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SEWAGE TREATMENT PLANT AT THE GRAND CANYON NATIONAL PARK

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The Grand Canyon National Park, created by act of Congress, February 26, 1919, is one of the 19 national parks administered by the National Park Service, under the Department of the Interior. It lies in the northern part of Arizona and has an area of 958 square miles. Within this area the Colorado River flows through 56 miles of gorge or canyon which is over a mile deep and 20 miles wide at the top in places. The park derived its name from this canyon. Most of the visitors to the park have, in the past, gone to the south rim, where there are hotels, stores, and an automobile camp. The data given in this paper refer to sewage disposal at the south rim. An extensive building and development program is now under way on the north rim, but up to the present time only a comparatively few people have ever visited the territory in the park to the north of the Colorado River.

WATER SUPPLY

The water supply for the south rim, furnished by the Santa Fe Railroad Co., is ordinarily hauled in tank cars from Flagstaff, Ariz., a distance of about 100 miles. When this supply becomes low, water is obtained from Puro, Ariz., which is about 120 miles from the canyon. The cost of bringing in water from Flagstaff is $3.09 per 1,000 gallons, and the amount delivered during the peak of the tourist season, when there are approximately 2,400 people in the park, averages about 100,000 gallons daily.

The only sources of water supplies in the territory around the south rim are (1) the San Francisco Mountains, about 52 miles away; (2) Bright Angel Creek, about 6 miles away and at about 5,000 feet lower elevation; (3) some springs approximately 2 miles distant and about 3,500 feet below the rim of the canyon; and (4) the Colorado River. No attempt has ever been made to develop either of the first two sources, on account of the cost, and the spring supply has been in litigation until recently. The Colorado River has not been considered as a source of supply on account of the high turbidity of the water throughout the year at the place where a pumping plant could

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be installed, and because of the expense of a 6-mile pipe line and the cost of raising the water approximately 5,000 feet.

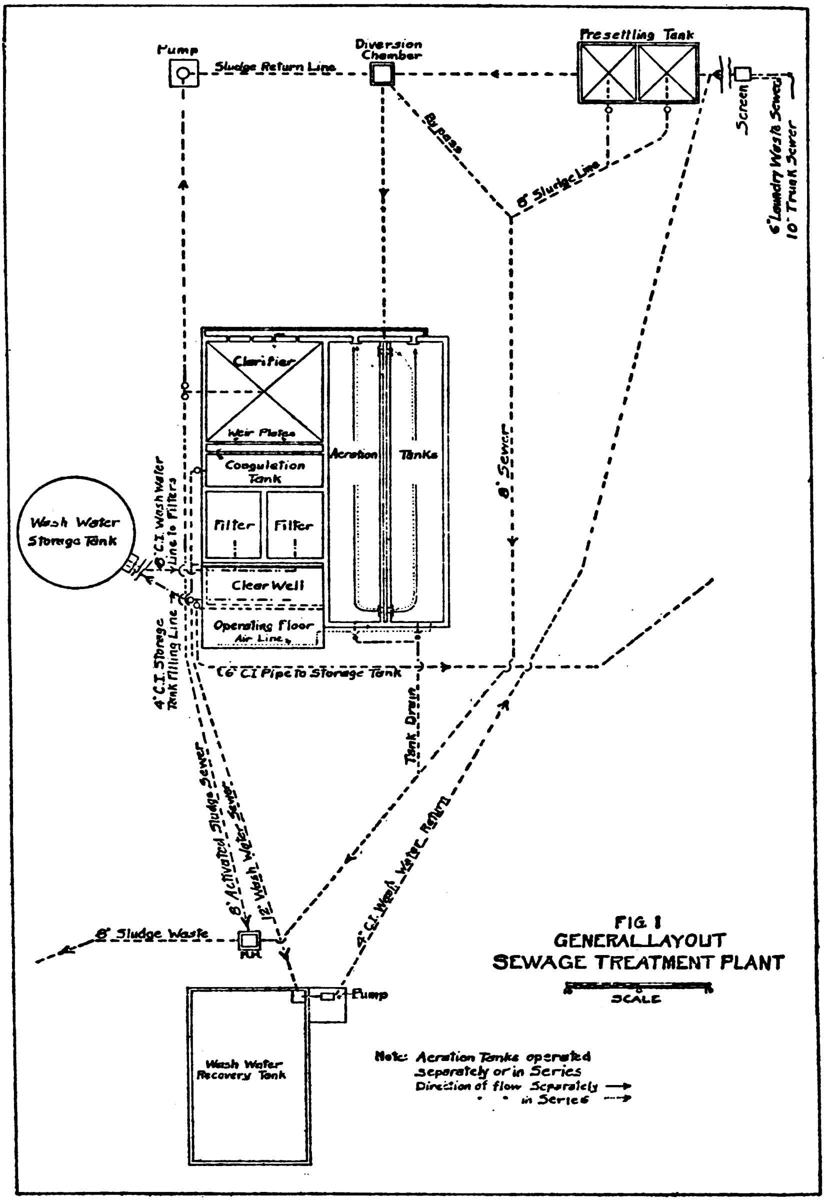

FIG. 1
GENERAL LAYOUT
SEWAGE TREATMENT PLANT

SEWAGE DISPOSAL

When the Santa Fe Railroad Co. began extensive developments at the south rim, before the Grand Canyon National Park was created.

Fig. 2.—General view of sewage treatment plant. (1) Wash water return line; (2) presettling tank; (3) diversion chamber; (4) valve on line from air channel; (5) aeration tanks; (6) clarifier; (7) house over sand filters, clear well, pumps, and motors

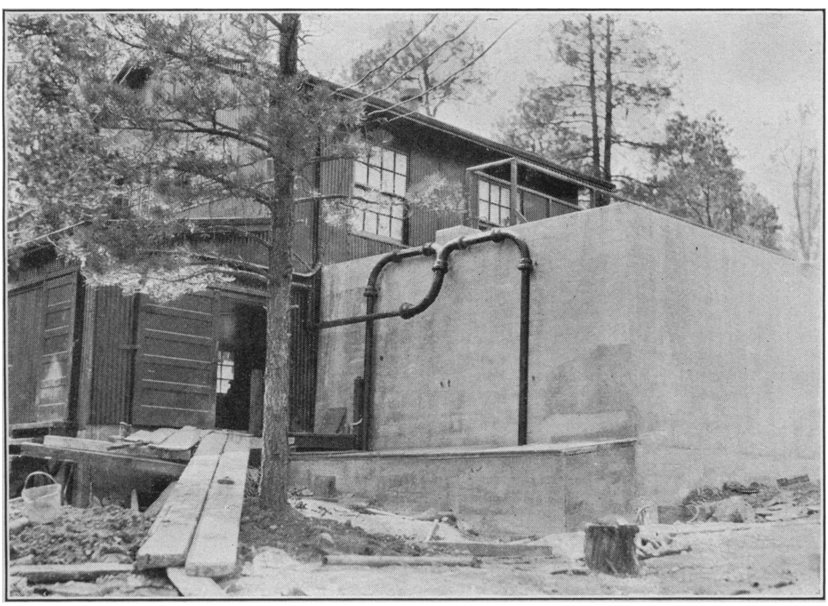

Fig. 3.—Air supply pipes to channels under filtros plates

a sewage treatment plant, consisting of septic tanks, contact filters, and pressure sand filter, was constructed to treat the sewage so that the effluent could be used for irrigating lawns and for boiler purposes. The effluent, however, was always putrescible, contained hydrogen sulphide and could not be used for irrigating lawns near the hotel, and it was not satisfactory for boiler purposes. There was also a decided odor in the vicinity of the plant. The laundry waste caused foaming in the boilers, and was by-passed around the treatment plant.

In 1924 the number of visitors to the park had increased to such an extent that it was necessary to make extensive improvements to the railroad terminal facilities, improve the roads, and adopt a comprehensive development plan for hotels, residences, stores, garages, etc., to take care of the visitors and employees. The problem of supplying water for the increased population was acute, and in the general plan worked out for major improvements there was included a new sewerage system and a sewage treatment plant that would purify the sewage so that it could be used for as many purposes as possible in place of fresh water.

On account of the troubles experienced in using the effluent from the old treatment plant in boilers, when the laundry waste was treated along with the domestic sewage, a separate sewer line was included in the design of the sewerage system to carry the laundry waste to the by-pass around the treatment plant.

TREATMENT PLANT

Since it was desired to purify the sewage so it could be used in place of fresh water, for certain purposes, methods of treatment were considered which would produce, consistently, the highest quality of effluent under the climatic and other conditions at the canyon. Settling tanks, slow sand filters, and sterilization would produce a satisfactory effluent, but the high cost of sand (approximately $7 per yard) and the difficulties of operation during the winter at an elevation of 6,800 feet, made this method impractical. Settling tanks, sprinkling filters, slow sand filters, and sterilization would also produce an effluent of the highest quality, but the high cost of materials and the severe winters precluded the adoption of this method. There remained, therefore, the activated sludge process, rapid sand filters, and sterilization as the method which could be operated with the least difficulties in the winter, which would produce throughout the year an effluent of the quality desired, and would require the smallest amount of material to be shipped to the canyon. In the following paragraphs there is given a description of the treatment devices installed. The layout of the plant is shown in Figure 1, and a general view in Figure 2.

Screen.—A coarse bar screen is located in a screen chamber on the trunk sewer line near the inlet to the presettling tank. It is 3 feet wide by 3 feet deep and has ⅜-inch by 2-inch rectangular iron bars spaced 2⅜-inch on centers. The bars are embedded in concrete at the top and bottom, and slope in the direction of flow of the sewage at an angle of 30°.

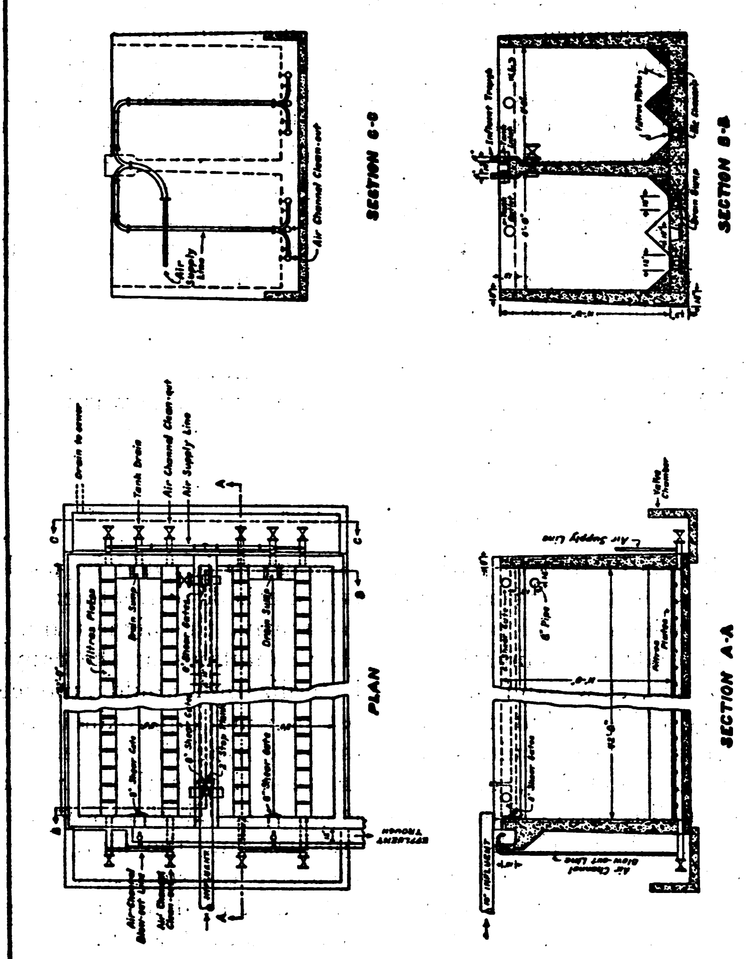

FIG. 4—AERATION TANK

Presettling tank.—Since it was essential that an effluent be obtained of the highest possible quality, and there was some uncertainty as to how the strong domestic sewage would react to the activated sludge treatment, it seemed advisable to install a presettling tank for the purpose of removing as much of the fresh fecal matter and other coarse material as practicable. The tank was designed for a detention period of 30 minutes at the time of maximum flow. It has hopper bottoms, and the sludge is discharged by gravity into the bypass around the plant. The tank has two sewage outlet pipes, one of which is level with the top of the hoppers and leads to the aeration tanks while the other is near the top of the tank and connects with the lower pipe. This tank, as will be explained later, is also used to store a part of the night flow of sewage.

Diversion chamber.—This is a small chamber located on the line from the presettling tank to the aeration tank for the purpose of bypassing the sewage, when necessary, around the treatment plant.

Aeration tanks.—There are two tanks, each 42 feet by 8 feet by 10 feet deep below the water level, and they were designed to treat approximately 200,000 gallons of sewage daily with an average aeration period of six hours. The design of the tanks is shown in Figure

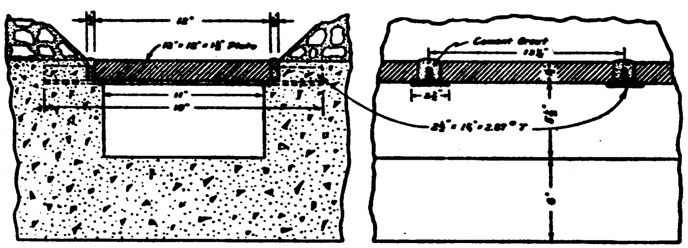

FIG. 5 - DETAILS OF DIFFUSER PLATE INSTALLATION

4. In each tank there are two continuous concrete air channels, each 42 feet long by 11 inches wide by 5½ inches deep. Filtros plates, 12 inches by 12 inches by 1½ inches thick, were grouted into the top of the side walls of the channels, and into T-irons, 2½ inches by 1¼ inches and 2.87 pounds per foot, across the channels, as shown in Figure 5. The air channels at both ends of the tanks have 4-inch pipes that extend through the concrete walls about 2 feet, and on the end of each pipe there is a 4-inch gate valve. These pipes and valves were installed for the purpose of cleaning out the air channels and to permit cleaning the under surfaces of the plates if they should become clogged. The air is applied to the 4-inch pipe at the ends of the tanks nearest the blowers, as shown in Figure 3. At the opposite ends, 2-inch pipes connected to the 4-inch pipes between the valves and the tank walls lead upwards and over the walls into the tank. The 2-inch pipes were installed in order that the sew-

age which accumulates in the air channels when the plant is closed down can be blown up into the tanks instead of through the plates.

No difficulties were encountered in placing the filtros plates over the channels, and there has been no leakage of air around the plates. There was, however, leakage through a short section of one of the ridges of one tank when the plant was first placed in operation, but this leak was easily repaired.

The two tanks are separated by a wall that has at the top a channel which receives the raw sewage from the presettling tank. By means of a stop gate in the channel, the sewage is discharged into the end of one tank and flows out through an opening in the partition wall at the farther end into the other tank and through it to the effluent channel. If it is desired to use only one tank, the sewage is carried in the channel in the top of the partition wall to the farther end of the tanks where it is discharged into either tank and flows back to the effluent channel.

Clarifier.—This tank is 16 feet square and 11½ feet deep and is provided with a scraping device that concentrates the sludge at an outlet pipe in the center. It has a detention period of approximately 2.8 hours with the present flow of sewage, assuming that most of the sewage reaches the plant during 14 hours.

The effluent of the activated sludge tanks enters the clarifier through four openings spaced equally apart along one side and about 1 foot below the surface of the sewage. The effluent flows out over a brass weir plate into a channel that leads to the end of a small secondary settling tank.

Secondary settling tank.—The secondary settling tank is 16 feet by 4 feet by 10 feet deep, and was originally designed as a coagulation basin to be used in connection with the operation of the rapid sand filters. It was found, however, that it was not necessary to use coagulants, and the tank has been used to settle the effluent from the clarifier. An appreciable amount of solids is removed by this tank, and the sludge is discharged through 1-inch openings spaced 1 foot apart in an 8-inch pipe that extends the full length of the bottom of the tank.

Rapid sand filters.—Two filter units were designed, each having an area of 77 square feet. Concrete wash-water troughs were provided, and the underdrainage consists of 12-inch headers with 1¼-inch cast-iron laterals having ¼-inch holes bored on 3-inch centers. The specifications for the coarse sand and gravel were as follows:

8 inches gravel passing 2½-inch mesh screen and retained on 1½-inch mesh.

4 inches gravel passing 1½-inch mesh screen and retained on ¾-inch mesh.

4 inches gravel passing ¾-inch mesh screen and retained on ¼-inch mesh.

4 inches gravel passing ¼-inch mesh screen and retained on 1/12-inch mesh.

On account of the lack of data regarding the size of sand for rapid sand filters filtering sewage, there was ordered for filter No. 1 a sand having an effective size of 0.35 millimeters and a uniformity coefficient of 1.6, and for filter No. 2 a sand with an effective size of 0.40 millimeters and a uniformity coefficient of 1.6.

Although the sand and gravel delivered were marked in accordance with the specifications, it was found later, when difficulties were experienced in operating the filters, that the sand in filters No. 1 and No. 2 had effective sizes of 0.34 millimeters and 0.23 millimeters and uniformity coefficients of 1.29 and 1.48, respectively.

Loss of head gauges and rate controllers and other equipment were installed so that the filters could be operated in accordance with common practice in water-filtration plants.

Wash-water tank.—Water is delivered to the wash-water tank through a 4-inch pipe line connected to the reclaimed sewage force main, and the flow is regulated by an altitude valve. An 8-inch pipe supplies wash water for the filters.

