Public Health Reports

Vol. 58 • AUGUST 20, 1943 • *No. 34*

THE INCIDENCE AND PREVALENCE OF CANCER OF THE LUNG [1]

By HAROLD F. DORN, *Senior Economist, United States Public Health Service*

The increasing frequency with which cancer of the lung has been reported as a cause of death in recent years has aroused considerable speculation as to whether the increase represents a real change in the incidence of this form of malignant neoplasm or is merely the result of improved methods of diagnosis in combination with a more careful search for a disease which has attracted attention because it is reported more frequently than in the past (*1*).

Between 1914 and 1930 the death rate from cancer of the lungs and pleura increased 3.7 times compared with an increase of 20 percent for all forms of cancer combined (*2*). The change among males exceeded that among females, the relative increases being 4.5 and 2.6 times, respectively.

The death rate from cancer of the lungs and pleura continued to increase from 1930 to 1940. The relative change by age groups in the mortality rate for cancer of the lungs and pleura, the respiratory system as a whole, and for all forms of cancer between 1930–31 and 1939–40 among white males and females is shown in figures 1 and 2.

After eliminating the effect of changes in the age composition during the past decade, the death rate from cancer of the lungs and pleura increased 22 percent among white females and 78 percent among white males, or roughly about 2.5 and 8.5 percent per year, respectively. Between 1914 and 1931 the average annual increases were approximately 8 and 10.5 percent, respectively, for females and males, which indicates that the rate of increase in the death rate is becoming smaller.

The mortality rate of other forms of respiratory cancer increased even more than the rate for lungs and pleura. In the white male

[1] From the Division of Public Health Methods, National Institute of Health.

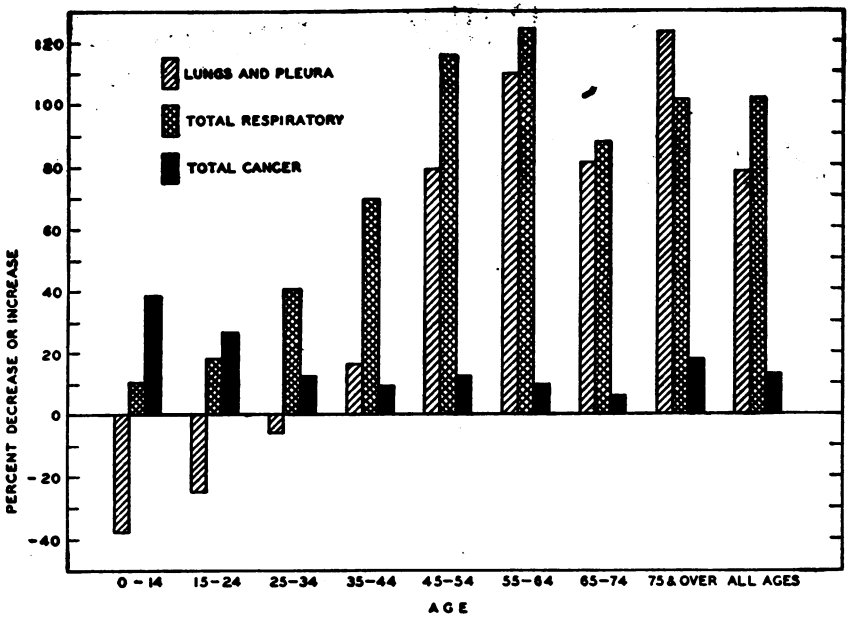

FIGURE 1.—Percentage change in the number of deaths per 100,000 white male population from cancer of the lungs and pleura, cancer of the total respiratory system, and all forms of cancer by age from 1930–31 to 1939–40.

