	D	4	1	5														
Union of Socialist Soviet Republics: Astrakhan—																		
Axary District	C							3										
	D							2										
Venezuela: State of Miranda—Tacata and Cua	C		P															
On vessel: S. S. Tymeric, at Barbados, from New Orleans	C					1												

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

PLAGUE—Continued

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

Place		October-December, 1927	January-March, 1928	April, 1928	May, 1928	June, 1928	July, 1928
Algeria (see also table above):							
Algiers	C	2			1		
Angola	C	3					
British East Africa (see also table above):							
Kenya	C	62	65	17	11	58	
	D			5			
Ecuador: Guayaquil	C	18	20		1	5	
	D	5	8			2	
Plague-infected rats		31	75		1	4	7
Indo-China (see also table above)	C	10	12	9	16		
Kwangchow-Wan	C		18	17	10		
Madagascar (see also table above)	C	692	940	95		104	
	D	605	864	90		94	
Ambositra Province	C	25	202	25	13		
	D	17	191	25	10		
Antisirabe Province	C	109	281	35	14	19	
	D	108	279	34	14	19	
Itasy Province	C	104	55	1			
	D	94	49	1			
Moramanga Province	C	95	56				
	D	83	55				

Place		October-December, 1927	January-March, 1928	April, 1928	May, 1928	June, 1928	July, 1928
Madagascar—Continued.							
Tamatave	C				1	7	
	D					7	
Tananarive Province	C	408	348	34	20	17	
	D	354	292	30	30	17	
Nigeria (see also table above)	C	63	41	18	30		
	D	61	41	17	30		
Peru	C	34	93		20		
	D	11	23		4		
Callao	D	3					
Lima	C	7	6		4		
	D	3			2		
Senegal (see also table above)	C		30	81	216	151	
	D		17	40	115	91	
Rufisque	C				17	29	12
	D				9	22	5
Thies	C			30	72	243	103
	D			23	40	174	64
Tivaouane	C			51	105	169	84
	D			28	57	90	70
Syria: Beirut (see also table above)	C	2				1	4

PLAGUE RATS ON VESSELS

S. S. *Modemi* at Goteborg, Sweden, from Bahia and Buenos Aires via Cape Verde Islands, December 22, 1927.
S. S. *Gydevore* at Landskrona, Sweden, from Rosario via Canary Islands, January 22, 1928.
S. S. *Dryden* at Liverpool from La Plata River ports, January 20, 1928.
S. S. *Sicily* at Liverpool from Buenos Aires and Rosario, June 8, 1928, 7 plague-infected rats.

SMALLPOX

Place		Jan. 15–Feb. 11, 1928	Feb. 12–Mar. 10, 1928	Mar. 11–Apr. 7, 1928	Apr. 8–May 5, 1928	May 6–June 2, 1928	Week ended— June, 1928 9	16	23	30	July, 1928 7	14	21	28	August, 1928 4	11	18	25
Algeria (see also table below)	C	71	72	3	12													
Algiers	C	15	10	5	4	5	1	7	4	3	1							
Oran	C	11	5	12	17	5		4						3				
Angola (see table below).																		
Arabia: Aden	C		1						1									
Brazil (see also table below):																		
Pernambuco	D					1												
Rio de Janeiro	C			1							1							
	D			1														
British East Africa (see also table below):																		
Kenya—Mombasa	C			2	1													
Tanganyiki	D	5																
British South Africa:																		
Northern Rhodesia	C	233	297	67	628	195	5	3	6	1	6							
	D	23	42	9	51	17	1				4							
Southern Rhodesia	C	3	7	7	24	13		13	4	19		1		19				
	D		1		10					4				4				
Canada:																		
Alberta	C	27	27	47	12	44	4	1	1	3			1	2	10			
Calgary	C			1														
Edmonton	C	2	9	7	3							1	1	2				
British Columbia—Vancouver	C	26	10	17	24	11	1	2	1		3	2	2	4				
Manitoba	C	1			7	4	10							4				
Winnipeg	C	2																
New Brunswick	C		1			1		7							1	2		
Ontario	C	243	147	83	50	41	5	8	14	6			6	5	2			
Kingston	C	1			3								2					
Ottawa	C	68	22	26	4	6	1											
Toronto	C	20	14	9	11	12			3					1				
Quebec	C	26	54	112	83	78	21	14	14	32	21	16	12	13	5	9	5	
Montreal	C	8	9	9	9	3	3	2	3	3	3	1	1				2	6
Quebec	C	16	13	10	23	47	17	11	10	14	21	9	7	7	4	3	4	
Sherbrooke	C			3				4										
Saskatchewan	C	97	22	33	52	28		4	3	9					4	1		
Moose Jaw	C	11	13	7	3	1					1							
Regina	C			3	8	1				1								
Saskatoon	C	15	2															
Ceylon: Colombo	C	4	6	1														
	D	1		1														