Clear well.—The clear well is 16 feet square and 5½ feet deep below the overflow. The capacity is 10,500 gallons, but in practice the automatic floats start the pumps in operation when the sewage reaches about one foot below the overflow.

Pumping equipment.—The reclaimed sewage is pumped to a steel storage tank by two 4-inch vertical centrifugal pumps which are operated by vertical motors. The tank sets level with the ground and has a capacity of 200,000 gallons. The operation of the pumps is controlled by automatic float switches.

Blowers.—One air compressor with rotor revolving in water, which washes the air, was installed originally and a duplicate unit added a year later. The capacity of each of these units is 200 cubic feet per minute.

Sterilizing equipment.—A semiautomatic chlorine machine is used for applying liquid chlorine to the reclaimed sewage. When either of the pumps start operating, the force of the current in the main moves a vane hanging in the line, and this in turn opens a valve on the chlorine machine that permits chlorine dissolved in water to flow into the clear well at the combined suction of the pumps. When the pumps stop operating the vane falls back to a vertical position and shuts off the chlorine.

In addition to the liquid chlorine machine there is standard equipment for using sodium hypochlorite solution for sterilizing the filter effluents when for any reason liquid chlorine can not be applied. Sodium hypochlorite solution is kept on hand in 5-gallon jugs and everything is ready for use in an emergency.

Wash water recovery tank.—Since every 1,000 gallons of reclaimed sewage that can be used in the place of fresh water is worth $3.09, a settling tank was installed to collect the wash water from the filters. This tank is 25 feet by 16 feet by 4½ feet deep below the overflow. The capacity is 13,500 gallons, and this is sufficient to store the wash water and permit it to be pumped back to the presettling tank at a low rate over a period of several hours.

OPERATION DATA

Sewage was turned into the treatment plant the latter part of June, 1926, and the effluent was pumped to the storage tank the next day. At first only one aeration tank was used and a fairly satisfactory floc developed within a few days. The floc did not settle out in the clarifier, however, and later there was trouble in keeping the floc down in the tank. As a result the filters clogged quickly. After two months a floc developed which settled in the clarifier, and since then there has been no trouble of a serious nature in operating the plant.

Much of the fine sand has been lost in washing the filters, and new sand has been ordered with an effective size of 0.40 millimeters and a uniformity coefficient of 1.6 for both filters. The coarser sand should give much higher rates.

In Table 1 there are given the more important data pertaining to the operation of the sand filters, aeration tanks, and sterilization of the filter effluent, from May, 1927, to March 31, 1928.

The only sewage lost is that mixed with the sludge drawn off from the presettling tank (600 gallons daily) and the activated sludge that accumulates in excess of the amount required for the operation of the aeration tanks. The total volume of activated sludge wasted per month on the average is about 20,000 gallons.

TABLE 1.—*Data pertaining to operation of sand filters, aeration tanks and sterilization* [1]

Month, 1927-28	Net rate m. g. a. d. for Filter No. —[2]		Per cent wash water Filter No. —		Period between washings (hours) Filter No. —		Flow raw sewage, 1,000 gallons	Reclaimed sewage, 1,000 gallons	Amount of air used per gallon, each tank	Aeration period, hours each tank	Chlorine, parts per million	
	1	2	1	2	1	2					Added	Residual at plant
May	20.6	20.6	3.7	3.5	32	32	73	[3] 72	------	------	3.6	0.4
June	23.0	23.0	3.4	3.8	50	32	83	81	2.1	5.5	3.6	.4
July	23.9	23.9	2.8	5.0	63	36	85	84	2.0	5.3	3.6	.5
August	24.4	24.4	3.3	3.8	68	53	88	86	2.1	5.1	3.2	.4
September	23.5	23.5	3.5	3.9	64	59	83	82	2.2	5.5	3.7	.5
October	21.0	21.0	3.8	4.2	50	41	75	74	3.0	6.1	4.0	.4
November	22.2	22.2	2.3	2.1	54	59	80	78	2.2	5.6	3.5	.5
December	21.1	21.1	3.8	4.1	47	44	76	75	2.5	6.0	2.7	.5
January	20.5	20.0	2.8	2.5	47	51	73	72	2.4	6.1	2.6	.5
February	21.6	21.6	3.7	3.3	38	39	77	76	2.4	5.8	1.9	.5
March	21.9	21.9	3.3	2.8	49	57	77	76	2.1	5.8	2.3	.5

[1] The figures in the table represent averages of daily records.
[2] Sand practically same size in both filters. This is due to returning to the filters sand lost in washing.
[3] Volume of reclaimed sewage was obtained by meter on force main; that of raw sewage by computation.

From the first of May, 1927, to the end of November, 1927, 98.5 per cent of the sewage was reclaimed; and since December, the laundry waste, amounting to 7,000 gallons daily during the winter and 10,000 gallons in the summer, has been mixed with the sewage and recovered.

As already stated, the air supply lines connect with the four 42-foot air channels under the filtros plates. When the blower is closed down, the sewage filters through the plates and fills the channels. When the air is turned on again, the valves on the 2-inch blow-out lines are opened and the sewage is blown through the pipes into the tank. By this method of operation no sewage is forced back through the plates. The sewage can be blown back through the plates, however, and this has been done frequently. It requires less than one minute to free the channels of sewage after the air pressure is turned into them. The initial air pressure on the channels was 5 pounds per square inch; and after operation of the plant for almost two years, it is only 5½ pounds.

The average amount of air used, approximately 4.6 cubic feet per gallon, for the period covering 11 months, was no doubt more than was required, but it was the normal output of the blower and there would have been no economy in reducing the volume. The aeration period, about 11½ hours, was longer than necessary to produce a satisfactory floc and stable effluent, but the tank capacity was available and it seemed advisable to use it. It is believed that the present tanks and one blower will treat twice the volume of sewage now received at the plant.

An excess of about 0.5 parts per million of free chlorine has been carried in the force main at all times to insure complete sterilization of the reclaimed sewage in the storage tank.

There is an operator in charge of the plant from 7 in the morning until 10 at night. Just before 10 p. m. the sewage in the presettling tank is drawn down to the hoppers and the sludge wasted, and the clear well is pumped out. The blower and aeration tanks operate throughout the night, but generally there is not enough sewage flowing between 10 p. m. and 7 a. m. to fill the presettling tank and clear well. This method of operating the plant has proved entirely satisfactory and saves the labor of one man.

The aeration tanks give most satisfactory results when they contain about 25 per cent of activated sludge. Sludge is returned from the clarifier to the diversion chamber ahead of the aeration tanks by an air lift. Originally a low lift screw type of pump was used for returning the activated sludge, but on account of excessive wear of the bearings an air lift was substituted.

CHEMICAL AND BACTERIOLOGICAL RESULTS

Chemical analyses.—A complete chemical laboratory was installed in April, 1927. The monthly average results of analyses of sewage and effluents for 11 months are given in Table 2.

TABLE 2.—*Monthly average results of analyses of sewage and effluents* [1]

Month 1927–28	Suspended matter, parts per million			Settleable solids, c. c. per liter, 1 hour		Nitrogen in clear well as—			Dissolved oxygen, parts per million, (clear well)	Oxygen demand (5 day), parts per million				Relative stability by methylene blue test (per cent)		Alkalinity as $CaCO_3$ by M. O., parts per million		
	R	C	CW	R	C	NH_3	NO_2	NO_3		R	AS	C	CW	CW	C	R	C	CW
1927																		
May	259	----	4.3	12.0	Tr.	0.56	------	5.6	3.2	----	----	----	1.8	90+	90+	185	----	24
June	244	6.0	3.5	9.1	Tr.	.60	0.33	7.3	3.3	366	0.8	1.5	1.7	90+	90+	169	19	20
July	283	9.0	3.3	13.0	Tr.	.50	.70	5.8	4.1	487	1.3	1.9	1.6	90+	90+	187	27	24
Aug	292	6.0	3.0	10.0	Tr.	.53	.90	4.5	3.8	437	1.6	1.7	1.6	90+	90+	191	39	37
Sept	211	8.0	3.0	9.0	Tr.	.54	.77	3.9	4.0	380	1.1	1.3	1.0	90+	90+	209	38	34
Oct	225	5.0	3.0	11.0	Tr.	.45	.63	4.9	4.4	406	1.3	1.5	1.3	90+	90+	217	22	20
Nov	210	5.0	3.0	7.5	Tr.	.60	1.40	4.4	5.0	390	1.1	1.4	1.4	90+	90+	176	30	28
Dec	214	6.0	3.0	9.7	Tr.	.63	1.00	4.8	5.0	420	1.1	1.3	1.1	90+	90+	163	51	48
1928																		
Jan	201	10.0	5.0	10.0	Tr.	.58	.38	7.0	4.7	403	2.5	2.7	2.3	90+	90+	166	50	51
Feb	193	7.3	3.4	12.0	Tr.	.62	.32	5.8	4.5	388	1.6	1.7	1.6	90+	90+	172	87	86
Mar	207	7.0	4.0	11.0	Tr.	.39	.48	7.1	4.8	351	1.6	1.7	1.6	90+	90+	204	81	81
N	127	119	124	289	210	87	68	87	284	52	51	52	279	307	306	296	268	296

[1] Composite samples.

NOTE.—R=Raw sewage; C=Clarifier; CW=Clear well; AS=Activated sludge tank effluent after settling 30 minutes; N=Number analyses made.

In comparison with the averages of results given in Public Health Bulletin No. 132, "Sewage Treatment in the United States," the settleable solids, suspended matter, and oxygen demand results of analyses of raw sewage at the canyon were, respectively, 278, 23, and 232 per cent stronger than the averages for the 15 cities given in the BULLETIN. The suspended matter in the sand filter effluent at the canyon was consistently below five parts per million, the nitrates were high, and the oxygen demand was below two parts per million. The oxygen demand of the effluents of the aeration tanks and clarifier was likewise uniformly less than two parts per million. The dissolved oxygen was low; and this is explained in part by the fact that at the elevation of the treatment plant (6,866 feet) the solubility of oxygen in water is about 30 per cent less than at sea level. The relative stability of the effluents from the filters and clarifier by the methylene blue test was in every analysis more than 90 per cent.

There is practically no permanent hardness in the sewage at the canyon, and up to the time the laundry waste was treated at the plant, December, 1927, the average of 185 determinations of alkalinity was 190 parts per million, and for the same number of analyses of the effluent of the clarifier and the sand filters, the averages were, respectively, 29 and 27 parts per million. The effect of the laundry waste on the effluent is discussed later in this paper.

In Public Health Bulletin No. 132, page 13, Table No. 6, there are given the changes in the alkalinity of different sewages on passing through oxidizing devices. The sprinkling filters at Fitchburg reduced the alkalinity from 99 to 8 parts per million; those at Baltimore, 144 to 63; Reading, Pa., 177 to 105; Rochester (Brighton plant), 189 to 131; Lexington, 194 to 152; Atlanta (Intrenchment Creek plant), 82 to 48; Atlanta (Peachtree plant), 69 to 35; and Columbus, 219 to 192. The contact filters at Alliance reduced the alkalinity from 194 to 167, while similar filters at Canton showed an increase of 11 parts per million. The activated sludge plant at Houston (south side) reduced the alkalinity from 304 to 220, and the north side plant, 270 to 198; at San Marcos, Tex., the reduction was from 311 to 239; and at Sherman, Tex., the alkalinity of the effluent was 416, and of the sewage, 415. The reduction of the alkalinity in each plant was almost directly in proportion to the degree of purification effected. At Fitchburg, for example, where 92 per cent of the alkalinity of the sewage was removed by the sprinkling filters, the nitrification was higher and the oxygen demand lower than at any of the other filter plants. The effluent from the activated sludge plant at Sherman, Tex., which was the poorest of all the effluents examined from activated sludge plants, had practically the same alkalinity as the raw sewage. The plant at the Grand Canyon removed 86 per cent of the alkalinity before the laundry waste was treated with the sewage, and 80 per cent afterwards.

In view of the fact that the oxidizing processes of sewage-treatment plants, when producing a high quality of effluent, reduce the alkalinity somewhat in proportion to the extent of oxidation of the organic matter, it is but reasonable to assume that the reduction is associated with the biological activity of the oxidizing devices. This relation, if better understood, might possibly throw more light on the problem of sewage treatment.

The pH value of the raw sewage and activated sludge at the canyon averages 7.0, and the final effluent, 6.3.

Bacteriological results.—Routine bacteriological analyses have been made weekly at the treatment plant since January 1, 1928. A summary of the results is given in Table 3.

TABLE 3.—*Summary of bacteriological analyses*

[Period covered by analyses, Jan. 1 to Mar. 31, 1928]

Total count on agar, 24 hours, 37° C.	
Raw sewage, average 14 analyses	810,000
Aeration tank, average 4 analyses	28,000
Effluent sand filters, average 14 analyses	103
Sterilized effluent in force main, average 14 analyses	2
B. coli	
(1) Raw sewage:	
Number per c. c., average 14 analyses	220,000
Number samples having 1,000 per c. c	1
Number samples having 10,000 per c. c	11
Number samples having 100,000 per c. c	2
(2) Effluent, clarifier:	
Number samples having less than 100 per c. c	1
Number samples having 100 per c. c	10
Number samples having 1,000 per c. c	4
(3) Effluent, sand filters:	
Number samples having less than 1 per c. c	8
Number samples having 1 per c. c	6
(4) Sterilized effluent delivered to storage tank:	
Number 10 c. c. portions tested	70
Number 10 c. c. portions negative	69

The results given in the table show that 99.98 per cent of the bacteria in sewage growing on agar, 24 hours, 37° C., were removed by the treatment plant, and that 99.84 per cent of the *B. coli* in the raw sewage were removed by the aeration tanks and clarifier, and 99.99 per cent by the plant as a whole. Out of the 70 portions of 10-cubic-centimeter samples of the sterilized effluent analyzed, only one was positive for *B. coli.*

Before the bacteriological work was started at the plant, 41 samples of the reclaimed sewage were sent to the Arizona State Board of Health for analysis. Of these, 28 were taken from the force main to the storage tank. The analyses showed that only five of the one hundred and forty 10-cubic-centimeter portions were positive for *B. coli,* and all these portions were from one sample. Thirteen samples were taken from a tap on the reclaimed sewage distribution line in the power house. In one sample all five 10-cubic-centimeter portions were positive for *B. coli,* and in one other sample one portion was positive. All other results were negative.

Since June, 1926, there has been made a total of 55 analyses of samples of the sterilized effluent collected from the force main to the storage tank and from a tap in the reclaimed sewage line in the power house, and five portions of 10 cubic centimeters each were analyzed from each sample. There were, therefore, 275 portions tested. Of these portions, 12, or 4.4 per cent, were positive for *B. coli.* It is believed that these results represent the average quality of the effluent for the entire time the treatment plant has been operated.

RECOVERY OF LAUNDRY WASTES

After the treatment plant had been in operation for a few months and was producing a satisfactory effluent, an investigation was made to determine how the laundry waste could be treated so that it could be recovered along with the sewage and not interfere with the use of the reclaimed sewage for generating steam. The investigation included chemical precipitation using alum in amounts varying from 10 to 35 grains per gallon. The smallest amount of alum giving satisfactory results was 15 grains per gallon. The averages of the analyses of the compositite waste untreated and treated with 15 grains per gallon were as follows:

	Raw waste	Treated waste
Oxygen demand, five days, parts per million	97	25
Suspended matter, parts per million	221	12
Total solids, parts per million	1, 061	864
Alkalinity, parts per million	249	50
Phenol alkalinity, parts per million	7	0
Noncarbonate hardness, parts per million	0	0

The reduction of the alkalinity from 249 to 50 parts per million by using 15 grains of alum per gallon is not in accordance with the reduction found in water treatment plants. The only explanation that can be offered for the reduction of 13 parts per million per grain of alum used is that the untreated laundry waste contained in suspension insoluble precipitates which reacted with the acid of the standard solution, whereas with the treated samples only the clear supernatant fluid which was free of suspended matter, was titrated.

Since the analyses showed that the hardness of the laundry waste was due to carbonates and bicarbonates, and 86 per cent of these constituents was removed from the sewage in the treatment plant, it was not considered necessary to treat the waste. It was mixed with the sewage and treated at the plant beginning December, 1927. The total hardness of the combined sewage and waste after treatment was determined hourly by the soap method for eight days during the hours the waste was passing through the plant. The analyses varied from a minimum of 23 to a maximum of 37 parts per million, with an average of 34. This average is slightly above that for the treated sewage before the waste was added. The monthly average results of soap hardness of the final effluent for January, February, and March were, respectively, 24, 38, and 47 parts per million, while the alkalinity results for the final effluent for the three months were 56, 86, and 81. The higher results for alkalinity were due to the presence in the laundry waste of sodium carbonate, which effects the alkalinity but not the soap hardness.

The suspended matter in the laundry waste was about the same as that in the raw sewage and the oxygen demand about one-fourth.

With the recovery of the laundry waste the amount of reclaimed sewage approaches very closely to 99 per cent of all the water discharged into the sewers.

USES OF RECLAIMED SEWAGE

At the present time the reclaimed sewage is used in stationary boilers for generating steam for heating purposes, and in the locomotives that haul passengers and freight trains on the branch line of the Santa Fe from Williams to the canyon; for cooling water for Diesel engines; for irrigating lawns around the hotel; and for flushing toilets in the public comfort stations in the El Tovar Hotel, Bright Angel Camp, railroad depot, and the Government automobile camp.