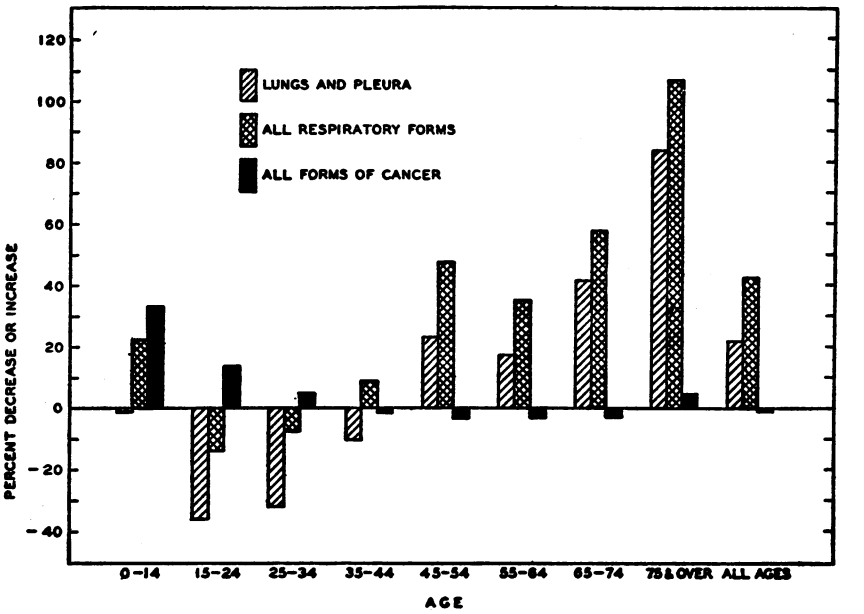

FIGURE 2.—Percentage change in the number of deaths per 100,000 white female population from cancer of the lungs and pleura, cancer of the total respiratory system, and all forms of cancer by age from 1930–31 to 1939–40.

population the rate for total respiratory doubled (an increase of 102 percent); in the white female population the rate increased 42 percent.

The rapid increase in the death rate from cancer of the respiratory system is in striking contrast to the change in the death rate for all forms of cancer. During the past decade the death rate from all forms of cancer among white females actually decreased although the amount of the decrease was negligible (only 1 percent). The corresponding rate among white males increased about 10 percent, but this increase was considerably less than the increase for respiratory cancer, including cancer of the lung.

It can be seen from figures 1 and 2 that the reported increase in the death rate from respiratory cancer is due primarily to an increase in late adult life. During the past decade increases in the death rate from lung cancer were confined to males 35 or more years of age and to females 45 or more years of age. At the younger ages the death rates in 1939–40 were lower than the rates in 1930–31.

Cancer of the respiratory system develops more frequently among males than among females in contrast to all forms of cancer as a whole, which has a higher rate among females (table 1). On the average, the death rate from all forms of cancer is about 9 percent higher for females than for males, but the rate for cancer of the lungs and pleura among males is nearly 2.5 times that among females and for all forms of respiratory cancer the rate among males is more than 3 times the rate among females.

TABLE 1.—*Number of deaths per 100,000 white population from cancer of the respiratory system and from all forms of cancer by sex and age, United States, 1939–40*

Age	Lungs and pleura		Total respiratory		All forms of cancer	
	Male	Female	Male	Female	Male	Female
0–14	0.1	0.1	0.2	0.2	3.8	3.4
15–24	0.3	0.2	0.6	0.3	6.1	4.4
25–34	0.7	0.4	1.2	0.6	12.1	20.7
35–44	3.0	1.3	5.8	1.9	38.4	78.4
45–54	12.4	4.4	22.7	6.1	131.5	197.1
55–64	25.3	9.1	45.1	12.3	350.6	385.7
65–74	28.4	13.3	51.3	18.0	740.6	664.5
75 and over	24.1	12.1	45.9	18.2	327.5	1,110.9
All ages:						
Crude	6.1	2.5	11.1	3.5	117.4	129.5
Standardized [1]	6.2	2.5	11.4	3.6	119.0	129.5

[1] Standardized for age using the total urban population of the United States, 1940.