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

SMALLPOX—Continued

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

Place		Jan. 15–Feb. 11, 1928	Feb. 12–Mar. 10, 1928	Mar. 11–Apr. 7, 1928	Apr. 8–May 5, 1928	May 6–June 2, 1928	Week ended— June, 1928 9	June, 1928 16	June, 1928 23	June, 1928 30	July, 1928 7	July, 1928 14	July, 1928 21	July, 1928 28	August, 1928 4	August, 1928 11	August, 1928 18	August, 1928 25
China:																		
Amoy	C		1	6	9	3												
Antung	C				3													
Canton	C		2	7	2	2												
Chefoo	C			P		P		P			P							
	D		1															
Foochow	C	P	P	P	P					P		P						
Hong Kong	C	2	7	32	25	30	9	2	2	1	3	3	1	4	6	3		
	D	2	4	19	26	23	12	3		4	2	2		1	5	1		
Manchuria—																		
Changchun	C	4			4	6								1				
Dairen	C	15	13	15	16	35	14	11	12	11	4	11	3	3				
	D	8	7	8			7	4	2	7	4	4	3	1				
Fushun	C						4	2				1			1			
	D											1						
Harbin	C	5	7	7	10	27	4	2	14	11								
Kwantung	C								14						1			
Mukden	C	4	21	1	4	3	1	3	1	1								
	D									1								
Pensihu	C						1											
	D						1											
Port Arthur	C											1			1			
	D														1			
South Manchuria Railway Zone	C								5									
Shanghai—																		
Foreigners only	C	5	6	7	3	11	4		3		1	1				1		
Including natives	D	11	19	9	9	19	2	6	3		6	4			1			
Tientsin	C	48	20	13	17	9	2	6	4	4								
Chosen (see table below).																		
Curacao (alastrim)	C	2	3															
Dominican Republic: Santo Domingo	C			2	1													
Dutch East Indies:																		
Balikpapan	C										7							
	D										2							