The force main from the treatment plant runs direct to the storage tank with only one branch taken off to supply cooling water for the Diesel engines. The entire distribution system from the storage tank is inclosed in vitrified pipes up to the outlets or fixtures where the reclaimed sewage is used. Beyond the vitrified pipe the uncovered distribution lines are painted red. The sewer pipe will prevent cross connections to fresh water lines. The pressure on the fresh water mains is greater than that on the reclaimed sewage lines. No valves, spigots, or any other openings are permitted on reclaimed sewage lines except where absolutely necessary. Accurate maps are kept up to date showing all the fresh water and reclaimed sewage pipe lines and no extensions or alterations of either piping system can be made without the approval of the superintendent of the park. With these limitations and precautions in distributing the reclaimed sewage, and the careful supervision given to the operation of the treatment plant, it is believed that it will be possible to use the reclaimed sewage indefinitely without any danger to the health of visitors to the park or of employees.

There has been no criticism by employees at the canyon who use the reclaimed sewage for generating steam or for any other purposes. The locomotive engineers vigorously opposed the use of "sewage" in passenger engines at first, but after a demonstration by an expert engineer they used the reclaimed sewage and found that it produced less scale than the fresh water obtained at the canyon.

All the reclaimed sewage is now being used for the purposes named above, and no others will be permitted, except possibly the washing of automobiles, under certain restrictions.

The treatment plant is operated under the supervision of a competent sanitary engineer who has two trained assistants.

COST OF OPERATION

In considering the cost of operation, the fact should be kept in mind that the plant was designed and is operated to produce an effluent of the same degree of purity from a bacteriological standpoint as drinking water, and that every 1,000 gallons of reclaimed sewage that can be used in place of fresh water is worth $3.09. The cost data, therefore, should be considered in relation to water filtration rather than sewage disposal.

The average volume of sewage reclaimed daily during 1927 was 79,000 gallons, and the itemized cost of treatment per 1,000 gallons, was approximately as follows:

Electric current at 5c per kilowatt:	
Operating blower	$0.20
Returning wash water	.003
Operating clarifier	.01
Lighting	.003
Labor for operating plant:	
2 operators and sanitary engineer	.177
Liquid chlorine, oil, grease, repairs to equipment, and extra labor	.009
Interest on investment[1] (treatment plant only)	.086
Depreciation[1] (treatment plant only)	.086
	.574

These costs would be reduced approximately one-half if the plant were operating at the capacity for which it was designed and if electric current were available at the commercial rate charged in cities; and the labor cost would decrease materially for plants treating large volumes of sewage.

CONCLUSIONS

The experience at the canyon has proved that it is possible to produce, continuously, a sewage effluent of the same quality as drinking water, in so far as bacteriological results are concerned, and of better quality than the original water for generating steam.

It is believed that where there is a scarcity of water, particularly in the West and Southwest, it will be economically practicable to reclaim sewage for industrial purposes, and for irrigating any kind of crops without danger of contaminating ground water or the products grown. The same degree of purification, however, will not be required for sewage to be used for irrigation as for industrial purposes, but sterilization will be necessary for reclaimed sewage used in growing vegetables and some other crops. The cost per acre-foot for sterilizing a well-oxidized effluent such as that produced by an activated sludge plant will be approximately $1.20 for small treatment plants using small cylinders of chlorine, and $0.60 for large plants using one-ton containers. The costs for operation of treatment plants will depend on the volume of sewage treated and the prices for labor and materials and for electric current where the activated sludge process is used. Where sewage is reclaimed for industrial purposes or for irrigation, a part of the operating expenses should logically be charged against the municipalities for disposal of the

[1]Estimates, but believed correct within 2 cents per 1,000 gallons.

sewage, and the remainder paid by the parties benefitting by the use of the reclaimed sewage.

No municipality or private corporation should attempt to design a treatment plant to reclaim sewage without the assistance of a competent sanitary engineer, and every plant constructed should be under the supervision of a competent operator.

ACKNOWLEDGMENTS

The treatment plant was designed by the writer, assisted by L. D. Mars, formerly assistant sanitary engineer, United States Public Health Service; M. R. Tillotson, formerly civil engineer of the park and now superintendent; and G. L. Davenport, assistant engineer, Santa Fe Railroad Co. The plant was built jointly by the Government and the Santa Fe Railroad Co. Mr. J. R. Eakin, formerly superintendent of the park, had general supervision over the part built by the Government, with Mr. Tillotson in active charge of construction, and the work done by the Santa Fe was under the general supervision of R. B. Ball, chief engineer coast lines, and G. L. Davenport, assistant engineer.

The plant was operated for one month at the start by Frank R. Shaw, associate sanitary engineer United States Public Health Service, and he was succeeded by Dario Travaini, who is now in charge and who supplied the chemical and bacteriological analyses given in the tables.

COURT DECISIONS RELATING TO PUBLIC HEALTH

Quarantine because of refusal to have cattle tuberculin tested upheld.—(New York Court of Appeals; People *v.* Teuscher, 162 N. E. 484; decided July 19, 1928.) A 1924 amendment (Laws 1924, ch. 267) added the following provision to section 76 of the farms and markets law (now the agriculture and markets law):

> Whenever 90 per centum of the herds of cattle in any town have been subjected to the tuberculin test for the purpose of ridding such herds of the disease known as tuberculosis, and the owner of any untested herd in such town refuses or neglects to have his herd tuberculin tested, then the commissioner may order the premises or farm on which such untested herd is harbored to be put in quarantine, so that no domestic animal shall be removed from or brought to the premises quarantined, and so that no products of the domestic animals on the premises so quarantined shall be removed from the said premises.

Ninety per cent of the herds of cattle in a certain township were tuberculin tested. The defendant, a herd owner in the township, refused to permit the test to be applied to his herd. The commissioner of farms and markets, pursuant to the above-quoted law, ordered a quarantine of defendant's premises. The order was violated by the defendant by removing milk from his farm and selling it to milk-gathering stations. Under other sections of the statute the commissioner brought an action to recover penalties for, and to restrain, the violation of his order, and had judgment, which on appeal was affirmed by the appellate division of the supreme court and by the court of appeals. The defendant assailed the statute, on which the order was based, as an unconstitutional interference with liberty and property, and a denial of the equal protection of the laws. In overruling this objection, the court of appeals said:

* * * The standard to be applied in ordering a quarantine involves, in his [defendant's] view, an arbitrary preference of some localities and persons to the detriment of others. The classification, he says, is unrelated in any reasonable degree to the mischief to be remedied. * * *

We find no arbitrary preference of localities or persons, no classification unrelated to the mischief to be remedied. The plan of the statute is to make the township the territorial unit in the war upon unhealthy cattle. More will be accomplished, it has been thought, by attacking the units severally than by going against all together. [Cases cited.] No doubt there are gaps and leaks in any scheme of subdivision. Milk from the herds in the tested town of Rome will be rid of the infection, but milk may be brought from untested towns near by, and sold even in Rome, without offense against the statute. This is far from saying that the purification of the source of supply in a given territorial unit is not a public good. At least the local herds will be sound, and buyers from that source of supply will have a certificate of safety. A class may lawfully be restricted, if the lines defining the restriction are not arbitrary altogether, and the rule to be applied within them is uniform and even.

* * * Legislation is not void because it hits the evil that is uppermost. Equally it is not void because it hits the evil that is nearest. There would be paralysis in a different rule. A statute prescribes the quality of food produced within a State. It does not become invalid for failing at the same time to provide a method of maintaining equal quality in respect of food imported. As well might we say that every local ordinance is void because by the conditions of its existence it is a rule for a locality. The war upon disease would be even harder than it is if nothing short of extermination could render it legitimate.

* * * * * * *

The size of the unit is not, however, the sole basis of the attack upon the statute. Attack is also made upon the standard of selection to be applied within the unit. The principle of local cooperation—a principle shared by this statute with those in other States—involves, it is said, a false basis of division. There is a denial, in this view, of the equal protection of the laws, if not an unlawful delegation of legislative power, when the voluntary use of a test by a prescribed percentage of the owners in a township is made a standard of conduct to which others must conform, though owners in other townships, where there is a different percentage of opposition, are free from such restraints. Again there is significance in practice and decision. If the legislatures in so many States have "deemed it wise to invite and secure voluntary local cooperation" before applying a plan "to a given area" (Schulte *v.* Fitch, supra), we may suspect that in a choice so general there is something more substantial than a vagary of the will.

The local mind can best discern in these things as in many others the local needs and interests. [Cases cited.] The legislature might have said that every farmer in every township must submit his cattle to the test. [Cases cited.] It chose to adopt a rule less general and oppressive. Whether there was need for the test at any given time and place could not be known in advance. * * * The safest thing was to leave the choice to the enlightened self-interest of those within the industry. * * * Some protection, however, there would have to be against dissent within the group, the factious opposition of an intransigent minority. The test of a herd would go for naught, the danger of inspection [infection?] would be as great almost as before, so long as another herd, untested, was harbored on a neighbor's farm. The statute does not say that even then a mere majority of owners may impose their will on the minority. Not till 90 per cent have united in resorting to the test does it say that the other 10 per cent must conform, or else submit to a quarantine that will keep their cattle off the market. Pressure so effective is equivalent to a command to yield.

A command thus conditioned is neither a denial of equal laws [case cited] nor an illegitimate delegation of legislative power [case cited]. It is the adaptation of the rule, according to the judgment of the vicinage, to the occasion and the need. Small use would there be in stimulating the many within a township to a care of the public health if one or a few wiseacres or obstructionists could make the labor vain. * * *

Ninety per cent of the cattle owners in the township of Rome have said by their acts that the test rejected by the defendant is useful and desirable. Legislation in this State and elsewhere has confirmed their judgment. Acts of Congress have done the same. See, e. g., Mason's Fed. Code, title 21, secs. 111, 123 (21 U. S. C. A. secs. 111, 123). The defendant holds out, and says the test is worthless. The Constitution does not protect him in this assertion of his own will against a judgment so preponderant. * * *

Liability of city for negligent disposal of sewage.—(Oklahoma Supreme Court; City of Sayre *v.* Rice, 269 P. 361; decided July 31, 1928.) An action to recover damages, based on the negligent operation of a sewer system, was brought against the city of Sayre. The plaintiff alleged that the main line of the city's sewer system became broken and that the sewage, originally intended to be emptied into a river, was discharged upon the bottom lands of the river in the near vicinity of plaintiff's land and home, causing loss of rents and discomfort, annoyance, and illness to her and her family. A jury returned a verdict in favor of the plaintiff, and the city appealed. The nature of the evidence presented by the plaintiff to substantiate her claim for damages on account of sickness, allegedly caused by the nuisance, is stated thus by the appellate court:

* * * Plaintiff's evidence merely showed that the city sewer discharged the sewage upon the ground about 200 or 300 yards from her home, where the same was not carried off during dry weather by the water, and that certain sickness, including typhoid fever, occurred in her home. There was no evidence reasonably tending to show that the nuisance caused any of the sickness or fever. No evidence was even offered that the sickness would not likely have resulted from other causes, and that the discharge of sewage contained such disease germs as would create the disease complained about. There was no opinion given by expert witnesses that such condition would likely result in typhoid or other fevers; and, in so far as the record discloses, one would have to rely solely on conjecture as to what produced the fevers testified about. * * *

The supreme court held that, because of this state of the evidence, the matter of sickness should not have been submitted to the jury as a proper item of damage, and remanded the cause for a new trial, saying:

* * * Without the aid of some proof as to the causal relation between the nuisance and the injury, a jury would be licensed to enter the field of conjecture, which, in many instances, would result in unjust and untold injury to the parties litigant. It can not be ascertained from the record whether the amount of the verdict, in excess of the rentals allowed under the special interrogatories, were because of the noxious odors to plaintiff and her family or because of the typhoid and other fevers about which testimony was given. The item of sickness having been submitted to the jury as a proper item of damage, it is reasonable to suppose that some compensation, and possibly the greater part thereof, was allowed by reason of such sickness. Under the record, this item should have been excluded, and it was error to refuse the requested instruction.

PUBLIC HEALTH ENGINEERING ABSTRACTS

Bedford (England) Refuse Destructor and Sewage Disposal Works. N. Greenshields. Munic. Eng. Sanit. Record 80, 48 (1927). Abstract by C. H. Badger. *Chemical Abstracts*, vol. 22, No. 12, June 20, 1928, p. 2225.

"A brief description of the destructor is given. The sewage-pumping station adjoins the destructor. Enough steam is generated by burning house refuse to pump all the screened sewage, about 1,600,000 gallons per day, against a head of 65 feet to the sewage-disposal works. The sewage screenings are mixed with the destructor flue dust and sold as fertilizer. An underground sewage-pumping station discharging into a high-level sewer and the disposal works are also briefly described. Storm water is treated on 37 acres of land. About 9,000 tons of liquid sludge and humus per year is put on arable land for two to three years, which is then rented to small holders for three years."

Experimental Salvage Plant. Results Obtained at Nottingham (England). W. C. Culley, Munic. Eng. Sanit. Record 80, 133–4 (1927). Abstract by C. H. Badger. *Chemical Abstracts*, vol. 22, No. 12, June 20, 1928, p. 2225.

"Practical working uncovered a number of faults which are described. Alterations based on experience showed a reduction in working costs and increased the capacity from 50 to 60 tons of crude refuse per day. Unwashed cinder is sold to an electric-power plant. The disposal of screened dust is at present unsatisfactory, most of it being hauled away on contract. The experimental plant has proved that the destructors can not compete in economical working with a combined separation and incineration method for the disposal of crude refuse."

An Ideal Organization for a Street Cleaning and Waste Disposal Department. Elmer C. Goodwin. *The American City*, vol. 38, No. 6, June, 1928, pp. 137–139. Abstract by J. H. O'Neill.

The special problems which occur only in the work of the cleaning of streets and the collecting and disposing of the refuse of a community make it necessary that this work be the sole function of a special department. The department would consist of the following divisions: (1) Street cleaning and refuse collections; (2) final disposition of refuse; (3) equipment and maintenance; (4) engineering and planning; (5) clerical. The heads of the divisions would report directly to the chief executive, or general superintendent of the department. In addition to the regular reports from the division heads, the general superintendent should have some special inspectors reporting directly to him on special assignments.

The organization and duties of the different divisions are discussed in detail.

Sewage Works Analyses. F. W. Mohlman. Proceedings of Tenth Texas Water Works Short School, January, 1928, pp. 221–232. Abstract by W. L. Havens.

This is an excellent article, pointing out the necessity for intelligent interpretation of sewage and effluent analyses and suggesting that the less informative methods of past years be discarded in favor of more valuable methods now being improved and standardized. The author advises that more attention be paid to proper sampling and the use of determinations of biochemical oxygen demand, suspended solids, organic plus ammonia nitrogen and hydrogen ion concentration for raw sewage and settled effluents, and, in addition, tests for dissolved oxygen, nitrites and nitrates on biologically treated effluents, and total, volatile, and fixed solids on sludges and screenings. The latter part of the article contains a discussion of the technique of the biological oxygen demand determination and its significance in sewage treatment and stream pollution.

The Design of Small Sewage Treatment Works at Gaithersburg, Md. Harry R. Hall. *Water Works*, vol. 67, No. 6, June, 1928, pp. 235–239. (Abstract by C. G. Gillespie.)

This is an interesting account of a painstaking study to fit a high grade of treatment (sprinkling filter) to a town of 2,000 people by designing economically, with easiest extension of the plant. For the present, Gaithersburg (1,300 people) and Washington Grove (a summer resort of 700 people), both in the Washington Suburban Sanitary District, will have a joint sewage disposal, but Washington Grove will ultimately dispose of its sewage into another valley. The main outfall is 15 inches, 1.2 miles long, including 430 feet of 8-inch inverted siphon. The outfall will care for 7,000 people.

Treatment plant is in the valley of Muddy Branch, which discharges into the Potomac River 8 miles from the plant. The site is ¼ mile from the nearest road or house, in a country of excellent farms, with dairying, hence the type of plant used. The plant will be operated by the designers. Absence of electric current precludes the use of mechanical devices. The result of economy studies was the use of primary and final tanks, which are rectangular, with shallow, steep-sided hopper bottoms, with separate sludge digestion. The total flow depth is 16 feet 5 inches for primary and 14 feet 7 inches for secondary; minimum slope of hoppers is 0.8 on 1. Each tank has duplicate flowing-through chambers with a 24-inch central scum chamber. The slope of the partition walls is 1 to 1. This design gives 309 cubic feet of sludge capacity below slots in primary tank and 180 in final tank. The detention period is 1.5 hours, based on average flow, in primary tank, and 1 hour in final tank. The sludge is removed to first unit of two sludge digestion tanks. The sludge allowance is 3 cubic feet per person for future population of 2,500. The sludge is admitted 6 feet below the water surface near the center. The supernatant liquor is removed 0.2, 2, and 3.9 feet below the surface and discharged on the sludge drying beds. The sludge agitation in digesters will be effected by manual use of scraper. The sprinkling filter rate is 2.65 m. g. a. d.; average depth is 5.6 feet. The sides are a combination of vertical walls and sloping walls, with the filter medium sloping downward on unfinished face to allow for extension of the bed. The omission of the vertical walls increased the width of stone at the top 3 feet, yet it gave a net saving of $400 per half unit. The underdrain floors are 2 feet on centers. The modified Imhoff tank with separate sludge digestion saved $3,000 over the ordinary deep tank design with two flowing-through chambers. The cost of the work for first construction was $23,500, suitable for 1,250 population, building six additional sludge beds, $4,500, and another sludge digestion tank and completion of filters, $9,600; or a total of $37,600 for 2,500 persons designed for. These costs are about $20 per capita immediately and $15 per capita for the ultimate plant.

New Chlorine Preparations for the Sterilization of Drinking Water. W. E. Hilgers. Gesundh. Ing. 51, 177–84 (1928). Abstract by Wayne L. Denman *Chemical Abstracts*, vol. 22, No. 11, June 10, 1928, p. 2017.