The available information concerning the number of living persons with cancer is too incomplete to give a reliable estimate of the illness rates. The principal source of data concerning living cases is from admissions to hospitals and more recently from the reports made to a few State departments of health by physicians and hospitals. The

latter are still too incomplete to be used as a basis for estimating illness rates, while the admissions to a particular hospital are so selective that they are unsuitable for the computation of morbidity rates. The use of admission records of a single institution has given rise to many conflicting statements about the incidence of cancer (*3*, *4*).

Because no accurate records of the total number of living persons with a malignant neoplasm were available, the United States Public Health Service in 1938 began to collect such records in a number of urban areas where it was believed that hospital and medical facilities were accessible to all groups of the population. Ten areas were selected for study: Atlanta, Pittsburgh, Detroit, Chicago, New Orleans, Dallas and Fort Worth, San Francisco and Alameda County, Birmingham, Philadelphia, and Denver. In each instance, the county in which the city is located was included and in addition Cherokee, Clayton, Cobb, DeKalb, Douglas, Fayette, Forsythe, and Gwinnett counties were included in the Atlanta area. The population of these areas numbered slightly more than 13 million in 1940 or about 18 percent of the total urban population of the United States.

A complete description of the procedure used in the survey will be found in the reports (listed in reference *5*) which have been issued for each city. For the present purpose it will be sufficient to point out that information concerning each patient seen or treated for a malignant growth during a given calendar year was solicited by means of a questionnaire mailed to every physician and hospital in the study areas. A personal visit was made to physicians and hospitals failing to reply. Reports were obtained from every hospital and from all but about 2 percent of the physicians.

Two types of illness rates will be used; first, the incidence rate or the number of new cases of cancer diagnosed during the course of a year, and, second, the prevalence rate or the number of known cases of cancer at any time during the year. In the discussion which follows cases with cancer of the lung include those diagnosed as having a primary cancer of the lung or bronchiogenic cancer.

Nearly 3 percent of the 39,970 cases in the white population were reported to have a primary cancer of the lung. This is slightly less than the percentage of all deaths from cancer which is attributed to cancer of the lungs and pleura, 3.5 percent.

Age specific prevalence rates of cancer for white males and females are shown in table 2. From these data it is apparent that although the illness rate from all forms of cancer is higher among females than among males, the opposite is true for respiratory cancer. The rate for cancer of the respiratory system is more than 4 times as high among males as among females and the rate for cancer of the lung is more than 3 times as high among males as among females.

TABLE 2.—*Prevalence rates of cancer per 100,000 white population by sex and age for primary cancer of the lung, the respiratory system, and all forms of cancer*

Age	Lung		Total respiratory		All forms of cancer	
	Male	Female	Male	Female	Male	Female
0–14	[1]	0.1	0.3	0.2	10.8	8.7
15–24	0.4	0.3	1.2	0.4	22.1	16.4
25–34	1.4	1.4	2.8	1.8	49.8	96.6
35–44	10.5	1.9	15.3	3.0	138.4	351.9
45–54	34.0	9.8	50.5	11.7	417.8	758.2
55–64	64.8	16.0	104.7	20.4	1,060.7	1,261.8
65–74	64.3	24.1	117.3	29.2	2,075.7	1,792.4
75 and over	53.4	17.8	96.5	23.0	3,011.3	2,266.1
All ages:						
Crude	15.1	4.5	24.5	5.7	302.1	390.9
Standardized [2]	15.9	4.7	26.0	6.0	340.6	411.6
Number of cases	870	259	1,408	328	17,368	22,602

[1] Less than 0.1 per 100,000 population.
[2] Standardized for age using the total urban population of the United States, 1940.

Data collected by the United States Public Health Service.

Out of every 100,000 white males or females at any one time about 410 females and 340 males are under treatment for cancer. Five of the females and 16 of the males are being treated for cancer of the lung.

Although it is not possible to determine the number of new cases of cancer which develop each year, it is possible to determine the number of cases which are diagnosed for the first time during a given year—this number is roughly equivalent to the number of new cases, especially if all or nearly all of the persons with cancer seek medical treatment prior to death.