Belawan Deli	C								9	2		2		2		1		
	D								3			1				1		
Borneo—Pontianak	C		1													1		
Java—																		
Batavia and West Java	C	4	2	5	1	2												
East Java and Madura	C	2	9		2			1	1									
	D		1		2													
Surabaya	C														1			
	D														1			
Palembang	C											1						
Sumatra—Medan	C	23	14	7	2	10		2		2		2	1					
	D	11	2	5	3	5						1	1					
Ecuador (see table below).																		
Egypt	C	1	2	52	12	1												
	D			33	7	1												
Behera Province												1						
Cairo	C	1																
France (see table below).																		
Gold Coast (see table below).																		
Great Britain:																		
England and Wales	C	1,530	1,473	1,341	1,344	1,199	365	282	230	219	182	177	173	149	126	111		
Birmingham	C	44	3	1	1			2				1						
Bradford	C	24	12	19	14	17	6		3	1	2							
Bristol	C	3	4	12	17	10	1			1								
Cardiff	C			5	3	2												
Castleford	C		4	36	69	24	5	4		9	2	5	4	3	6	2		
Hull	C									1	1	20	3		6	2		
Leeds	C	3	9	14	1		3	4	1			1			1			
Liverpool	C		1															
London	C	4	14	17	42	25	49	24	11	12	4	3	9	3	3			
Manchester	C	25	8	14	8	5	1											
Newcastle-on-Tyne	C	27	12	9	4	12	3	2		1		28				1		
Nottingham	C	27	11	13	17	20	2	1			2	1		3		3		
Sheffield	C	8	6	1	14	4		1		1	1			1				
Stoke-on-Trent	C	1	15	12	32	24	4	2	7	1		3		2	4	4		
Weymouth	C											1						
Greece (see table below).																		
Hedjaz	C	35	115			6	3		11		8		5	5				
	D	23	46			2			1		1		2	3				
India	C	17,777	18,850	28,034	30,436	21,489	4,608	3,515	3,015									
	D	3,709	3,826	5,540	6,672	5,046	1,051	937	795									
Bassein	C	1			1													
Bombay	C	61	149	218	200	136	19	15	20	17	17	27	11	12		13		
	D	24	73	120	118	78	15	8	12	11	6	16	6	5		8		
Calcutta	C	58	71	134	171	130		22	23	16	19	15	11	7		3		
	D	34	50	104	130	101		16	20	14	13	10	8	4		1		
Karachi	C		1	1	2	3						2		1				
	D		1		1	1						1		1				
Madras	C	74	100	183	169	59	6	9	7	13	10	11	8	10		11		
	D	8	19	29	38	18	3	1	2	4	3	4	6	5		2		
Moulmein	C									1		2	2	5		3		
	D									1		1	1	4				

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

SMALLPOX—Continued

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

Place		Jan. 15–Feb. 11, 1928	Feb. 12–Mar. 10, 1928	Mar. 11–Apr. 7, 1928	Apr. 8–May 5, 1928	May 6–June 2, 1928	Week ended— June, 1928: 9	June 16	June 23	June 30	July, 1928: 7	July 14	July 21	July 28	August, 1928: 4	Aug. 11	Aug. 18	Aug. 25
India—Continued.																		
Negapatam	C	8	3		7	8		9	4	6		2	8	16		13		
	D	3			3	1	2	2	2	1		1	1	2		1		
Rangoon	C	275	377	320	167	36	5	3	5	17	2	1	4			1		
	D	64	104	102	79	13	2	1	1	2	1	1	1	1				
Tuticorin	C					3												
Vizagapatam	C	10	2	3	2	3	4	4				2	1					
	D	8				1			3			1	2					
India (French):																		
Chandernagor	C			5	5									1				
	D			1	1									1				
Pondicherry	C	47	9	18	36	32	6	3	2	2		3	5	4	4			
	D	47	9	18	36	23	6	3	2	2		3	5	4	4	11		
Indo-China (see also table below):																		
Saigon	C		3															
Iraq:																		
Baghdad	C	19	7	5	5	16	3	3	7	3	7	10	2	5		4	2	1
	D	11	4	4	3	6	1	1	7	1	3	6	2	4		1	1	
Basra	C	1	7	5	4	3			1	1	6							2
	D			2	2	3			1	1	2							
Italy:																		
Leghorn	C		1	1														
Palermo	C			5	10	6	4	6					4		6			
Rome and vicinity	C	3																
Ivory Coast (see table below).																		
Jamaica (outside Kingston) (alastrim)	C	5	10	13	4	2	1		2		1							
Japan:																		
Kobe	C					11												
Nagoya	C				6	2												
Osaka	C								2	2								
Tokyo City	C	4	4	15	8	2												
	D	1	2	1	1													
Tokyo prefecture (outside city)	C			24	1	1												
	D			1	2													
Yokohama	C				2	3												
	D					1												