"Various Cl preparations were tested with respect to their power to sterilize water. 'Kaporit,' calcium hypochlorite containing 60–75 per cent of active Cl, was first tested. Using a sample made by infecting pure water with a filtered culture of bacteria a reduction from 55,290 per c. c. to 0 per c. c. was obtained with 0.2 mg. Cl and 20 minutes' reaction time, and other results were equally as good. Another Cl preparation under the name 'Ergichlor', which is NaClO, was tried. The results obtained were quite satisfactory. Cl water was used in the form of an ampoule, under the name of 'Aquapurol,' with good results. Still another Cl preparation is the chloramine tablet. These tablets are suitable for sterilization in the field where the water is fairly clear. With a high organic content the action is greatly retarded. Sterilization with these tablets is slower than with Cl water. (The results of these tests are given in various tables.) The efficiency of the various Cl preparations is a function of the quality of the water, the total number of bacteria, the miscibility in water, and the stability or rate of evolution of chlorine. Control of a drinking water by determination of free Cl is not sufficient, but bacteriological determinations should also accompany it."

The Sanitary Significance of Lactose-Fermenting Bacteria not Belonging to the B. coli Group. Frank E. Greer. *Journal Infectious Diseases*, vol. 42, No. 5, May, 1928, pp. 501–513. (Abstract by W. L. Havens.)

There are several types of lactose-fermenting bacteria which may confuse the test for *B. coli* and, if their importance is not well understood, it may result in entirely erroneous analyses. The three principal types often encountered in water include *Clostridium welchii*, *Bacillus aerosporus*, and *Streptococcus fecalis*. Other types less frequently found or present only in isolated localities include the leather bacillus of Houston, *Phytomonas aerogenes* and an anaerobe described by Raab.

The article describes laboratory methods for identification of the various bacteria mentioned and explains their significance when encountered in water analyses.

The Sanitary Significance of Lactose-Fermenting Bacteria not Belonging to the B. coli Group. Frank E. Greer. *Journal Infectious Diseases*, vol. 42, No. 5, May, 1928, pp. 514–524. (Abstract by W. L. Havens.)

This article deals particularly with the lactose-fermenting bacteria found in Chicago sewage and Chicago water.

In sewage the bacteria of this type identified included *B. coli*, *Streptococcus fecalis*, *B. aerosporus*, and *Clostridium welchii*. The first two mentioned were found present in large numbers. *Cl. welchii* was present in considerable numbers, but less numerous than either of the two organisms above referred to. *B. aerosporus* was not found in sufficient numbers to be considered a constant member of the flora of sewage.

In Lake Michigan water the same bacteria were found present, although the numbers show a seasonal variation and also vary in the raw and treated water. Their presence often renders the 48-hour presumptive test of treated water valueless as an index of *B. coli* during many months of the year. This demonstrates that lactose broth as a medium for testing Lake Michigan water at Chicago is not sufficiently selective for *B. coli* to enable the exclusion of other lactose-fermenting organisms common to the Chicago water supply.

Chloro-Phenol Tastes and Abnormal Absorption of Chlorine. H. H. Gerstein. *Water Works*, vol. 67, No. 6, June, 1928, pp. 227–228. (Abstract by C. G. Gillespie.)

This is an interesting account, showing the wind-induced travel of phenol from oil pollution from lakeward flow of the Calumet River and from Indiana Harbor to Chicago intake. The wind changed southwesterly toward the intake the morning of December 25, 1927. By December 28 the average velocity was 31.6 miles per hour, at which time the chlorine demand suddenly increased at Sixty-eighth Street and Dunne Cribs supply 3¾ miles south of Calumet River and 9¼ miles southeast of Indiana Harbor. Maximum chloro-phenol taste and chlorine required occurred at 7 p. m. December 28, then gradually decreased as the area of pollution passed. Four Mile Crib was reached December 29; Two Mile Crib was reached the afternoon of the same day and Wilson Avenue Crib late that evening. On December 29 the wind reversed and pollution was carried back to the cribs, causing a second period of bad water in reverse order. Again, January 3–7, 1928, the wind shifted southwest; pollution reached Sixty-eighth Street and the Dunne Cribs January 7. Chloro-phenol tests made by the modification of Gibbs method show 5 p. p. b. will cause taste. On December 28 one test showed 63.2 p. p. b. It was noted that on the last occasion tests showed less phenol than previously, and yet tastes were even worse. The probability is expressed that industrial wastes containing phenol also contained compounds interfering with the sensitivity of the test. These compounds have not been identified.

In Chicago the water is pumped into the distribution system 20 seconds to 2 minutes after chlorination; and instead of a residual chlorine test after 10 minutes, as is recommended, the test is made as the water leaves the pumps. In this period chlorine absorption varies from 5 to 20 per cent of the dosage. During the periods in question chlorine was completely absorbed in a few seconds; and to leave a minimum of 2.5 pounds per milligram at the discharge of the pump required doses as high as 14 pounds per milligram, or three to four times the amount required normally. By making residual chlorine tests at 15-minute intervals, bacterial analyses were kept favorable. The only two analyses for *B. coli* in unchlorinated water gave 2,400 per 100 c. c. In a survey of the lake opposite the Standard Oil Co. sewers at Whiting, Ind., the lake had a smooth, milky-white sheet of pollution 200 feet wide extending 2 miles into it from the sewer. Examinations showed phenol 7.5 p. p. b., 2,400 *B. coli* per 100 c. c. Calumet River tests indicated 7.5 to 12.5 p. p. b. phenols.

Constant Fight for Existence in Open Raw Water Reservoirs. M. F. Trice, *Water Works Engineering*, vol. 81, No. 6, March 14, 1928, pp. 338–370. (Abstract by H. V. Pedersen.)

This is an interesting article in which the author describes how all life is ultimately dependent upon the tiny plants known as bacteria. Beginning with the smallest order of life he describes how each successive higher order of life feeds upon the lower order and actually depends upon it for existence. This fight for existence which takes place in every pond is called the Cycle of Life.

Occasionally conditions arise when this cycle gets out of balance, resulting in a predominance of some one particular organism. When this occurs the quality of the water as a drinking supply is usually affected. Sometimes the predominating organism secretes an oily substance from which come tastes and odors.

The author also states that the surface waters in the Northern States are more favorable to the growth of micro-organisms than waters in the Southern States, due to the fact that surface waters of the South are more highly turbid than those of the North.

DEATHS DURING WEEK ENDED SEPTEMBER 22, 1928

Summary of information received by telegraph from industrial insurance companies for the week ended September 22, 1928, and corresponding week of 1927. (From the Weekly Health Index, September 26, 1928, issued by the Bureau of the Census, Department of Commerce)

	Week ended Sept. 22, 1928	Corresponding week, 1927
Policies in force	71, 693, 704	68, 744, 484
Number of death claims	12, 130	11, 992
Death claims per 1,000 policies in force, annual rate	8.8	9.1

Deaths from all causes in certain large cities of the United States during the week ended September 22, 1928, infant mortality, annual death rate, and comparison with corresponding week of 1927. (From the Weekly Health Index, September 26, 1928, issued by the Bureau of the Census, Department of Commerce)

City	Week ended Sept. 22, 1928		Annual death rate per 1,000 corresponding week, 1927	Deaths under 1 year		Infant mortality rate, week ended Sept. 22, 1928 [2]
	Total deaths	Death rate [1]		Week ended Sept. 22, 1928	Corresponding week, 1927	
Total (69 cities)	6, 507	11.1	10.3	738	660	59
Akron	32			2	5	22
Albany [3]	41	17.8	14.4	4	3	82
Atlanta	73	15.0	13.8	7	8	
White	45		8.3	4	3	
Colored	28	(4)	26.8	3	5	
Baltimore [3]	186	13.0	12.3	27	25	86
White	135		11.4	19	19	76
Colored	51	(4)	17.3	8	6	125
Birmingham	66	15.5	17.7	11	11	94
White	34		15.7	1	7	14
Colored	32	(4)	20.9	10	4	225
Boston	190	12.4	12.8	29	35	80
Bridgeport	34			3	5	55
Buffalo	131	12.3	11.8	16	9	69
Cambridge	23	9.6	9.7	0	0	0
Camden	19	7.3	11.0	2	7	32
Canton	24	10.7	8.7	3	3	71
Chicago [3]	594	9.8	9.7	63	56	54
Cincinnati	132	16.7	13.4	20	14	121
Cleveland	171	8.8	7.7	12	15	33
Columbus	71	12.5	11.5	9	9	84
Dallas	53	12.7	9.9	4	5	
White	36		9.3	4	4	
Colored	17	(4)	13.3	0	1	
Dayton	50	14.2	10.4	11	4	182
Denver	88	15.6	11.9	11	14	
Des Moines	22	7.6	9.5	2	1	33
Detroit	250	9.5	8.2	39	29	60
Duluth	22	9.8	10.5	1	4	23
El Paso	34	15.1	13.3	13	3	
Erie	21			1	0	21
Fall River [3]	29	11.3	8.7	8	3	137
Flint	39	13.7	12.8	20	8	255
Fort Worth	33	10.3	8.0	4	2	
White	28		6.2	4	1	
Colored	5	(4)	21.3	0	1	
Grand Rapids	32	10.2	7.4	3	1	45
Houston	47			4	8	
White	38			4	6	
Colored	9	(4)		0	2	
Indianapolis	107	14.6	13.4	12	8	91
White	88		12.0	7	5	61
Colored	19	(4)	23.3	5	3	303
Jersey City	59	9.5	6.8	8	6	60
Kansas City, Kans	33	14.6	6.7	5	2	106
White	25		4.3	4	2	99
Colored	8	(4)	17.2	1	0	145
Kansas City, Mo	66	8.8	11.2	2	10	14

(Footnotes at end of table)

Deaths from all causes in certain large cities of the United States during the week ended September 22, 1928, infant mortality, annual death rate, and comparison with corresponding week of 1927. (From the Weekly Health Index, September 26, 1928, issued by the Bureau of the Census, Department of Commerce)—Continued

City	Week ended Sept. 22, 1928		Annual death rate per 1,000 corresponding week, 1927	Deaths under 1 year		Infant mortality rate, week ended Sept. 22, 1928
	Total deaths	Death rate		Week ended Sept. 22, 1928	Corresponding week, 1927	
Knoxville	40	19.8	10.7	7	2	152
White	31		11.0	7	2	169
Colored	9	(4)	8.5	0	0	0
Los Angeles	211			18	23	51
Louisville	65	10.3	10.6	5	2	42
White	61		9.8	4	2	38
Colored	4	(4)	14.9	1	0	69
Lowell	26	12.3	14.7	5	7	105
Lynn	16	7.9	7.0	1	1	25
Memphis	64	17.6	15.7	4	3	47
White	36		16.7	3	1	56
Colored	28	(4)	14.0	1	2	31
Milwaukee	94	9.0	6.4	6	10	27
Minneapolis	85	9.7	7.8	10	1	60
Nashville	53	20.0	12.5	5	2	79
White	42		10.5	2	1	43
Colored	11	(4)	16.1	3	1	180
New Bedford	19	8.3	7.4	0	0	0
New Haven	21	5.8	10.4	1	4	14
New Orleans	147	17.9	17.6	17	21	82
White	96		15.6	11	12	80
Colored	51	(4)	23.2	6	9	87
New York	1,194	10.4	9.8	136	116	53
Bronx Borough	165	9.1	7.5	16	13	48
Brooklyn Borough	381	8.6	8.6	44	43	44
Manhattan Borough	484	14.4	13.7	50	47	70
Queens Borough	116	7.1	6.4	9	12	36
Richmond Borough	48	16.7	13.2	8	1	144
Newark, N. J	82	9.1	8.0	4	6	21
Oakland	71	13.5	10.3	3	4	33
Oklahoma City	27			5	1	
Omaha	46	10.8	9.8	6	2	70
Paterson	31	11.2	8.0	1	4	17
Philadelphia	438	11.1	10.1	49	53	66
Pittsburgh	144	11.2	10.3	17	16	56
Portland, Oreg	59			3	2	32
Providence	64	11.7	10.0	8	4	70
Richmond	42	11.3	9.8	6	1	78
White	22		7.3	3	0	61
Colored	20	(4)	15.9	3	1	110
Rochester	51	8.1	9.5	3	6	24
St. Louis	167	10.3	12.1	23	23	77
St. Paul	39	8.1	9.4	1	2	10
Salt Lake City [3]	26	9.9	10.4	1	4	16
San Antonio	51	12.2	9.4	12	8	
San Diego	35	15.3	21.3	2	5	38
San Francisco	164	14.7	13.1	5	6	31
Schenectady	23	12.9	10.1	3	2	94
Seattle	68	9.3	9.2	6	3	62
Somerville	13	6.6	11.3	2	2	69
Spokane	31	14.9	10.5	0	2	0
Springfield, Mass	35	12.2	11.7	6	5	95
Syracuse	55	14.4	10.3	2	2	24
Tacoma	23	10.9	7.8	1	0	26
Toledo	62	10.4	10.6	5	9	48
Trenton	30	11.3	10.7	2	4	34
Washington, D. C	114	10.8	9.8	16	13	91
White	72		7.4	8	4	66
Colored	42	(4)	17.2	8	9	148
Waterbury	18			2	1	58
Wilmington, Del	25	10.2	11.1	1	3	26
Worcester	45	11.9	13.1	3	0	36
Yonkers	28	12.1	6.6	3	2	68
Youngstown	42	12.6	7.4	4	5	53

[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, Sept. 21, 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; Houston, 25; Indianapolis, 11; Kansas City, Kans., 14; Knoxville, 15; Louisville, Ky., 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 22, 1928, and September 24, 1927

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended September 22, 1928, and September 24, 1927

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Sept. 22, 1928	Week ended Sept. 24, 1927	Week ended Sept. 22, 1928	Week ended Sept. 24, 1927	Week ended Sept. 22, 1928	Week ended Sept. 24, 1927	Week ended Sept. 22, 1928	Week ended Sept. 24, 1927
New England States:								
Maine	3	5	8		21	7	0	0
New Hampshire	4				18		0	
Vermont					1		0	0
Massachusetts	53	74	11	4	43	25	4	0
Rhode Island	4	7			5		2	0
Connecticut	26	17	8	1	4	3	1	2
Middle Atlantic States:								
New York	88	166	[1] 8	[1] 12	72	40	24	4
New Jersey	56	102	3	3	18	5	2	3
Pennsylvania	87	107			102	19	5	1
East North Central States:								
Ohio	28		2		22		0	
Indiana	16	10	7	14	2	11	0	0
Illinois	95	88	11	3	43	26	2	4
Michigan	56	52			14	13	4	1
Wisconsin	12	39	35	6	21	73	1	6
West North Central States:								
Minnesota	33	27	3		9	4	0	4
Iowa [2]	9	23				1	0	2
Missouri	22	24	3	3	3	2	0	1
North Dakota	4	12	1	2	1	4	0	0
South Dakota	1	4					1	0
Nebraska	7	1		1	2	2	0	0
Kansas	9	39	3		5	33	2	0
South Atlantic States:								
Delaware		2			1	3	0	0
Maryland [2]	29	23	9	8	8	11	0	1
District of Columbia	12	10	1		4	2	0	0
Virginia							0	0
West Virginia	12	26	8	10	8	24	0	1
North Carolina	85	75			11	75	0	2
South Carolina	44	88	342	258		53	0	0
Georgia	28	41	164	17	2	8	1	0
Florida	20	28		4		1	0	0

[1] New York City only. [2] Week ended Friday.

***Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended September 22, 1928, and September 24, 1927*—Continued**

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Sept. 22, 1928	Week ended Sept. 24, 1927	Week ended Sept. 22, 1928	Week ended Sept. 24, 1927	Week ended Sept. 22, 1928	Week ended Sept. 24, 1927	Week ended Sept. 22, 1928	Week ended Sept. 24, 1927
East South Central States:								
Kentucky	38						1	
Tennessee	32	36	16	8	1	14	2	1
Alabama	75	64	38	13	5	21	0	2
Mississippi	31	29	3	3			0	1
West South Central States:								
Arkansas	16	12	13	9	2	3	0	0
Louisiana	17	48	14	6	2	5	1	0
Oklahoma [3]	64	90	23	19		8	0	1
Texas	19	30	24	1	3	5	0	0
Mountain States:								
Montana	5				1	2	2	0
Idaho		2					1	0
Wyoming	10					7	0	0
Colorado	5	16	3			3	5	0
New Mexico	6	10				9	0	0
Arizona	1				3		2	0
Utah [2]	3	7					1	0
Pacific States:								
Washington	8	12			10	27	1	2
Oregon	9	9	2	5	3	8	1	1
California	64	61	21	5	13	36	1	4

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Sept. 22, 1928	Week ended Sept. 24, 1927	Week ended Sept. 22, 1928	Week ended Sept. 24, 1927	Week ended Sept. 22, 1928	Week ended Sept. 24, 1927	Week ended Sept. 22, 1928	Week ended Sept. 24, 1927
New England States:								
Maine	2	15	14	17	0	0	8	13
New Hampshire	0		8		0		0	
Vermont	3	1	3	2	0	0	0	0
Massachusetts	25	97	54	130	0	0	12	19
Rhode Island	0	4	6	10	0	0	2	1
Connecticut	2	12	15	18	0	0	3	9
Middle Atlantic States:								
New York	70	55	65	112	0	2	42	62
New Jersey	9	37	24	45	0	0	33	26
Pennsylvania	11	42	101	167	0	0	60	36
East North Central States:								
Ohio	15	96	71		3		32	
Indiana	0	0	32	54	8	15	19	34
Illinois	6	42	87	78	5	17	55	45
Michigan	5	24	68	57	6	12	15	8
Wisconsin	2	14	41	65	4	16	10	8
West North Central States:								
Minnesota	34	8	55	48	0	0	10	4
Iowa [2]	3	5	11	11	0	4	5	3
Missouri	2	23	41	32	8	4	36	32
North Dakota	11	3	21	22	0	0	0	2
South Dakota	3	2	6	10	2	5	1	3
Nebraska	3	8	36	12	3	0	1	1
Kansas	6	19	41	46	4	0	17	25
South Atlantic States:								
Delaware	0	0	2	4	0	0	1	5
Maryland [2]	28	2	10	22	0	0	41	38
District of Columbia	2	0	4	8	0	0	4	2
Virginia	1	1			0	1		
West Virginia	14	18	36	56	4	9	43	59
North Carolina	2	0	59	40	5	13	29	23
South Carolina	0	4	10	22	0	2	53	78
Georgia	1	0	10	11	0	0	51	44
Florida	1	1	0	6	0	0	4	10

[2] Week ended Friday.