From table 3 it can be seen that during the course of a year about 250 out of every 100,000 white females and 220 out of every 100,000 white males are diagnosed as having a malignant tumor. Of these, 3 females and 11 males have a primary cancer of the lung. These data clearly indicate that cancer of the lung is a relatively rare primary site of cancer, particularly among females.

A number of experiments with mice have demonstrated that various hydrocarbons will produce malignant tumors (*6*). There is also some epidemiological evidence that air pollution may be a factor in respiratory disease, although this evidence is at best indirect (*7*). If it were true that soot and other flue products resulting from the burning of coal, when continuously present in the atmosphere, increased the incidence of lung tumors in the population, it should be possible to detect this fact by collecting information concerning the number of persons with respiratory cancer in cities with varying degees of atmospheric pollution. Table 4 presents incidence rates for malignant tumors of the lung and the entire respiratory system for a number of cities included in the survey.

TABLE 3.—*Number of new cases of cancer per 100,000 white population per annum by sex and age for primary cancer of the lung, the respiratory system, and all forms of cancer*

Age	Lung		Total respiratory		All forms of cancer	
	Male	Female	Male	Female	Male	Female
0–14	(1)	0.1	0.3	0.2	7.9	6.4
15–24	0.2	0.1	0.9	0.1	14.5	12.0
25–34	1.2	0.6	2.3	0.9	35.1	101.1
35–44	7.0	1.0	10.8	1.7	92.9	224.1
45–54	24.0	5.8	35.1	7.0	285.6	461.9
55–64	42.4	11.7	69.2	14.4	705.2	747.9
65–74	44.0	13.6	77.8	17.0	1,299.4	1,039.8
75 and over	36.6	9.7	56.2	13.5	1,757.9	1,185.0
All ages:						
Crude	10.3	2.7	16.6	3.5	196.1	234.4
Standardized [2]	10.8	2.9	17.5	3.7	219.2	252.0
Number of cases	592	157	952	200	11,273	13,554

[1] Less than 0.1 per 100,000 population.
[2] Standardized for age using the total urban population of the United States, 1940.

Data collected by the United States Public Health Service.

Although exact measures of the air pollution are not available, it is generally thought that, of the cities listed in table 4, the greatest amount of pollution is in Pittsburgh. However, the incidence rate for lung and respiratory cancer in males is lower in Pittsburgh than in any of the other cities except Denver. There is less difference in the rates for females; in fact these data indicate that there is no real difference in the rates of the surveyed cities.

TABLE 4.—*Number of new cases of cancer per 100,000 white population per year with primary location in the lungs and the respiratory system by sex for selected cities* [1]

City	Lung		Total respiratory	
	Male	Female	Male	Female
Philadelphia	14.8	3.1	25.1	4.4
Alameda and San Francisco	11.5	3.1	19.1	4.3
Chicago	10.2	3.0	18.1	4.0
Detroit	11.1	2.4	15.9	3.3
Pittsburgh	8.7	2.9	14.9	4.0
Denver	7.4	4.0	12.4	5.3

[1] Standardized for age using the total urban population of the United States, 1940.

Data collected by the United States Public Health Service.

The highest rate for males was reported from Philadelphia. It is possible that the rate for Philadelphia is somewhat too high because of the Chevalier Jackson Clinic in that city. The rates in table 4 are based upon resident cases only, but it is possible that some patients staying with friends or relatives in Philadelphia may have been reported as residents. So far as is known this did not occur.

These data do not necessarily prove that atmospheric pollution has no effect upon the incidence of respiratory cancer. On the other hand they offer no affirmative evidence that such is the case. The causes of respiratory cancer are probably too complicated to be discovered in this relatively crude manner.

The figures in tables 2 and 3 may be used to estimate the number of persons with cancer of the lung in the whole country by multiplying them by the age distribution of the population of the United States in 1940. The data on which these rates are based were collected in urban areas so that it might be thought the rates are too high to use as a national average since the death rate from cancer is higher in urban than in rural communities. On the other hand, the rates are somewhat too low because a number of persons with cancer fail to obtain medical treatment prior to death. These two factors counterbalance each other to a certain extent so that estimates for the entire country may not be seriously in error.