Latvia (see table below).																		
Mauretania	C		P															
Mexico (see also table below):																		
Acapulco	C					2												
	D					2												
Jalisco (State)	C		P	P	P													
Guadelajara	D		1	2	12	13	4	2	2	2	1	1	3	4	1	4		
Manzanillo	D			1														
Mazatlan	D					3	1	1										
Mexico City and surrounding territory	C	2	1		1	2					1	2						
	D						1											
Reynosa	C												1					
Saltillo	D					2	1		1									
Tampico	C		1															
Morocco (see table below).																		
Nigeria (see also table below):																		
Lagos	C			1						1								
Southern Provinces	C		7	93			44	7										
	D			35			12											
Palestine: Jerusalem	C	1																
	D	1																
Persia (see table below).																		
Poland	C	3	1	1	9	1	1	2										
	D				1													
Portugal (see also table below):																		
Lisbon	C	12	20	5	6	7	2		2	3	3	1	1	3				
	D		1															
Oporto	C				1													
Senegal (see also table below):																		
Dakar	C		34	29	16	29	4	4										
	D			20	8	7												
Siam	C	35	12	28	10	8		3			1							
	D	4	3	4	3	1		1										
Bangkok	C				1													
	D					1												
Spain (see also table below):																		
Valencia	C		1	2														
Straits Settlements: Singapore	C	1	1	1	3		1											
Sudan (Anglo-Egyptian)	C	85	109	332	160	168	22	18	93	73	32	63		49	31		78	4
	D	48	27	100	32	20	7	3	17	10	5	18		12	9		6	
Sudan (French) (see table below).																		
Syria (see table below).																		
Taiwan: Keelung	C								1									
Tunisia: Tunis	C	3	14	4	6	3	1			1	5		1					
Union of South Africa:																		
Cape Province	C	P																
Natal	C	P	P	P				1										
Orange Free State	C	P		P		P	P	P			P							
Transvaal	C				P	P		P	P	P								
Union of Socialist Soviet Republics (see table below).																		
Upper Volta	C		5	2	9													
Venezuela: Maracaibo	C	1																
	D	1	1															

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

SMALLPOX—Continued

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

Place		Jan. 15–Feb. 11, 1928	Feb. 12–Mar. 10, 1928	Mar. 11–Apr. 7, 1928	Apr. 8–May 5, 1928	May 6–June 2, 1928	Week ended— June, 1928: 9	June, 1928: 16	June, 1928: 23	June, 1928: 30	July, 1928: 7	July, 1928: 14	July, 1928: 21	July, 1928: 28	August, 1928: 4	August, 1928: 11	August, 1928: 18	August, 1928: 25
On vessel:																		
S. S. Arendskerk at Singapore, from Amoy, China	C			P														
S. S. Kashgar at Kobe, from Shanghai	C				P													
S. S. Rohna at Penang, from Negapatam	C					P												
S. S. Theseus, from Jeddah to Penang	C											1						
S. S. Tjileboct at Hong Kong, from Shanghai	C				P													
S. S. Yarmouth at Kingston, Jamaica, from Habana, Cuba	C			1														
S. S. Victoria at Nome, Alaska	C								8									

Place		October–December, 1927	January–March, 1928	April, 1928	May, 1928: 1–10	May, 1928: 11–20	May, 1928: 21–31	June, 1928: 1–10	June, 1928: 11–20	June, 1928: 21–30	July, 1928: 1–10	July, 1928: 11–20
Algeria (see also table above)	C	682										
Oran	C	11										
Indo-China (French) (see also table above)	C	97	426	35	36	6	37	47		36	8	3
Ivory Coast	C					7						4
Senegal (see also table above)	C			51			20	23	14	2		
	D			7			9					
Dakar	C			11	12	7	5	4	1	3		
	D			8	4	3						
Sudan (French)	C		15	4	30	P	P	20				17
	D				6							
Syria:												
Aleppo	C	1	1						1	2		
Beirut	C	2	75	9	2	3	2	1	7	2	4	1
	D		2	1								
Damascus	C	47	14									

Place		October–December, 1927	January–March, 1928	April, 1928	May, 1928	June, 1928	July, 1928
Angola	C	151	47				
	D	2					
Congo	C	77	36				
Cuanza-Norte	C		1				
Cuanza-Sul	C	9	10				
Zaire	C	5					
Brazil (see also table above):							
Porto Alegre	C	5	1				
British East Africa (see also table above):							
Zanzibar	C	2					
	D	1					
Chosen	C	4	48	20	152		
	D	1	16	6	38		
Seoul	C		1				
Ecuador: Guayaquil	C	6	35	19	31	11	35
	D		1				
France	C	25	34	6	15	21	
Gold Coast	C	4	4				