[3] Exclusive of Oklahoma City and Tulsa.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended September 22, 1928, and September 24, 1927—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Sept. 22, 1928	Week ended Sept. 24, 1927	Week ended Sept. 22, 1928	Week ended Sept. 24, 1927	Week ended Sept. 22, 1928	Week ended Sept. 24, 1927	Week ended Sept. 22, 1928	Week ended Sept. 24, 1927
East South Central States:								
Kentucky	3		55		0		38	
Tennessee	2	4	30	14	0	11	60	70
Alabama	3	2	27	11	4	4	35	57
Mississippi	5	0	5	12	1	0	26	11
West South Central States:								
Arkansas	0	1	9	4	1	0	33	66
Louisiana	1	1	2	10	0	1	30	31
Oklahoma [2]	0	10	19	16	0	3	62	110
Texas	1	25	14	18	1	6	4	23
Mountain States:								
Montana	3	0	5	6	2	3	9	1
Idaho	2	0	5	4	0	1	0	1
Wyoming	0	1	14	4	0	1	1	4
Colorado	2	4	10	22	0	1	8	15
New Mexico	1	19	6	5	0	0	8	14
Arizona	0	2	0	1	1	0	1	8
Utah [1]	1	4	6	4	0	17	2	4
Pacific States:								
Washington	16	11	17	13	25	5	9	7
Oregon	0	21	16	5	10	5	3	10
California	4	43	76	75	19	10	18	19

[1] Week ended Friday. [2] Exclusive of Oklahoma City and Tulsa.

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
June, 1928										
South Dakota	1	2	2	1	108		2	66	14	4
July, 1928										
South Dakota	1	4			112		0	58	16	3
August, 1928										
Alabama	4	62	141	1,026	56	99	4	21	8	290
Arkansas	0	17	77	1,579	10	230	1	5	4	214
Illinois	31	298	54	17	132	3	19	205	35	154
Iowa	3	22			5		8	51	6	14
Kansas	4	24	3	7	15	1	11	106	36	109
Louisiana	1	31	87	335	35	75	0	14	1	192
Maryland	1	78	11	3	56	1	124	36	0	157
Minnesota	5	104	4		23		30	157	5	25
Missouri	13	83	6	22	53	1	2	76	17	96
New York	145	493		19	829		362	222	0	216
Ohio	15	150	45	7	301		72	172	17	171
Oklahoma [1]	1	58	60	1,071	10	79	3	34	26	333
Rhode Island	0	22	4		297		1	25	0	9
South Carolina	0	91	881	2,607	15	736	9	8	5	302
Wisconsin	9	55	60		83		8	169	37	24
Wyoming	3	20			3		0	20	2	4

[1] Exclusive of Oklahoma City and Tulsa.

June, 1928

South Dakota:	Cases
Chicken pox	24
Mumps	4
Whooping cough	12

July, 1928

South Dakota:	
Chicken pox	12
Mumps	3
Trachoma	2
Whooping cough	18

August, 1928

	Cases
Actinomycosis:	
Kansas	1
Anthrax:	
Louisiana	2
Ohio	1
Oklahoma [1]	1
Chicken pox:	
Alabama	12
Arkansas	28
Illinois	138
Iowa	35
Kansas	18
Louisiana	9
Maryland	14
Minnesota	34
Missouri	12
New York	174
Ohio	85
Oklahoma [1]	6
Rhode Island	4
South Carolina	21
Wisconsin	95
Wyoming	4
Dengue:	
Alabama	7
Louisiana	2
South Carolina	19
Dysentery:	
Illinois	60
Kansas (bacillary)	2
Louisiana	5
Maryland	89
Minnesota	4
New York	1
Ohio	4
Oklahoma [1]	112
German measles:	
Illinois	21
Iowa	5
Kansas	1
Maryland	1
New York	58
Ohio	2
Hookworm disease:	
Arkansas	3
Louisiana	27
South Carolina	101
Impetigo contagiosa:	
Maryland	7
Lead poisoning:	
Illinois	16
Ohio	12
Leprosy:	
Louisiana	6
Lethargic encephalitis:	
Alabama	3
Illinois	3
Iowa	2
Maryland	1
New York	24
Ohio	3
Wisconsin	2
Mumps:	
Alabama	23
Arkansas	29
Illinois	126
Iowa	34
Kansas	70
Louisiana	11
Maryland	23
Missouri	21
New York	187
Ohio	56
Oklahoma [1]	16
Rhode Island	2
Wisconsin	62
Wyoming	12
Ophthalmia neonatorum:	
Illinois	51
Kansas	1
Louisiana	3
Missouri	1
New York	4
Ohio	90
South Carolina	13
Paratyphoid fever:	
Arkansas	1
Illinois	14
Kansas	6
Louisiana	2
New York	4
Ohio	4
South Carolina	28
Puerperal septicemia:	
Illinois	6
New York	4
Ohio	1
Rabies in animals:	
Illinois	24
Maryland	5
Missouri	3
New York	8
Rhode Island	17
Rabies in man:	
Illinois	1
Ohio	1
Rocky Mountain spotted or tick fever:	
Wyoming	3
Septic sore throat:	
Illinois	7
Maryland	5
Missouri	8
New York	9
Ohio	36
Oklahoma [1]	13
Tetanus:	
Illinois	7
Kansas	6

[1] Oklahoma City and Tulsa excluded.

	Cases
Tetanus—Continued.	
Louisiana	4
Maryland	2
Missouri	2
Ohio	5
Oklahoma [1]	2
Trachoma:	
Arkansas	9
Illinois	8
Kansas	1
Louisiana	1
Missouri	1
Ohio	6
Oklahoma [1]	4
Tularaemia:	
Iowa	1
Wyoming	3
Typhus fever:	
Alabama	12
Maryland	4
New York	1
Undulant fever:	
Illinois	1
Iowa	7
Kansas	2
Maryland	1
Undulant fever—Continued.	
Minnesota	2
Missouri	1
Vincent's angina:	
Kansas	2
Maryland	5
New York	55
Wyoming	1
Whooping cough:	
Alabama	73
Arkansas	38
Illinois	922
Iowa	35
Kansas	231
Louisiana	27
Maryland	544
Minnesota	52
Missouri	175
New York	1,429
Ohio	945
Oklahoma [1]	28
Rhode Island	12
South Carolina	189
Wisconsin	850
Wyoming	22

RECIPROCAL NOTIFICATIONS

Notifications regarding communicable diseases sent during the month of August, 1928, by departments of health of certain States to other State health departments

Diesease	California	Illinois	Minnesota	New York
Chicken pox		1		
Diptheria		1	1	2
Colitis (amebic)			1	
Dysentery (amebic)			1	
Malaria	2			
Meningitis (meningococcic)				1
Pneumonic (embolic)		1		
Scarlet fever			1	3
Trachoma		1		
Tuberculosis	1		40	
Typhoid fever	3	5		6
Undulant fever	1			
Whooping cough		1		1

GENERAL CURRENT SUMMARY AND WEEKLY REPORTS FROM CITIES

The 99 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 31,500,000. The estimated population of the 93 cities reporting deaths is more than 30,805,000. The estimated expectancy is based on the experience of the last nine years excluding epidemics.

[1] Oklahoma City and Tulsa excluded.

Weeks ended September 15, 1928, and September 17, 1927

	1928	1927	Estimated expectancy
Cases reported			
Diphtheria:			
43 States	1,086	1,393	
99 cities	449	598	628
Measles:			
42 States	414	627	
99 cities	108	117	
Poliomyelitis:			
44 States	334	709	
Scarlet fever:			
43 States	1,064	1,286	
99 cities	348	410	378
Smallpox:			
43 States	98	220	
99 cities	5	31	14
Typhoid fever:			
43 States	984	1,084	
99 cities	167	196	208
Deaths reported			
Influenza and pneumonia:			
93 cities	400	375	
Smallpox:			
93 cities	1	0	
Kansas City, Mo	1	0	

City reports for week ended September 15, 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	0	0	0	0	1	0	0
New Hampshire:									
Concord	[1] 22,546	0	0	1	0	0	0	0	0
Manchester	84,000	0	2	0	0	0	0	0	1
Vermont:									
Barre	[1] 10,008	0	0	0	0	0	1	0	0
Burlington	[1] 24,089	1	1	0	0	0	0	0	1
Massachusetts:									
Boston	787,000	2	26	18	4	0	3	2	14
Fall River	131,000	0	2	2	1	0	7	0	2
Springfield	145,000	0	1	4	0	0	1	0	1
Worcester	193,000	0	4	4	0	0	3	2	1
Rhode Island:									
Pawtucket	71,000	0	0	2	0	0	0	0	0
Providence	275,000	0	4	3	0	0	1	0	3
Connecticut:									
Bridgeport	([2])	0	4	1	0	0	0	0	0
Hartford	164,000	0	3	1	0	0	0	0	1
New Haven	182,000	1	1	2	0	0	0	0	5

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

City reports for week ended September 15, 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			
MIDDLE ATLANTIC									
New York:									
Buffalo	544,000	0	12	13	--------	0	3	5	4
New York	5,924,000	12	90	57	9	4	19	11	89
Rochester	321,000	0	4	3	--------	0	1	2	3
Syracuse	185,000	1	3	1	--------	0	0	2	2
New Jersey:									
Camden	131,000	0	3	2	0	0	0	0	1
Newark	459,000	4	7	16	1	1	1	6	5
Trenton	134,000	0	2	0	0	0	0	0	2
Pennsylvania:									
Philadelphia	2,008,000	5	38	15	0	2	4	0	21
Pittsburgh	637,000	3	15	10	0	1	2	2	15
Reading	114,000	0	2	1	0	0	0	0	0
EAST NORTH CENTRAL									
Ohio:									
Cincinnati	411,000	0	6	2	0	0	0	0	6
Cleveland	960,000	2	30	10	0	1	6	3	13
Columbus	285,000	0	3	3	0	1	0	0	3
Toledo	295,000	1	8	0	1	1	3	0	1
Indiana:									
Fort Wayne	99,900	0	2	0	0	0	0	0	0
Indianapolis	367,000	0	5	1	0	0	1	1	5
South Bend	81,700	0	1	0	0	0	0	0	0
Terre Haute	71,900	0	1	0	0	0	0	0	0
Illinois:									
Chicago	3,048,000	21	49	56	3	1	11	7	37
Springfield	64,700	0	0	1	0	0	1	0	2
Michigan:									
Detroit	[2] 1,242,044	8	41	23	0	4	10	1	18
Flint	136,000	2	5	0	0	0	1	0	2
Grand Rapids	156,000	0	3	0	0	0	1	2	0
Wisconsin:									
Kenosha	52,700	1	1	0	0	0	0	2	0
Milwaukee	517,000	9	9	6	1	0	4	2	8
Racine	69,400	0	1	0	0	0	1	0	2
Superior	[1] 39,671	0	1	0	0	0	0	0	2
WEST NORTH CENTRAL									
Minnesota:									
Duluth	113,000	4	1	0	0	1	1	0	1
Minneapolis	434,000	8	17	12	0	1	2	13	5
St. Paul	248,000	3	13	0	0	0	1	2	5
Iowa:									
Davenport	[1] 52,469	0	0	1	0	--------	0	0	--------
Des Moines	146,000	0	3	0	0	--------	0	0	--------
Sioux City	78,000	0	1	1	0	--------	0	0	--------
Waterloo	36,900	0	1	0	0	--------	0	5	--------
Missouri:									
Kansas City	375,000	1	4	0	0	1	1	1	0
St. Joseph	78,400	0	1	0	0	0	0	0	3
St. Louis	830,000	3	23	30	1	0	0	0	--------
North Dakota:									
Fargo	[1] 26,403	0	0	0	0	0	0	0	0
Grand Forks	[1] 14,811	0	0	0	0	--------	0	0	--------
South Dakota:									
Aberdeen	[1] 15,036	0	0	0	0	--------	0	0	--------
Sioux Falls	[1] 30,127	0	0	0	0	--------	0	0	--------
Nebraska:									
Omaha	216,000	1	10	5	0	0	2	0	3
Kansas:									
Topeka	56,500	0	1	1	1	2	0	1	1
Wichita	92,500	0	2	1	0	0	0	6	3

[1] Estimated, July 1, 1925.

[2] Special census.

City reports for week ended September 15, 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			
SOUTH ATLANTIC									
Delaware:									
Wilmington	124,000	1	1	0	0	0	0	0	3
Maryland:									
Baltimore	808,000	1	19	13	2	1	0	2	15
Cumberland	[1] 33,741	0	1	0	0	0	1	0	0
Frederick	[1] 12,035	0	0	1	0	0	0	0	0
District of Columbia:									
Washington	528,000	0	8	17	2	1	1	0	5
Virginia:									
Lynchburg	[3] 38,493	--------	2	--------	--------	--------	--------	--------	--------
Norfolk	174,000	0	1	0	0	0	0	0	0
Richmond	189,000	0	13	9	0	0	0	1	2
Roanoke	61,900	0	4	6	0	0	1	0	0
West Virginia:									
Charleston	50,700	0	1	1	0	0	0	0	0
Wheeling	[1] 56,208	0	1	0	0	0	1	8	2
North Carolina:									
Raleigh	[1] 30,371	0	3	0	0	0	0	0	0
Wilmington	37,700	0	0	0	0	0	0	0	0
Winston-Salem	71,800	0	2	5	0	0	1	1	0
South Carolina:									
Charleston	74,100	0	1	1	14	0	0	0	0
Columbia	41,800	0	2	0	0	0	0	0	2
Greenville	[1] 27,311	0	1	0	0	0	0	0	0
Georgia:									
Atlanta	([2])	0	6	4	5	1	1	1	4
Brunswick	[1] 16,809	0	0	1	0	0	0	0	0
Savannah	94,900	--------	1	--------	--------	--------	--------	--------	--------
Florida:									
St. Petersburg	[3] 47,629	--------	0	--------	--------	0	--------	--------	0
Tampa	102,000	0	1	0	0	1	0	0	2
EAST SOUTH CENTRAL									
Kentucky:									
Covington	58,500	0	0	1	0	0	0	0	0
Louisville	311,000	0	4	3	0	0	0	0	2
Tennessee:									
Memphis	177,000	0	4	4	0	0	0	0	0
Nashville	137,000	2	4	7	0	0	2	0	1
Alabama:									
Birmingham	211,000	0	5	3	0	0	0	0	3
Mobile	66,800	0	1	5	0	3	0	0	1
Montgomery	47,000	0	2	2	0	--------	0	1	--------
WEST SOUTH CENTRAL									
Arkansas:									
Fort Smith	[1] 31,643	1	0	0	0	--------	0	0	--------
Little Rock	75,900	0	1	0	0	0	0	1	0
Louisiana:									
New Orleans	419,000	0	6	16	1	2	0	0	5
Shreveport	59,500	0	1	0	0	0	0	0	1
Oklahoma:									
Oklahoma City	([2])	0	2	3	1	0	0	0	1
Texas:									
Dallas	203,000	0	5	10	0	0	0	0	2
Fort Worth	159,000	0	2	3	0	0	0	0	0
Galveston	49,100	0	0	0	0	0	0	0	3
Houston	[1] 164,954	0	3	3	0	0	0	0	3
San Antonio	205,000	0	2	6	0	0	0	0	3
MOUNTAIN									
Montana:									
Billings	[1] 17,971	0	1	0	0	0	0	0	0
Great Falls	[1] 29,883	2	0	0	0	0	0	0	0
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	1	0	0	0	0	0	0	0

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

City reports for week ended September 15, 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			
MOUNTAIN—con.									
Colorado:									
Denver	285,000	5	15	3	-------	0	5	1	3
Pueblo	43,900	0	2	0	0	0	0	0	1
New Mexico:									
Albuquerque	[1] 21,000	0	0	0	0	0	0	0	0
Utah:									
Salt Lake City	133,000	7	3	1	0	0	0	7	1
Nevada:									
Reno	[1] 12,665	0	0	0	0	0	0	0	0
PACIFIC									
Washington:									
Seattle	([2])	4	3	2	0	-------	0	3	-------
Spokane	109,000	5	1	3	0	-------	1	0	-------
Tacoma	106,000	0	3	0	0	0	0	7	1
Oregon:									
Portland	[1] 282,383	5	5	5	0	0	1	1	1
California:									
Los Angeles	([2])	1	28	8	2	1	2	6	11
Sacramento	73,400	0	2	3	0	0	0	1	1
San Francisco	567,000	4	13	3	4	0	2	3	5