It is estimated that between 450,000 and 500,000 persons in the United States are under medical treatment for cancer. In addition there is an unknown number of persons with undiagnosed cancer as well as those who have been treated for cancer and are now "cured." Approximately 20,000 of the known cases under treatment have a primary cancer of the respiratory system; of these about 13,000 are being treated for primary cancer of the lung.

Slightly more than 8,000 new cases of primary cancer of the lung are diagnosed and receive medical treatment for the first time each year. Nearly 5,000 additional cases with primary cancer of other parts of the respiratory system are also diagnosed, making a total of approximately 13,000 new cases of primary cancer of the respiratory system which are given medical care for the first time each year.

REFERENCES

(1) Cancer of the lung a growing health problem. Metropolitan Life Insurance Co., Statistical Bulletin, 20: 7–9 (November 1939).
(2) Gover, Mary: Cancer mortality in the United States. I. Trend of recorded cancer mortality in the death registration States of 1900 from 1900 to 1935. Public Health Bulletin No. 248. Government Printing Office, 1939.
(3) Editorial. Brit. Med. J., 1: 672–673 (May 30, 1942).
(4) Matz, P. B.: The incidence of primary bronchiogenic carcinoma. J. Am. Med. Assoc., 111: 2086–2092 (1938).
(5) Sommers, H. J.: The incidence of cancer in Denver, Colorado, 1939. Pub. Health Rep., 57: 1971–1986 (1942).
(6) Editorial. Aetiology of lung cancer. Brit. Med. J., 1: 194 (Feb. 13, 1943).
(7) Mills, C. A.: Urban air pollution and respiratory disease. Am J. Hyg., 37: 131–141 (1943).

542592°—43——2

CARBARSONE TREATMENT FOR *BALANTIDIUM COLI* INFECTIONS[1]

By MARTIN D. YOUNG, *Parasitologist, United States Public Health Service*, and ROBERT BURROWS, *Parasitologist, South Carolina State Hospital*

In 1939, seven infections of *Balantidium coli* were reported at the South Carolina State Hospital (*1*). Up until that time there was not a universally accepted treatment for this infection. These seven infections were treated with carbarsone; this report presents the results of the treatment.

TABLE 1.—*Dosages of carbarsone and results of treatment in seven infections of Balantidium coli*

Patient	Number of doses	Dose in grams	Daily dosage (grams)	Post-treatment observations		
				Length in months	Number of examinations	Number positive
D. H.	20	0.25	0.5	48	3	0
J. T.	20	.25	.5	40	16	0
S. H.:						
First course	20	.25	.5	1	2	2
Second course[1]	20	.25	.5	1.5	3	0
H. K.:						
First course	20	.25	.5	[2] 6	15	4
Second course	20	.25	.5	[2] 40	12	0
E. A.[1 3]	15	.1–.24	.1–.24	4	7	0
J. W.	20	.50	1.0	48	13	0
A. L.	20	.50	1.0	25	11	0

[1] Died of causes unrelated to balantidiasis.
[2] Irregular treatment. Total of 2.2 gm. given in 15 doses over a 22-day period.
[3] Approximately.

Carbarsone in the amount of 0.25 gm. per dose, two doses per day given for 10 days, eradicated the infections in two (D. H. and J. T.) of the four patients so treated. In the two failures (S. H. and H. K.) the course was repeated and was successful. In one case (E. A.) receiving the drug in smaller amounts the infection disappeared. In the other two cases (J. W. and A. L.) a course of 1.0 gm. per day (two doses of 0.5 gm. each) for 10 days eradicated the infection.

Post-treatment examinations were made repeatedly for periods extending from 1 month up to 4 years. The absence of balantidia during the follow-up periods indicated a cure.

These seven infections, as far as can be ascertained by the authors, appear to be the largest group treated as yet in this country.