Place		October–December, 1927	January–March, 1928	April, 1928	May, 1928	June, 1928	July, 1928
Greece	C	9	36	1	22	31	
	D		4		1	2	
Latvia	C	2	1				
Mexico (see also table above)	D	346	256				
Morocco	C	622	132	19	25	10	
Nigeria (see also table above)	C	316	592				
	D	81	84				
Persia	D	2	7				
Portugal (see also table above)	C		258		98	74	
	D		30		9	3	
Spain (see also table above):							
Madrid	D	1					
Union of Socialist Soviet Republics:							
Railways, etc	C	33	38				
Other territories in Europe	C	1,255	998				
Transcaucasus, Siberia, and Central Asia	C	81					
Ukraine	C	48	17				

TYPHUS FEVER

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

Place		Jan. 15–Feb. 11, 1928	Feb. 12–Mar. 10, 1928	Mar. 11–Apr. 7, 1928	Apr. 8–May 5, 1928	May 6–June 2, 1928	Week ended— June, 1928: 9	June 16	June 23	June 30	July, 1928: 7	July 14	July 21	July 28	August, 1928: 4	Aug. 11	Aug. 18	Aug. 25
Algeria (see also table below):																		
Algiers	C	1	3	9	4	13	28	1	2	2	1		2					
	D		1		2		6											
Oran	C	2	10	4	11	4	5	1		1	2	6	6	2				
	D				1			1										
Austria: Vienna	C	1																
Bulgaria (see also table below):																		
Kustendil Department	C										2							
Sofia	C	1		20	1	20	3	10	1		1							
	D						2	3	1									

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

TYPHUS FEVER—Continued

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

Place		Jan. 15–Feb. 11, 1928	Feb. 12–Mar. 10, 1928	Mar. 11–Apr. 7, 1928	Apr. 8–May 5, 1928	May 6–June 2, 1928	Week ended— June, 1928				July, 1928				August, 1928			
							9	16	23	30	7	14	21	28	4	11	18	25
Chile:																		
Iquique	C													1				
	D												1					
Talcahuano	D			1														
Valparaiso	C		1					1					2					
	D						2	1										
China (see also table below):																		
Manchuria—																		
Dairen	C				10													
Harbin	C				2	16	7	9	4	3								
Kwantung	C				17	293	135	223	181			213						
South Manchuria Railway Zone	C							7	3			5						
Tientsin	C					2				2								
Chosen (see table below).																		
Czechoslovakia (see table below).																		
Egypt	C	9	17	2	3	11			7									
	D	2	8	1	1	2			3									
Alexandria	C											1			1			
Assiout Province	C						1			1	1	1						
Assouan Province	C						1			1								
Behera Province	C			29	32	43	3		3	1	2							
	D				7	7	2											
Cairo	C			2	4							1						
	D			1	4							1						
Dakalieh	C						1				1							
Gharbieh Province	C			23	14	5	2			2		1						
	D				5		1		1	1								
Keneh Province	C			5	38				1									
	D				7				1									
Menoufieh Province	C				28	9	3		1	1								
	D				3	3	1		1									
Port Said	C											1	1			4	3	1
Suez	C					1						1	1	2	1			1
	D					1												