Division, State, and city	Scarlet fever		Smallpox			Tuberculosis, deaths reported	Typhoid fever			Whooping cough, cases reported	Deaths, all causes
	Cases, estimated expectancy	Cases reported	Cases, estimated expectancy	Cases reported	Deaths reported		Cases, estimated expectancy	Cases reported	Deaths reported		
NEW ENGLAND											
Maine:											
Portland	1	5	0	0	0	2	1	0	1	5	21
New Hampshire:											
Concord	0	0	0	0	0	1	0	0	0	0	14
Manchester	1	2	0	0	0	2	0	0	0	0	15
Vermont:											
Barre	0	0	0	0	0	0	0	0	0	0	-------
Burlington	0	0	0	0	0	0	0	0	0	0	6
Massachusetts:											
Boston	16	15	0	0	0	13	4	2	0	18	162
Fall River	1	0	0	0	0	1	2	0	0	0	26
Springfield	1	0	0	0	0	1	0	0	0	1	33
Worcester	3	7	0	0	0	1	1	0	0	1	44
Rhode Island:											
Pawtucket	0	2	0	0	0	1	0	0	0	0	13
Providence	2	4	0	0	0	0	2	1	0	0	63
Connecticut:											
Bridgeport	2	0	0	0	0	0	0	0	0	0	27
Hartford	2	0	0	0	0	3	1	0	0	2	30
New Haven	2	1	0	0	0	2	2	3	0	17	43
MIDDLE ATLANTIC											
New York:											
Buffalo	7	7	0	0	0	6	3	0	0	17	107
New York	35	25	0	0	0	96	43	45	4	75	1,262
Rochester	2	0	0	0	0	6	1	0	0	10	73
Syracuse	4	2	0	0	0	2	3	0	0	19	52
New Jersey:											
Camden	1	0	0	0	0	3	1	0	0	5	21
Newark	5	2	0	0	0	8	2	1	0	39	88
Trenton	0	0	0	0	0	3	1	[3] 1	[3] 1	0	44
Pennsylvania:											
Philadelphia	24	14	0	0	0	34	13	7	0	84	426
Pittsburgh	15	7	0	0	0	5	4	4	1	24	166
Reading	0	0	0	0	0	0	1	1	0	9	34

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

City reports for week ended September 15, 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
EAST NORTH CENTRAL											
Ohio:											
Cincinnati	5	9	0	0	0	7	2	5	0	4	127
Cleveland	14	11	0	0	0	10	4	6	0	46	176
Columbus	4	1	0	0	0	2	1	0	0	9	69
Toledo	5	3	0	0	0	2	2	1	1	17	59
Indiana:											
Fort Wayne	1	0	0	0	0	2	1	1	2	0	17
Indianapolis	4	5	0	0	0	7	2	4	0	6	103
South Bend	1	0	1	0	0	0	0	0	0	0	15
Terre Haute	1	0	0	0	0	2	0	0	0	0	30
Illinois:											
Chicago	35	36	0	0	0	45	9	3	0	79	602
Springfield	1	0	0	0	0	0	1	0	0	1	15
Michigan:											
Detroit	31	33	0	0	0	15	6	1	1	166	281
Flint	6	10	0	0	0	0	1	0	0	9	32
Grand Rapids	4	0	1	0	0	0	1	1	0	4	21
Wisconsin:											
Kenosha	0	0	0	0	0	0	0	0	0	0	11
Milwaukee	11	27	0	0	0	2	0	1	0	71	94
Racine	2	0	0	0	0	0	0	0	0	4	9
Superior	1	2	1	0	0	0	0	0	0	0	4
WEST NORTH CENTRAL											
Minnesota:											
Duluth	4	7	0	0	0	1	0	0	0	3	26
Minneapolis	20	10	0	0	0	0	1	1	0	6	74
St. Paul	7	5	1	0	0	4	1	0	0	17	45
Iowa:											
Davenport	0	1	0	0	-------	-------	0	1	-------	1	-------
Des Moines	3	1	0	0	-------	-------	0	0	-------	0	33
Sioux City	0	0	0	0	-------	-------	0	0	-------	3	-------
Waterloo	1	0	0	0	-------	-------	0	0	-------	0	-------
Missouri:											
Kansas City	3	3	0	2	1	6	0	2	0	1	98
St. Joseph	0	0	0	0	0	2	0	0	0	0	26
St. Louis	13	5	0	0	0	17	7	10	0	20	182
North Dakota:											
Fargo	1	2	0	0	0	0	0	0	0	0	6
Grand Forks	0	0	0	0	-------	-------	0	0	-------	0	-------
South Dakota:											
Aberdeen	2	0	0	0	-------	-------	0	0	-------	1	-------
Sioux Falls	1	0	0	0	-------	-------	0	0	-------	0	11
Nebraska:											
Omaha	2	1	0	0	0	2	0	0	0	4	56
Kansas:											
Topeka	1	0	0	0	0	0	0	0	0	10	25
Wichita	2	2	0	0	0	3	2	0	0	2	26
SOUTH ATLANTIC											
Delaware:											
Wilmington	1	0	0	0	0	3	0	0	0	0	33
Maryland:											
Baltimore	6	4	0	0	0	16	11	3	0	67	229
Cumberland	1	1	0	0	0	1	1	3	0	0	17
Frederick	0	0	0	0	0	0	0	0	0	0	3
District of Columbia:											
Washington	6	4	0	0	0	19	4	0	1	15	150
Virginia:											
Lynchburg	0	-------	0	-------	-------	-------	2	-------	-------	-------	-------
Norfolk	1	4	0	0	0	0	1	3	0	2	-------
Richmond	5	0	0	0	0	2	2	2	1	0	48
Roanoke	1	5	0	0	0	2	3	1	0	0	24
West Virginia:											
Charleston	1	1	0	0	0	0	2	3	0	0	21
Wheeling	2	0	0	0	0	0	2	0	0	0	17
North Carolina:											
Raleigh	0	2	0	0	0	0	0	0	0	0	9
Wilmington	0	1	0	0	0	0	0	0	0	0	7
Winston-Salem	2	0	1	0	0	2	1	1	0	2	17

City reports for week ended September 15, 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
SOUTH ATLANTIC—continued											
South Carolina:											
Charleston	0	0	0	0	0	1	3	1	0	0	17
Columbia	0	0	0	0	0	0	1	2	0	1	28
Greenville	0	2	0	0	0	1	1	0	0	1	8
Georgia:											
Atlanta	5	4	1	0	0	5	4	4	1	1	79
Brunswick	0	0	0	0	0	1	0	0	0	0	2
Savannah	0		0				1				
Florida:											
St. Petersburg	0		0		0	0	0		0		5
Tampa	0	1	0	0	0	7	0	0	0	0	33
EAST SOUTH CENTRAL											
Kentucky:											
Covington	0	2	0	0	0	2	0	0	0	2	25
Louisville	2	5	0	0	0	5	5	0	0	5	87
Tennessee:											
Memphis	2	8	0	0	0	6	5	11	1	10	57
Nashville	2	2	0	0	0	2	6	7	0	3	53
Alabama:											
Birmingham	4	2	0	0	0	7	5	0	0	3	70
Mobile	0	0	0	0	0	4	0	1	0	0	21
Montgomery	0	1	0	0			1	1		0	
WEST SOUTH CENTRAL											
Arkansas:											
Fort Smith	1	0	0	0			0	1		0	
Little Rock	2	1	0	0	0	1	2	2	0	4	
Louisiana:											
New Orleans	2	3	0	0	0	9	4	3	1	3	122
Shreveport	1	0	0	0	0	3	1	0	2	0	22
Oklahoma:											
Oklahoma City	2	0	0	0	0	1	2	4	1	3	30
Texas:											
Dallas	3	5	1	0	0	3	2	0	1	14	52
Fort Worth	1	3	0	0	0	4	1	0	1	0	31
Galveston	0	0	0	0	0	0	0	0	0	0	13
Houston	0	1	1	1	0	3	1	0	1	0	65
San Antonio	0	1	0	0	0	3	0	1	0	0	38
MOUNTAIN											
Montana:											
Billings	0	0	0	0	0	0	0	0	0	0	7
Great Falls	0	0	1	0	0	0	0	0	0	0	4
Helena	0	0	0	0	0	0	0	0	0	0	0
Missoula	0	0	0	0	0	0	1	0	0	0	8
Idaho:											
Boise	0	0	0	0	0	0	0	0	0	0	5
Colorado:											
Denver	4	2	1	0	0	10	3	0	0	4	75
Pueblo	0	0	0	0	0	1	1	0	0	0	4
New Mexico:											
Albuquerque	0	1	0	0	0	3	2	0	0	2	8
Utah:											
Salt Lake City	1	1	0	1	0	3	2	2	0	5	34
Nevada:											
Reno	0	0	0	0	0	0	0	0	0	0	5
PACIFIC											
Washington:											
Seattle	5	3	0	1			2	1		7	
Spokane	3	3	1	0			0	3		0	
Tacoma	1	0	1	0	0	0	0	3	0	0	18
Oregon:											
Portland	4	6	4	2	0	1	2	2	0	0	43
California:											
Los Angeles	9	12	1	0	0	21	4	5	2	68	193
Sacramento	1	4	0	0	0	0	1	3	0	2	19
San Francisco	6	3	1	0	0	9	1	0	4	3	130

City reports for week ended September 15, 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
NEW ENGLAND									
Vermont:									
Barre	0	0	0	0	0	0	0	1	0
Burlington	0	0	0	0	0	0	0	1	0
Massachusetts:									
Boston	0	0	0	1	0	0	3	[1] 10	2
Fall River	0	0	0	0	0	0	0	2	1
Worcester	1	0	0	1	0	0	1	0	0
Rhode Island:									
Providence	2	0	0	0	0	0	0	1	0
Connecticut:									
Hartford	0	1	0	0	0	0	0	0	0
New Haven	0	0	0	0	0	0	0	1	0
MIDDLE ATLANTIC									
New York:									
Buffalo	0	0	0	1	0	0	1	2	1
New York City	29	12	1	2	0	0	14	36	10
Syracuse	0	0	0	0	0	1	1	1	0
New Jersey:									
Newark	0	0	2	0	0	0	1	0	1
Pennsylvania:									
Philadelphia	2	1	1	1	0	0	1	0	0
Pittsburgh	2	0	0	0	0	0	0	0	0
EAST NORTH CENTRAL									
Ohio:									
Cincinnati	0	1	0	0	0	0	1	0	0
Cleveland	1	2	0	0	0	0	1	6	4
Toledo	0	0	0	0	0	0	0	1	
Indiana:									
Indianapolis	0	0	0	0	0	0	0	1	0
Illinois:									
Chicago	3	1	1	1	0	0	4	0	0
Michigan:									
Detroit	3	1	0	0	0	0	2	3	0
Flint	1	0	0	0	0	0	1	0	0
Wisconsin:									
Milwaukee	1	0	1	0	0	0	1	0	0
WEST NORTH CENTRAL									
Minnesota:									
Duluth	0	0	0	0	0	0	0	2	0
Minneapolis	0	0	0	0	0	0	1	7	3
St. Paul	0	0	0	0	0	0	1	10	1
Missouri:									
Kansas City	0	0	0	0	0	0	0	1	0
St. Louis	1	2	0	0	0	0	1	0	0
North Dakota:									
Fargo	0	0	0	0	0	0	0	1	1
Kansas:									
Topeka	0	0	0	0	1	0	1	0	0
SOUTH ATLANTIC									
Maryland:									
Baltimore	0	0	2	0	6	0	2	6	1
District of Columbia:									
Washington	0	0	0	0	0	0	0	6	1
Virginia:									
Richmond	0	0	0	1	0	0	0	1	0
West Virginia:									
Wheeling	0	0	0	0	0	0	0	1	0
North Carolina:									
Winston-Salem	0	0	0	0	0	1	0	0	0
South Carolina:									
Charleston	0	0	0	0	0	0	0	1	0
Columbia	0	0	0	0	0	3	0	0	0

[1] 4 cases nonresident.

City reports for week ended September 15, 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
SOUTH ATLANTIC—continued									
Georgia:									
Atlanta	0	0	0	0	1	0	0	0	0
Florida:									
Tampa [2]	0	1	0	0	0	0	0	0	0
EAST SOUTH CENTRAL									
Kentucky:									
Louisville	0	0	0	0	0	0	0	2	0
Tennessee:									
Memphis	0	0	0	1	0	0	0	0	0
Nashville	0	0	0	0	0	0	0	2	0
Alabama: [2]									
Birmingham [3]	1	0	1	0	1	1	1	2	0
WEST SOUTH CENTRAL									
Arkansas:									
Little Rock	0	0	0	0	0	1	0	0	0
Texas: [3]									
Dallas	0	0	0	0	1	1	0	0	0
Fort Worth	0	0	0	0	0	1	1	0	0
Houston	0	0	0	1	0	0	0	0	0
MOUNTAIN									
Colorado:									
Denver	6	5	0	0	0	0	0	0	0
Pueblo	1	0	0	0	0	0	0	1	0
PACIFIC									
Washington:									
Seattle	0	0	0	0	0	0	1	11	0
Spokane	2	0	0	0	0	0	1	10	0
Tacoma	0	0	0	0	0	0	0	0	1
Oregon:									
Portland	2	0	0	0	0	0	0	0	0
California:									
Los Angeles	0	0	0	1	0	0	0	3	1

[2] Typhus fever: 2 cases; 1 case at Tampa, Fla., and 1 case at Mobile, Ala.
[3] Dengue: 1 case at Birmingham, Ala., and 1 at San Antonio, Tex.

The following table gives the rates per 100,000 population for 101 cities for the 5-week period ended September 15, 1928, compared with those for a like period ended September 17, 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 aggregated 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, August 12 to September 15, 1928—Annual rates per 100,000 population compared with rates for the corresponding period of 1927 [1]

DIPHTHERIA CASE RATES

	Week ended—									
	Aug. 18, 1928	Aug. 20, 1927	Aug. 25, 1928	Aug. 27, 1927	Sept. 1, 1928	Sept. 3, 1927	Sept. 8, 1928	Sept. 10, 1927	Sept. 15, 1928	Sept. 17, 1927
101 cities	54	80	64	81	[2] 56	[3] 84	51	94	[4] 75	101
New England	48	112	62	86	37	88	34	93	87	53
Middle Atlantic	55	94	66	78	58	77	49	90	57	105
East North Central	60	85	67	81	[2] 61	87	51	90	67	82
West North Central	57	44	64	53	51	69	70	63	97	125
South Atlantic	63	61	79	88	67	[3] 89	47	108	[4] 107	112
East South Central	40	51	35	61	40	51	30	106	125	117
West South Central	44	74	64	95	100	161	76	149	140	136
Mountain	27	54	44	134	44	117	53	152	35	224
Pacific	46	60	41	94	20	73	49	91	49	91

MEASLES CASE RATES

	Aug. 18, 1928	Aug. 20, 1927	Aug. 25, 1928	Aug. 27, 1927	Sept. 1, 1928	Sept. 3, 1927	Sept. 8, 1928	Sept. 10, 1927	Sept. 15, 1928	Sept. 17, 1927
101 cities	36	32	28	25	[2] 21	[3] 21	19	20	[4] 18	20
New England	64	84	85	58	90	58	55	63	39	30
Middle Atlantic	40	34	21	24	16	18	18	16	15	14
East North Central	39	13	31	13	[2] 28	11	24	15	24	18
West North Central	21	22	16	16	4	16	2	10	14	28
South Atlantic	30	27	33	31	4	[3] 18	5	14	[4] 11	14
East South Central	20	5	10	25	10	10	0	10	10	10
West South Central	28	41	0	17	0	41	4	17	0	17
Mountain	44	18	9	27	18	9	35	36	44	45
Pacific	8	71	31	52	13	42	28	34	13	44

SCARLET FEVER CASE RATES

	Aug. 18, 1928	Aug. 20, 1927	Aug. 25, 1928	Aug. 27, 1927	Sept. 1, 1928	Sept. 3, 1927	Sept. 8, 1928	Sept. 10, 1927	Sept. 15, 1928	Sept. 17, 1927
101 cities	30	50	33	54	[2] 32	[3] 57	37	52	[4] 58	69
New England	39	51	30	81	64	60	46	53	78	102
Middle Atlantic	20	31	18	37	14	38	18	30	28	46
East North Central	37	78	44	61	[2] 32	81	44	65	88	89
West North Central	60	63	49	61	55	69	39	91	68	87
South Atlantic	19	41	32	63	30	[3] 60	49	60	[4] 54	78
East South Central	25	20	45	86	95	76	60	96	100	46
West South Central	16	50	52	58	44	58	56	45	44	41
Mountain	27	81	62	63	35	63	27	54	27	99
Pacific	36	42	33	37	31	34	59	31	64	55

SMALLPOX CASE RATES

	Aug. 18, 1928	Aug. 20, 1927	Aug. 25, 1928	Aug. 27, 1927	Sept. 1, 1928	Sept. 3, 1927	Sept. 8, 1928	Sept. 10, 1927	Sept. 15, 1928	Sept. 17, 1927
101 cities	0	5	2	5	[2] 0	[3] 4	1	4	[4] 1	5
New England	0	0	0	0	0	0	0	0	0	0
Middle Atlantic	0	0	0	0	0	0	0	0	0	0
East North Central	1	7	5	6	[2] 1	7	1	3	0	0
West North Central	0	10	0	4	0	2	4	12	4	22
South Atlantic	0	4	0	0	0	[3] 0	0	2	[4] 0	4
East South Central	0	25	0	25	0	0	0	10	0	0
West South Central	0	4	0	0	0	0	0	4	4	4
Mountain	0	18	9	27	0	36	9	9	9	27
Pacific	3	13	0	31	5	18	8	13	3	37

[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] South Bend, Ind., not included.
[3] Greenville, S. C., not included.
[4] Lynchburg, Va., and Savannah, Ga., not included.