SUMMARY AND CONCLUSIONS

Carbarsone, in courses totaling either 5 or 10 gm. in a 10-day period, was given to six cases of balantidiasis. After one or two such courses of treatment, the infections were eradicated as shown by repeated post-treatment examinations some of which extended over a 4-year period.

[1] From the Division of Infectious Diseases, National Institute of Health.

A seventh infection, which received less carbarsone than the other six, also disappeared.

Carbarsone appears to be an effective drug in the treatment of *Balantidium coli* infections.

REFERENCE

(1) Young, M. D.: Balantidiasis. J. Am. Med. Assoc., 113:580–584 (Aug. 12, 1939).

SICKNESS ABSENTEEISM AMONG INDUSTRIAL WORKERS, FIRST QUARTER OF 1943, WITH AN INQUIRY INTO THE OCCURRENCE OF THE RESPIRATORY DISEASES, 1934–43 [1]

By W. M. Gafafer, *Senior Statistician, United States Public Health Service*

The accompanying data on the frequency of 8-day or longer absences on account of sickness and nonindustrial injuries are derived from analyses of periodic reports from industrial sick benefit associations, group insurance plans, and company relief departments.

First quarter of 1943.—Table 1 shows by cause the average annual number of absences per 1,000 workers for the first quarter of 1943 with the corresponding rates for 1942 and 1941, respectively. A comparison of 1943 with 1942 reveals a 32-percent increase in the rate for sickness and nonindustrial injuries, and a 68-percent increase for the respiratory group of diseases.

An examination of the rates for the 10 first quarters of 1934–43 shows the 1943 rate for sickness and nonindustrial injuries to be the highest, and 31 percent in excess of the 10-year mean of 124.2. Likewise the respiratory rate for the first quarter of 1943 has never been equalled or exceeded during the same 10-year period, the rate of 96.8 exceeding the 10-year mean of 63.5 by 52 percent.

Interest in the table thus centers around the respiratory diseases. Attention is directed to the pneumonia rate of 16 which is more than twice the corresponding rate for the preceding year. Moreover a comparison of the first quarters of 1943 and 1942 reveals a 78-percent excess for bronchitis, a 68-percent excess for diseases of the pharynx and tonsils, and a 67-percent excess for influenza and grippe. These observations raise the question of the changes with time of the contribution of each of these four causes to the total respiratory disease rate.

Respiratory causes, first quarters, 1934–43.—Figure 1 presents graphically the variation over the 10-year period 1934–43 of the contribution of each of four respiratory causes to the varying total respiratory

[1] From the Division of Industrial Hygiene, National Institute of Health. The last report of this series appeared in Public Health Reports, 58: 1250–1254 (Aug. 13, 1943.)

TABLE 1.—*Average annual number of absences on account of sickness and nonindustrial injuries disabling for 8 consecutive calendar days or longer among* MALE *employees in various industries, by cause, the first quarter of 1943 compared with the first quarters of 1942 and 1941* [1]