Great Britain: London County	C						1	1										
Greece: Piræus	C								1									
Hungary: Budapest	D								2					2				
Ireland:																		
Belfast	C					2	1											
	D						1											
Irish Free State	C	1			1	4												
Cork County	C				1													
Galway County—Oughterard	C													10				
Kerry County—Cahirciveen	C														1			
Japan (see table below):																		
Hiogo	C								1									
Yamagata	C					2		2										
Latvia (see table below).																		
Lithuania (see table below).																		
Mexico (see also table below):																		
Durango	D										1							
Guadalajara	D					1												
Mexico City, including municipalities in Federal District	C	5	8	12	8	19	4	3	5	2	6	2	1	1				
	D		4	3	1	2					2		1					
Monterey	D			1														
Morocco (see also table below)	C	1,051	316	748	591	280	40	44	55	75	40	50	49	39				
Palestine	C	5	10	7	6	4	2	1	3	2	1	3	3		2	3	3	2
Peru (see table below).																		
Poland	C	346	265	382	144	226	28	39	35	32	3	30	15	26	7			
	D	19	26	25	12	17		3	2	1	1		2	2				
Portugal (see also table below):																		
Oporto	C	1									1							
Rumania	C	39	68	141	142	99	36	21	18	5	8	8	8					
	D	9	5	11	12	8	6	4	1			1						
Syria (see also table below):																		
Aleppo	C							2										
Tunisia	C	4	1	18	19	7		4	3									
Union of South Africa:																		
Cape Province	C	1	P		P	P		P	P	P	P	P						
Natal	C	1	2		P	3		P		P	P	P						
Orange Free State	C	P			P	P		P	P	P	P	P						
Transvaal	C					1												
Union of Socialist Soviet Republics (see table below).																		
Yugoslavia (see table below).																		
On vessel S. S. Gaika at Durban, Natal, from Mauritius	C		1															

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

TYPHUS FEVER—Continued

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

Place		1927		January, 1928	February, 1928	March, 1928			April, 1928			May, 1928			June 1-10, 1928
		July-September	October-December			1-10	11-20	21-31	1-10	11-20	21-30	1-10	11-20	21-31	
Algeria (see also table above)	C	110	12												
	D	13	1												
Algiers	C	10	2												
Bulgaria (see also table above)	C	43	4	13	26							26			16
	D	3	2	1	5										2
Morocco (see also table above)	C	231	123												

Place		January, 1928	February, 1928	March, 1928	April, 1928	May, 1928	June, 1928	July, 1928
Chosen	C	183	400	313		241		
	D	19	44	25		32		
Chemulpo	C	1		1		2		
Gensan	C	1						
	D	1						
Seoul	C			10	28	18		
	D			1	2	4		
Czechoslovakia	C			25				
Greece: Athens	C	2	2		13	11	9	1
	D				2	2	1	
Japan	C					21		
Latvia	C		1	26	4	1		
Lithuania	C	86	137				10	8
	D	10	12					

Place		January, 1928	February, 1928	March, 1928	April, 1928	May, 1928	June, 1928	July, 1928
Mexico (see also table above)	D	46						
Peru:								
Arequipa	D	2			1			
La Oroya	C	P	P	P				
Turkey	C		17			7	2	2
	D		1			1		
Union of Socialist Soviet Republics:								
Railways, etc	C	41	107					
Transcaucasus, Siberia, and Central Asia	C	7						
Ukraine	C	533	459					
Other territories in Europe	C		1,853					
Yugoslavia	C	7	24	3	10	19	16	12
	D	3			1	3	1	3

YELLOW FEVER

Place		Nov. 20–Dec. 17, 1927	Dec. 18, 1927–Jan. 14, 1928	Jan. 15–Feb. 11, 1928	Feb. 12–Mar. 10, 1928	Mar. 11–Apr. 7, 1928	Apr. 8–May 5, 1928	May 6–June 2, 1928	Week ended— June, 1928: 9	June, 1928: 16	June, 1928: 23	June, 1928: 30	July, 1928: 7	July, 1928: 14	July, 1928: 21	July, 1928: 28	August, 1928: 4	August, 1928: 11	August, 1928: 18
Belgian Congo:																			
Boma	C		3																
	D		2																
Matadi	C		29	14	1		2	2											
	D		16	13															
Brazil:																			
Aracaju	D							2											
Bahia	C									1	3								
Estancia	C				1														
Pernambuco	C								1										
Rio de Janeiro	C							2	4	16	14	14	10	12	10	8	6	4	4
	D							2			6	9	5	7	9				
Sao Felix	C									P									
Dahomey: Grand Popo	C	1							1	2									
	D								1	1									
Gold Coast	C	1						2											
Ivory Coast	C		1								1								
	D		1								1								
Abidjan	C										1		1						
Ferkes-Sedougou	D																1		
Senegal: Dakar	C	7	2																
	D	7	2																

×