Summary of weekly reports from cities, August 12 to September 15, 1928—Annual rates per 100,000 population compared with rates for the corresponding period of 1927—Continued

TYPHOID FEVER CASE RATES

	Week ended—									
	Aug. 18, 1928	Aug. 20, 1927	Aug. 25, 1928	Aug. 27, 1927	Sept. 1, 1928	Sept. 3, 1927	Sept. 8, 1928	Sept. 10, 1927	Sept. 15, 1928	Sept. 17, 1927
101 cities	27	37	31	31	[2] 29	[3] 32	24	30	[4] 28	33
New England	16	30	16	33	23	21	16	40	14	47
Middle Atlantic	17	20	23	21	18	28	25	27	29	37
East North Central	18	19	18	11	[2] 15	15	13	7	14	16
West North Central	41	38	25	20	39	10	19	32	25	24
South Atlantic	33	81	51	58	44	[3] 71	33	58	[4] 42	31
East South Central	95	218	165	203	135	183	80	112	100	152
West South Central	96	79	52	74	72	54	28	74	28	37
Mountain	35	27	62	45	44	54	80	63	18	36
Pacific	26	31	26	21	26	8	13	8	38	16

INFLUENZA DEATH RATES

	Aug. 18, 1928	Aug. 20, 1927	Aug. 25, 1928	Aug. 27, 1927	Sept. 1, 1928	Sept. 3, 1927	Sept. 8, 1928	Sept. 10, 1927	Sept. 15, 1928	Sept. 17, 1927
95 cities	3	4	4	5	[2] 3	[3] 4	3	4	[4] 5	5
New England	2	2	2	2	0	2	0	5	0	0
Middle Atlantic	0	2	3	2	3	3	2	3	4	4
East North Central	4	2	3	3	[2] 3	5	2	4	5	2
West North Central	6	0	0	2	2	4	2	0	10	4
South Atlantic	0	5	9	11	4	[3] 7	9	5	[4] 7	9
East South Central	0	11	0	16	5	5	16	11	16	0
West South Central	29	30	16	21	4	13	8	13	8	17
Mountain	0	0	0	9	18	18	0	9	0	9
Pacific	10	0	3	7	3	0	7	7	3	10

PNEUMONIA DEATH RATES

	Aug. 18, 1928	Aug. 20, 1927	Aug. 25, 1928	Aug. 27, 1927	Sept. 1, 1928	Sept. 3, 1927	Sept. 8, 1928	Sept. 10, 1927	Sept. 15, 1928	Sept. 17, 1927
95 cities	55	45	56	46	[2] 55	[3] 56	57	62	[4] 63	60
New England	37	49	44	51	32	49	48	65	62	40
Middle Atlantic	66	47	68	55	60	72	56	66	69	60
East North Central	43	35	41	34	[2] 50	51	60	59	64	53
West North Central	31	25	35	31	31	23	22	43	43	46
South Atlantic	54	52	60	36	72	[3] 42	70	49	[4] 65	76
East South Central	115	69	84	69	105	48	78	117	37	106
West South Central	57	68	86	64	66	81	57	64	70	59
Mountain	62	36	44	36	53	54	44	90	44	99
Pacific	61	72	51	62	41	55	78	52	61	86

[2] South Bend, Ind., not included.
[3] Greenville, S. C., not included.
[4] Lynchburg, Va., and Savannah, Ga., 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 September 8, 1928.—The following report for the week ended September 8, 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

Ceylon.—Colombo.
India.—Bombay, Calcutta, Rangoon.
Indo-China.—Pnompenh.

CHOLERA

India.—Bombay, Calcutta, Madras, Negapatam.
French India.—Pondicherry.
Siam.—Bangkok.
Indo-China.—Saigon.
China.—Shanghai, Canton.

SMALLPOX

India.—Bombay, Calcutta, Madras, Negapatam, Vizagapatam.
French India.—Pondicherry.
Indo-China.—Pnompenh.
China.—Hong Kong.
Dutch East Indies.—Pontianak, Belawan Deli.

ARGENTINA

Santiago del Estero—Plague—September 28, 1928.—According to information dated September 28, 1928, received from the American consul at Rosario, there are many cases of plague, pneumonic form, in the Province of Santiago del Estero, 36 deaths having occurred in as many hours. Schools have been closed, and the Federal Government has been requested to send serum and doctors, as the epidemic is reported to be serious and spreading.

CANADA

Provinces—Communicable diseases—Week ended September 15, 1928.—The Canadian Ministry of Health reports cases of certain communicable diseases from six Provinces of Canada for the week ended September 15, 1928, as follows:

Disease	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Alberta	Totals
Cerebrospinal fever			3	1			4
Influenza	13						13
Poliomyelitis			6	8	69	11	94
Smallpox			9	7		3	19
Typhoid fever	6	4	21	49	11	1	92

Quebec—Communicable diseases—Two weeks ended September 15, 1928.—The Provincial Bureau of Health reports cases of certain communicable diseases for the two weeks ended September 15, 1928, as follows:

Disease	Week ended—		Disease	Week ended—	
	Sept. 8	Sept. 15		Sept. 8	Sept. 15
Cerebrospinal meningitis		3	Poliomyelitis	4	6
Chicken pox	1	2	Scarlet fever	44	50
Diphtheria	27	38	Smallpox	7	9
German measles		4	Tuberculosis	41	55
Influenza		8	Typhoid fever	16	21
Measles	7	3	Whooping cough	6	11
Mumps	5	1			

CANARY ISLANDS

Las Palmas—Public health—June, 1928.—During the month of June, 1928, there were reported at Las Palmas 156 births and 110 deaths. The population of Las Palmas was 66,461, according to the 1920 census. No case of bubonic plague was reported during the month of June.

FINLAND

Tuberculosis deaths, 1901–1926.—The following table shows the numbers of deaths from tuberculosis in Finland, and the tuberculosis death rates per 100,000 population, from 1921 to 1926, inclusive.

Year	Number of deaths	Deaths per 100,000	Year	Number of deaths	Deaths per 100,000
1901	6,289	229	1914	7,556	231
1902	6,639	238	1915	7,993	242
1903	6,561	232	1916	8,362	251
1904	6,879	240	1917	7,677	229
1905	6,844	236	1918	8,195	246
1906	6,652	226	1919	6,617	199
1907	6,901	231	1920	6,972	207
1908	7,234	239	1921	6,601	191
1909	6,768	220	1922	7,122	207
1910	6,995	224	1923	6,799	196
1911	6,944	220	1924	7,689	220
1912	7,306	228	1925	7,696	218
1913	7,574	234	1926	7,265	204

GREECE[1]

Patras—Dengue.—According to information dated September 8, 1928, there were 15,000 cases of dengue fever unofficially reported in Patras, Greece.

[1] See PUBLIC HEALTH REPORTS, Sept. 21, 1928, p. 2497, and Sept. 28, 1928, p. 2568.

ITALY

Communicable diseases—February 27–April 22, 1928.—During the eight weeks ended April 22, 1928, communicable diseases were reported in the Kingdom of Italy as follows:

Disease	Feb. 27–Mar. 4		Mar. 5–Mar. 11		Mar. 12–Mar. 18		Mar. 19–Mar. 25	
	Cases	Communes affected	Cases	Communes affected	Cases	Communes affected	Cases	Communes affected
Anthrax	11	10	9	9	9	9	10	10
Cerebrospinal meningitis	12	12	24	17	10	9	6	6
Chicken pox	408	133	361	132	430	114	365	109
Diphtheria	505	267	370	229	369	225	383	209
Dysentery	1	1			1	1		
Lethargic encephalitis	4	4	9	9	4	3	4	4
Measles	3,040	383	2,810	353	3,254	362	3,041	367
Poliomyelitis	11	11	9	9	2	2	5	4
Rabies			1	1				
Scarlet fever	376	153	339	146	285	128	363	114
Smallpox	11	4			15	4	6	4
Typhoid fever	352	206	295	173	228	153	177	112

Disease	Mar. 26–Apr. 1		Apr. 2–Apr. 8		Apr. 9–Apr. 15		Apr. 16–Apr. 22	
	Cases	Communes affected	Cases	Communes affected	Cases	Communes affected	Cases	Communes affected
Anthrax	11	11	7	7	9	7	11	9
Cerebrospinal meningitis	9	8	4	4	10	10	11	11
Chicken pox	344	110	232	84	320	121	258	108
Diphtheria	423	264	275	173	397	244	335	204
Dysentery			1	1	1	1	7	3
Lethargic encephalitis	3	3	3	3	4	4	5	5
Measles	3,178	382	2,304	318	2,953	386	2,018	348
Poliomyelitis	11	5	5	5	4	3	2	2
Rabies								
Scarlet fever	284	132	235	89	302	131	258	117
Smallpox	5	2	8	4	5	2	4	2
Typhoid fever	373	168	172	113	279	156	289	125

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	June 3–30, 1928	Week ended— July, 1928: 7	July 14	July 21	July 28	August, 1928: 4	Aug. 11	Aug. 18	Aug. 25	September, 1928: 1	Sept. 8
Ceylon: Colombo	C							1									
	D							1									
China:																	
Canton	C			2		1	2	2	2	1	3		2	2			1
	D			2		1	2	2	2	1	3		1	1			1
Shanghai	C											2	1	P		1	1
Swatow	C						3	7									
Dutch East Indies: Java—Batavia	C													1			
India	C	12,391	13,236	21,279	32,564	30,177	31,346	9,840	11,184	11,232	11,984						
	D	6,750	7,282	11,877	20,432	20,162	20,114	5,468	6,005	5,476	6,267						
Bassein	D	1	2	51	41	40	8										
Bombay	C	1	1	3		1		4		2		2					
	D		1	3				3		2	6		1	2	2	2	2
Calcutta	C	203	341	664	446	552	462	65	62	48	81	14	25	29			
	D	112	241	442	428	410	323	45	42	26	20	8	11	18	14	2	10
Madras	C	2	14	10	22	27	29	13	4	10	45	111	216	118			
	D	4	18	4	18	16	21	5	3	6	17	56	99	66	50	34	33
Madras Presidency	C	4,681	2,961	1,483		1,314	878										
	D	2,600	1,618	812		675	460										
Moulmein	D					1											
Negapatam	C	4	4														
	D	6	4		2		13						1		2		1
Rangoon	C	6	29	22	28	7	14			1		8	4				
	D	2	18	16	15	5	9			1		5	2	1			
Tuticorin	C			10	110								1				
	D			9	71												
Vizagapatam	D								4	1	2	6	12	13		5	

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

CHOLERA—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	June 3–30, 1928	Week ended— July, 1928: 7	July, 1928: 14	July, 1928: 21	July, 1928: 28	August, 1928: 4	August, 1928: 11	August, 1928: 18	August, 1928: 25	September, 1928: 1	September, 1928: 8
India (French):																	
Chandernagor	C	6	5	7							2	1	3	3			
	D	1	5	6							1	1	1	1			
Karikal	C	32	6		1							1	6	11	12		
	D	19	5		1							1	4	10	6		
Pondicherry	C	12	33	1	8				1		2	8	17	44	45	2	2
	D	10	19	1	8				1		2	6	11	25	18	2	
Indo-China (see also table below):																	
Pnompenh	C							1	2	1	1			1	1	1	
	D							1	2	1	1			1	1	1	
Saigon	C	4	16	96	116	15	6			2							2
	D	1	8	59	76	9	1			1							1
Tourane	C						1										
	D						1										
Kwangchow-Wan (see table below).																	
Persian Gulf:																	
Island of Henjam	C									1							
Jask	C										1						
Philippine Islands:																	
Bulacan Province—																	
Malolos	C										1						
Paombong	C													1			
Cagayan Province	C												1				
	D												2				
Ballesteros	C									1							
	D									1							
Pamplona	C						1										
	D						1										
Sanchez-Mira	C						4										
	D						2										
Cebu (port)	C										1						

Ilocos Norte Province	C							1									
	D							1									
Manila	C								4			1					
Pangasinan Province—Bayambang	C								1								
	D								1								
Surigao Province—Surigao	C										1		1	2			
	D										1		1	1			
Siam	C	200	295	291	349	202	203	58	35	10	60	9	16				
	D	139	214	218	234	127	144	30	29	7	48	4	4				
Ayudhaya	C						2					1	15	2	11		
	D						1						16	2	8		
Bangkok	C	101	60	60	74	50	7	3	5	1		1	1	1	1	1	1
	D	66	36	33	35	26	4		2	1							
Songkla	C																8
	D																6
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													
	D			7													
S. S. Kambangan at Batavia from Jeddah via Sabang and Palembang	C													1			
S. S. Tairea at Penang from Madras via Nagapatam	C														P		

Place		January-March, 1928	April, 1928	May, 1928	June, 1928			July, 1928			August, 1928		
					1-10	11-20	21-30	1-10	11-20	21-31	1-10	11-20	21-31
Indo-China (French) (see also table above):													
Annam	C	389	46	43	22	8	9	8	5	3		4	7
Cambodia	C	312	196	101	28	82	111	92	25	38		19	29
Cochin-China	C	1,407	933	404	143	109	77	65	55	33		13	15
Laos	C												
Tonkin	C	1	6	26	8	2	1	5	1	1		2	
Kwangchow-Wan	C			16					1				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	June 3–30, 1928	Week ended— July, 1928: 7	July 14	July 21	July 28	August, 1928: 4	Aug. 11	Aug. 18	Aug. 25	September, 1928: 1	Sept. 8	Sept. 15	Sept. 22	Sept. 29
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	2													
Cordoba Province	C				5															
Entre Rios	C						5													
Loreto	C					3														
Rosario	C	4	1			1		1												
Santa Fe	C						9	1												
Santiago del Estero	C		1				10	1												36
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	2									
	D	2	3		10			24		3	2									
Uganda	C	23	13			84	105													
	D	18	10			70	85													
Canary Islands:																				
Arrecife	C					1														
	D					1														
Lanzarote Village	C					1														

Las Palmas	C	1	1	4															2	
	D	1	1																1	
Palma Island	C														7					
	D														3					
Teneriffe	C		10														5			
	D		4														3			
Ceylon: Colombo	C	3	11	7	1	4	2									1	1			
	D	2	6	5	1	2	2									1	1			
Plague-infected rats		5	6																	
China:																				
Amoy	C					5			P											
Hong Kong	C				2		1				1									
	D						1													
Mongolia:																				
Tungliao	C																30			
Urga	C																	P		
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	61	6	7	10	9	10								
	D	136	103	80	47	65	61	6	7	10	9	10								
Plague-infected rats				3	7	9	4			1	1			2						
East Java and Madura	C	7		4	4			1												
	D	7		4	4			1												
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			1	1			
	D	2	1			2											1			
Amrieh District	C													13	13	4	1	1		
	D															2	2			
Assiout Province	C								1	1						1				
	D									1						1				
Beheira	C											1	1				3			
	D																1			
Beni-Suef	C				12	79	25	11	3	5	6	1	1	1	3	5	6	5		
	D				3	27	9		1	1	3				2	1	4			
Girga	C															1	3			
	D															1	3			
Maghagha District	C				1															
	D				1															
Menufia	C					11														
	D					2														
Minieh Province	C				48	76	76	1	11		1									
	D				9	17	24	1	2											
Port Said	C										1	1								
	D															1				
Sidi Barani	C							10	1		1	10								
	D								7		1	1	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	June 3-30, 1928	Week ended— July, 1928: 7	14	21	28	August, 1928: 4	11	18	25	September, 1928: 1	8	15	22	29
Egypt—Continued.																				
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														
Greece:																				
Athens and Piræus	C																		2	
Corfu	C						15					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	367	79	110	191	207									
	D	8,521	16,998	20,907	17,074	3,183	345	50	72	123	95									
Bassein	D	8	12	22	13	8	14		1	2						1				
Bombay	C	14	33	69	43	39	14				1	2								
	D	9	33	61	69	38	8				1	2	2	1	1		1			
Calcutta	D	1		2										2			1			
Madras Presidency	C	452	271	62	21	12	54	14	21	38	50									
	D	256	212	48	12	6	25	9	12	20	10									
Rangoon	C	35	48	30	16	14	31	9	12	11	11	7	9							
	D	30	43	26	14	15	28	10	11	10	8	7	8	6		3	7			
Vizagapatam	D						1													
Indo-China (see also table below):																				
Pnompenh	C							3		1				1		1	3			
	D							3		1				1		1	2			
Saigon	C						5								1					
	D						1								1					
Plague-infected rats							2													