Cause (Numbers in parentheses are disease title numbers from the International List of Causes of Death, 1939)	Annual number of absences per 1,000 males for the first quarter		
	1943	1942	1941
Sickness and nonindustrial injuries [2]	162.9	123.4	139.7
Nonindustrial injuries (169–195)	12.7	12.2	11.6
Sickness	150.2	111.2	128.1
Respiratory diseases	96.8	57.6	79.7
Tuberculosis of the respiratory system (13)	.5	.7	.5
Influenza, grippe (33)	40.8	24.4	51.1
Bronchitis, acute and chronic (106)	16.4	9.2	7.9
Pneumonia, all forms (107–109)	16.0	7.3	5.9
Diseases of the pharynx and tonsils (115b, 115c)	9.9	5.9	5.6
Other respiratory diseases (104, 105, 110–114)	13.2	10.1	8.7
Digestive diseases	14.2	16.0	14.5
Diseases of the stomach except cancer (117, 118)	4.5	4.4	3.9
Diarrhea and enteritis (120)	1.6	1.5	1.2
Appendicitis (121)	3.7	5.3	5.0
Hernia (122a)	1.9	1.7	1.6
Other digestive diseases (115a, 115d, 116, 122b–129)	2.5	3.1	2.8
Nonrespiratory-nondigestive diseases	35.5	35.4	30.8
Infectious and parasitic diseases (1–12, 14–24, 26–29, 31, 32, 34–44) [3]	2.6	3.2	2.4
Rheumatism, acute and chronic (58, 59)	4.4	4.0	4.7
Neurasthenia and the like (part of 84d)	1.2	1.0	.8
Neuralgia, neuritis, and sciatica (87b)	2.9	2.3	2.1
Other diseases of the nervous system (80–85, 87, except part of 84d, and 87b)	1.4	1.2	1.2
Diseases of the heart and arteries, and nephritis (90–99, 102, 130–132)	5.0	5.1	4.7
Other diseases of the genitourinary system (133–138)	2.4	2.4	2.1
Diseases of the skin (151–153)	2.7	2.3	2.3
Diseases of the organs of movement except diseases of the joints (156b)	3.6	3.4	3.0
All other diseases (45–57, 60–79, 88, 89, 100, 101, 103, 154, 155, 156a, 157, 162)	9.3	10.5	7.5
Ill-defined and unknown causes (200)	3.7	2.2	3.1
Average number of males covered in the record	265,711	251,889	218,021
Number of organizations	21	21	22

[1] The same 21 organizations are included in 1943 and 1942.
[2] Industrial injuries, venereal diseases, and a few numerically unimportant causes of disability are not reported.
[3] Except influenza, respiratory tuberculosis, and the venereal diseases.

disease rate. With regard to the movement of the total respiratory disease rate, it will be observed that the highest rate is yielded by 1943. Of interest also are the minimum rates displayed by the years 1934, 1938, and 1942, each of the first two rates introducing what appears to be a 4-year cycle. Noteworthy is the fact that each of the three minimum rates is higher than its predecessor.

The movement of the rates for influenza and grippe is the principal determining factor of the variation of the total respiratory rate. Each of the remaining three causes shown in figure 1 yields for 1943 the maximum frequency. Perhaps of most interest, and common to each of the four causes, is the abrupt increase in frequency from 1942 to 1943.

Frequency and duration of absences on account of respiratory diseases, 1943 and 1942.—The unusually high rates yielded for the first quarter of 1943 by the group of respiratory diseases and by certain of the specific respiratory causes rouse interest in the behavior of these rates

with respect to absence-duration. Since the frequency of all respiratory diseases based on 8-day or longer absences reported by the 21 cooperating companies was 68 percent in excess of the corresponding rate for 1942, can it be assumed that there was a similar excess in the frequency of absences of, say, 14 days or longer, or 21 days or longer?