Iraq:																				
Baghdad	C	4	2	5	11	13	9				1							1		
	D	2	2	5	6	3	4													
Plague-infected rats					4	3														
Dulaim Liwa	C	1			1															
Kwangchow-Wan (see table below).																				
Madagascar (see also table below):																				
Tamatave	C					1	20	3					4	1	1	1		2		
	D						8	3		4								1		
Nigeria (see also table below):																				
Lagos	C	10	8	7	17	28	43	15	14	14	10	14	12	15	10	14	9			
	D	11	8	6	18	28	42	15	14	14	9	15	11	16	10	14	9			
Plague-infected rats					8	55	57	23												
Paraguay: Ascuncion	C						5													
	D						2	2												
Peru (see also 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	6	3	6	1										
	D	12	36	30	13	11	7	2	5	1										
Ayudhaya	C						2	2												
	D						1	2												
Bangkok	C	2	1	1	4															
	D	2	1	1	2															
Nagara	C					1	2													
Straits Settlements:																				
Ipoh	C																			1
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				P								
	D	4	1	5																
Union of Socialist Soviet Republics:																				
Astrakhan—																				
Axary District	C						3													
	D						2													
Krasnoiarsk District	D															1				
Chita District	C																1			
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	August, 1928
Algeria (see also table above):								
Algiers	C				1			
Angola	C	3						
British East Africa (see also table above):								
Kenya	C	62	65	17	11	58	97	37
	D			5				34
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	11	7	2
Kwangchow-Wan	C		18	17	10			
Madagascar (see also table above)	C	692	940	95		104		45
	D	605	864	90		94		40
Ambositra Province	C	25	202	25	13			
	D	17	191	25	10			
Antsirabe Province	C	109	281	35	14	19		6
	D	108	279	34	14	19		6
Itasy Province	C	104	55	1				
	D	94	49	1				
Moramanga Province	C	95	56					2
	D	83	55					2
Madagascar—Continued.								
Tamatave	C				1	7	22	6
	D					7	14	6
Tananarive Province	C	408	348	34	20	17	15	
	D	354	292	30	30	17	15	
Nigeria (see also table above)	C	63	41	18	30			
	D	61	41	17	30			
Peru	C	34	93		20	5	5	
	D	11	23		4	2	2	
Callao	D	3						
Lima	C	7	6		4			
	D	3			2			
Senegal (see also table above)	C		30	81	216	151	230	43
	D		17	40	115	91	164	32
Rufisque	C				17	29	18	8
	D				9	22	7	
Thies	C			30	72	243	103	151
	D			23	40	174	64	119
Tivaouane	C			51	105	169	84	9
	D			28	57	90	70	
Syria: Beirut (see also table above)	C	2				1	4	

PLAGUE RATS ON VESSELS

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	June 3–30, 1928	Week ended— July, 1928: 7	14	21	28	August, 1928: 4	11	18	25	September, 1928: 1	8	15
Algeria (see also table below)	C	71	72	3	12													
Algiers	C	15	10	5	4	5	15	1		2				2				
Oran	C	11	5	12	17	5	4			5	3	5						1
Angola (see table below).																		
Arabia: Aden	C		1				11					1				1		
	D											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	15	4	44			53	188	6				
	D	23	42	9	51	17	1		3	2		2	9					
Southern Rhodesia	C	3	7	7	24	13	36		1	2	19			7	10			
	D		1		10		4				4							
Canada:																		
Alberta	C	27	27	47	12	44	9			1	2			4	21			
Calgary	C			1														
Edmonton	C	2	9	7	3				1	1	2							
British Columbia—Vancouver	C	26	10	17	24	11	4	3	2	2	4					1		
Manitoba	C	1			7	4	10				4							
Winnipeg	C	2																
New Brunswick	C		1			1	7					1	2	2				
Ontario	C	248	147	83	50	41	33			6	5	2		1	2			
Kingston	C	1			3					2					1			
Ottawa	C	68	22	26	4	6	1								1	1	5	
Toronto	C	20	14	9	11	12	3				1							
Quebec	C	26	54	112	83	78	81	21	16	12	13	5	9	5	8	9		
Montreal	C	8	9	9	9	3	11	3	1	1				2		6	2	4
Quebec	C	16	13	10	23	47	52	21	9	7	7	4	3	4	1	3	2	5
Sherbrooke	C			3			4											
Saskatchewan	C	97	22	33	52	28	16					4	1		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	June 3–30, 1928	Week ended— July, 1928: 7	14	21	28	August, 1928: 4	11	18	25	September, 1928: 1	8	15
China:																		
Amoy	C		1	6	9	3												
Antung	C				3													
Canton	C		2	7	2	2												
Chefoo	C			P		P	P	P				P						
	D		1															
Foochow	C	P	P	P	P		P		P		P		P					
Hong Kong	C	2	7	32	25	30	14	3	3	1	4	6	3	6	4	2	3	
	D	2	4	19	26	23	19	2	2		1	5	1	5	5	1	1	
Manchuria—																		
Changchun	C	4			4	6					1							
Fushun	C						6		1				1	1				
	D								1									
Harbin	C	5	7	7	10	27	31	7	2	2								
Kwantung	C						14					1						
	D											1						
Dairen	C	15	13	15	16	35	48	4	11	3	3			1				
	D	8	7	8			20	4	4	3	1			1				
Port Arthur	C								1			1						
	D											1						
Mukden	C	4	21	1	4	3	6											
	D						1											
Pensihu	C						1											
	D						1											
South Manchuria Railway Zone	C						5											
Shanghai—																		
Foreigners only	C	5	6	7	3	11	7	1	1			1	1			1		
Including natives	D	11	19	9	9	19	11	6	4			1		1				
Tientsin	C	48	20	13	17	9	14		1									
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						11		2		2	5	1	2	1		5	
	D						3		1			2	1					
Borneo—Pontianak	C		1									3		1	1	1	1	
	D												1		1			
Java—																		
Batavia and West Java	C	4	2	5	1	2					2	2						
East Java and Madura	C	2	9		2		2				3							
	D		1		2						3							
Surabaya	C											1	8	2				
	D											1						
Sumatra—																		
Medan	C	23	14	7	2	10	4		2	1	2	5	1					
	D	11	2	5	3	5			1	1		2	1					
Palembang	C								1									
Ecuador (see table below).																		
Egypt	C	1	2	52	12	1												
	D			33	7	1												
Behera Province	C								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	1,146	182	177	173	149	126	111	114	141	102		
Birmingham	C	44	3	1	1		2		1									
Bradford	C	24	12	19	14	17	10	2										
Bristol	C	3	4	12	17	10	2								2			
Cardiff	C			5	3	2												
Castleford	C		4	36	69	24	18	2	5	4	3	6	2	1	1	1		
Hull	C						1	1	20	3		6	2	3	4	6	3	
Leeds	C	3	9	14	1		8		1			1				4		
Liverpool	C		1															
London	C	4	14	17	42	25	96	4	3	9	3	3		5	1			
Manchester	C	25	8	14	8	5	1										3	
Newcastle-on-Tyne	C	27	12	9	4	12	6		28				1		1			
Nottingham	C	27	11	13	17	20	3	2	1		3		3	5	2	1		
Plymouth	C													6		1		
Sheffield	C	8	6	1	14	4	2	1			1			1				
Stoke-on-Trent	C	1	15	12	32	24	14		3		2	4	4					
Weymouth	C								1									
Scotland:																		
Arbroath	C												1	3				
Dundee	C															1		
Greece (see table below).																		
Hedjaz	C	35	115			6	14	8		5	5	1						
	D	23	46			2	1	1		2	3	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	June 3–30, 1928	Week ended— July, 1928: 7	14	21	28	August, 1928: 4	11	18	25	September, 1928: 1	8	15
India	C	17,777	18,850	28,034	30,436	21,489	13,497	3,106	2,586	2,359	1,980							
	D	3,709	3,826	5,540	6,672	5,046	3,700	859	730	649	520							
Bassein	C	1			1													
Bombay	C	61	149	218	200	136	71	17	27	11	12	19	13	3	3	4	3	
	D	24	73	120	118	78	46	6	16	6	5	9	8	2	2	3	3	
Calcutta	C	58	71	134	171	130	61	19	15	11	7	10	3	3	6	4	5	3
	D	34	50	104	130	101	50	13	10	8	4	9	1	3	4	3	4	3
Karachi	C		1	1	2	3			2		1							
	D		1		1	1			1		1							
Madras	C	74	100	183	169	59	35	10	11	8	10	9	11	13	10	19	23	
	D	8	19	29	38	18	10	3	4	6	5	2	2	5	1	5	7	
Moulmein	C						1		2	2	5		3	3	3	4		
	D						1		1	1	4			2	2	1		
Negapatam	C	8	3		7	8	19		2	8	16	4	13	8	10	7	9	
	D	3			3	1	7		1	1	2		1	4	4	3	1	
Rangoon	C	275	377	320	167	36	30	2	1	4		1	1					
	D	64	104	102	79	13	6	1	1	1	1	1						
Tuticorin	C					3												
Vizagapatam	C	10	2	3	2	3	8		2	1				1			9	
	D	8				1	3		1	2				1				
India (French):																		
Chandernagor	C			5	5						1		2					
	D			1	1						1		1					
Pondicherry	C	47	9	18	36	32	13		3	5	4	4	13	18	32			32
	D	47	9	18	36	23	13		3	5	4	4	11	2	6	3	3	28
Indo-China (see also table below):																		
Pnompenh	C													2		4	8	
	D													2		3	5	
Saigon	C		3															
Iraq:																		
Baghdad	C	19	7	5	5	16	16	7	10	2	5		4	2	1	5	7	10
	D	11	4	4	3	6	10	3	6	2	4		1	1		2	5	3
Basra	C	1	7	5	4	3	2	6							2		2	
	D			2	2	3	2	2							1		1	

Italy:																		
Leghorn	C		1	1														
Palermo	C			5	10	6	10			4		6						
Rome and vicinity	C	3																
Ivory Coast (see table below).																		
Jamaica (outside Kingston) (alastrim)	C	5	10	13	4	2	3	1							1	1		
Japan:																		
Kobe	C					11												
Nagoya	C				6	2					1							
Osaka	C						4											
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		21											
Guadalajara	D		1	2	12	13	10	1	1	3	4	1	4		2	1		2
Manzanillo	D			1														
Mazatlan	D					3	2							3				
Mexico City and surrounding territory	C	2	1		1	2		1	2					1	1			
	D						1								1			
Reynosa	C									1								
Saltillo	D					2	2											
Tampico	C		1															
Morocco (see table below).																		
Nigeria (see also table below):																		
Lagos	C			1			1											
Southern Provinces	C		7	93			51											
	D			35			12											
Palestine: Jerusalem	C	1																
	D	1																
Persia (see table below).																		
Poland	C	3	1	1	9	1	3			2								
	D				1													
Portugal (see also table below):																		
Lisbon	C	12	20	5	6	7	7	3	1	1	3							
	D		1								1		1					
Oporto	C				1													
Senegal (see also table below): Dakar	C		34	29	16	29	8											
	D			20	8	7												
Siam	C	35	12	28	10	8	3	1				3						
	D	4	3	4	3	1	1					2						
Bangkok	C				1													
	D					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	June 3–30, 1928	Week ended— July, 1928: 7	July, 1928: 14	July, 1928: 21	July, 1928: 28	August, 1928: 4	August, 1928: 11	August, 1928: 18	August, 1928: 25	September, 1928: 1	September, 1928: 8	September, 1928: 15
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	206	32	63		49	31	78	78	65	56	35	10
	D	48	27	100	32	20	37	5	18		12	9	6	6	13	7	6	3
Sudan (French) (see table below).																		
Syria (see table below).																		
Taiwan: Keelung	C						1											
Tunisia: Tunis	C	3	14	4	6	3	2	5	1	2		4		1				
Union of South Africa:																		
Cape Province	C	P																
Natal	C	P	P	P			1											
Orange Free State	C	P		P		P	P	P										
Transvaal	C				P	P	P						P					
Union of Socialist Soviet Republics (see table below).																		
Upper Volta	C		5	2	9								33		17			
	D												8					
Venezuela: Maracaibo	C	1																
	D	1	1										1					
On vessel:																		
S. S. Arendskerk at Singapore, from Amoy, China	C			P														
S. S. Kashgar at Kobe, from Shanghai	C				P													
S. S. Ronna 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	June, 1928 1-10	June, 1928 11-20	June, 1928 21-30	July, 1928 1-10	July, 1928 11-20	July, 1928 21-31	August, 1928 1-10	August, 1928 11-20	August, 1928 21-31
Algeria (see also table above)	C	682												
Oran	C	11												
Indo-China (French) (see also table above)	C	97	426	35	79	47		36	8	3	15	44	21	6
Ivory Coast	C				7					4	5			
	D										2			
Senegal (see also table above)	C			51	20	23	14	2						
	D			7	9									
Dakar	C			11	24	4	1	3						
	D			8	7									
Sudan (French)	C		15	4	30	20				17				55
	D				6									33
Syria:														
Aleppo	C	1	1				1	2					4	
Beirut	C	2	75	9	7	1	7	2	4	1				
	D		2											
Damascus	C	47	14											

Place		October-December, 1927	January-March, 1928	April, 1928	May, 1928	June, 1928	July, 1928
Angola	C	151	47	7	1		
	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	49	
	D	1	16	6	38	21	
Seoul	C		1				
Ecuador: Guayaquil	C	6	35	19	31	11	35
	D		1				
France	C	25	34	6	15	10	10
Gold Coast	C	4	4				

Place		October-December, 1927	January-March, 1928	April, 1928	May, 1928	June, 1928	July, 1928
Greece	C	9	36		22	31	9
	D		4		1	2	1
Latvia	C	2	1				1
Mexico (see also table above)	D	346	256				
Morocco	C	622	182	19	25	10	55
Nigeria (see also table above)	C	316	592	173	194		
	D	81	84	46	53		
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	59				
Other territories in Europe	C	1,255	1,717				
Transcaucasus, Siberia, and Central Asia	C	81	25				
Ukraine	C	48	27				

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

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	June 3–30, 1928	Week ended— July, 1928: 7	July 14	July 21	July 28	August, 1928: 4	Aug. 11	Aug. 18	Aug. 25	September, 1928: 1	Sept. 8	Sept. 15
Algeria (see also table below):																		
Algiers	C	1	3	9	4	13	32	1		2		1	4	3				
	D		1		2		6											
Oran	C	2	10	4	11	4	7	2	6	6	2	1	1	1				
	D				1		1											
Austria: Vienna	C	1																
Bulgaria	C	13	18		26		16			P	P	P		3	5			
	D	1	4				2							2				
Sofia	C	1		20	1	20	14	1										
	D						6											
Chile:																		
Iquique	C										1							
	D									1								
Talcahuano	D			1														
Valparaiso	C		1				1			2								
	D						3											
China (see also table below):																		
Manchuria—																		
Harbin	C				2	16	23											
Kwantung	C				17	293	530		213	138	80	60						
South Manchuria Railway Zone	C						10		5	1								
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				1		1
	D															1		
Assiuot Province	C						2	1	1					2				
Assouan Province	C						2							1				
Behera Province	C			29	32	43	7	2										
	D				7	7	2											
Cairo	C			2	4				1									
	D			1	4				1									
Dakalieh	C						1	1										

Gharbieh Province	C			23	14	5	4		1									
	D				5		3											
Keneh Province	C			5	38		1											
	D				7		1											
Menoufieh Province	C				28	9	5											
	D				3	3	2											
Port Said	C								1	1			4	3	1			1
Suez	C					1			1	1	2	1	1	1	1		1	
	D					1												
Great Britain: London County	C						2											
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													
Dublin	C																3	
Galway County—Oughterard	C										10							
Kerry County—Cahirciveen	C											1						
Japan (see table below):																		
Hiogo	C						1											
Yamagata	C					2	1		1	1								
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	14	6	2	1	1	4	2		4			
	D		4	3	1	2		2		1		2			1			
Monterey	D			1														
Morocco (see also table below)	C	1,051	316	748	591	280	214	40	50	49	14	39	2	2	1			
Palestine	C	5	10	7	6	4	8	1	3	5		5	3	3	3	2	2	
Peru (see table below).																		
Poland	C	346	265	382	144	226	134	25	30	15	26	7	19	11	18			
	D	19	26	25	12	17	6	1		2	2							
Portugal (see also table below): Oporto	C	1						1									1	
Rumania	C	39	68	141	142	99	80	8	8	8	9	8	1		7			
	D	9	5	11	12	8	11		1			1						
Syria (see also table below): Aleppo	C						2							1				
Tunisia	C	4	1	18	19	7	7									7		
Union of South Africa:																		
Cape Province	C	1	P		P	P	P	P	P	P	P	P	P					
Natal	C	1	2		P	3	P	P	P	P	P							
Orange Free State	C	P			P	P	P	P	P	P	P							
Transvaal	C					1					P							
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		January-March, 1928	April, 1928	May, 1928	June, 1928	July, 1928	August, 1928
Chosen	C	896	210	241	182		
	D	88	19	32	24		
Chemulpo	C	2		2			
Gensan	C	1					
	D	1					
Seoul	C	10	28	18			
	D	1	2	4			
Czechoslovakia	C	25					
Greece: Athens	C	4	13	11	9	6	
	D		2	2	1	1	
Japan	C			21			
Latvia	C	27	4	65	2		
Lithuania	C	223	66	64	32	8	11
	D	22	3	3	1		

Place		January-March, 1928	April, 1928	May, 1928	June, 1928	July, 1928	August, 1928
Mexico (see also table above)	D	46					
Peru:							
Arequipa	D	2	1				
La Oroya	C	P.					
Turkey	C	17		7		6	2
	D	1		1			
Union of Socialist Soviet Republics:							
Railways, etc	C	199					
Transcaucasus, Siberia, and Central Asia	C	17					
Ukraine	C	1,476					
Other territories in Europe	C	5,167					
Yugoslavia	C	34	10	19	16	12	
	D	3	1	3	1	3	

YELLOW FEVER

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	June 3-30, 1928	Week ended— July, 1928				August, 1928				September, 1928			
								7	14	21	28	4	11	18	25	1	8	15	22
Belgian Congo: Matadi	C	14	1		2	2													
	D	13																	
Brazil:																			
Aracaju	D					2													
Bahia	C						4										1		
	D													1			1	1	
Estancia	C		1														1		

Pernambuco	C						1												
Rio de Janeiro	C					2	48	10	12	10	8	6	4	4			4		1
	D					2	15	5	7	9				2					
Sao Felix	C						P												
Dahomey: Grand Popo	C						3												
	D						2												
Gold Coast	C					2													
Ivory Coast	C						1												
	D						1												
Abidjan	C						1	1											
Ferkes-Sedougou	D											1							