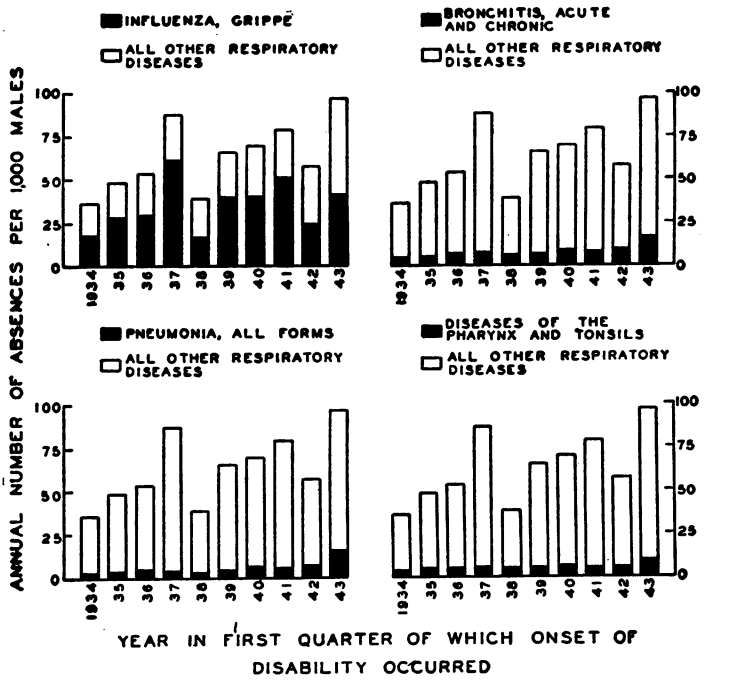

FIGURE 1.—Average annual number of absences per 1,000 males on account of respiratory diseases disabling for 8 consecutive calendar days or longer, variation of the first quarter rates with time; experience of male employees in various industries, 1934–43, inclusive. (Each bar for a particular year represents the average annual frequency from the respiratory group of diseases and the contribution made to that frequency by particular respiratory diseases.)

To investigate the question data on duration are available for one of the cooperating companies, a large eastern manufacturing plant with over 12,000 male workers and an excellent medical department. These data were used to determine the average annual number of absences per 1,000 males on account of respiratory diseases disabling for t days or longer, and beginning during the first quarters of 1943 and 1942, respectively. Sufficient data are available to allow t to assume values from 8 to 21 days. In general as t becomes larger the number of absences must become smaller. Should there be a relatively large number of long durations, the frequency rate would decrease rather slowly with increasing values of t; on the other hand a relatively large number of short absences would be indicated by a rate decreasing more rapidly. Thus a comparison of such rates for the 2 years would

be useful in showing possible differences in the two experiences with respect to duration of absence.

Accordingly the ratios of the frequencies for the group of respiratory diseases and five specific respiratory causes for 1943 to the corresponding rates for 1942 were examined for durations from 8 days or longer to 21 days or longer. Ratios showing an increasing trend for a particular cause would indicate a relatively greater number of longer absences in 1943 than in 1942, while ratios showing a decreasing trend would reveal a relatively greater number of shorter absences in 1943.

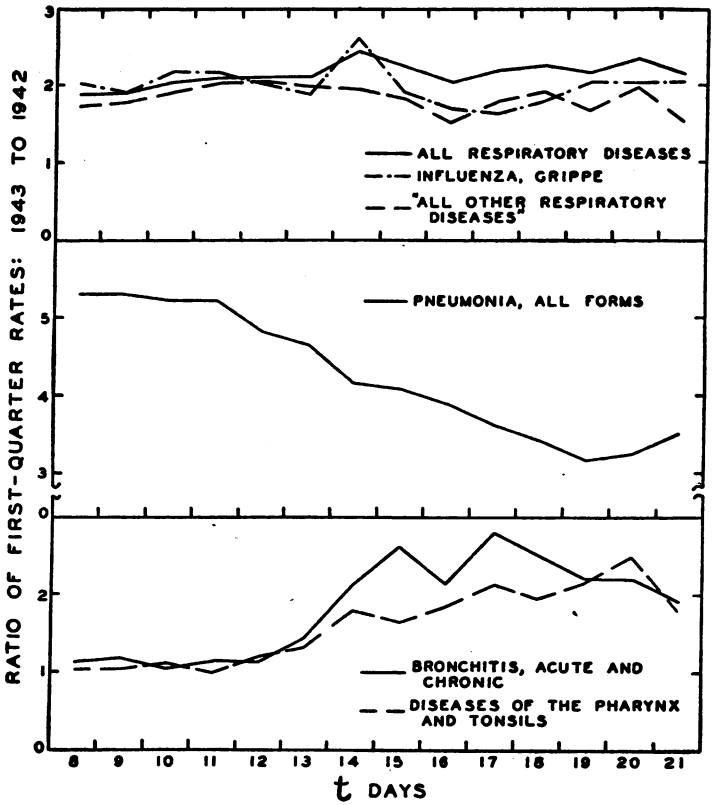

FIGURE 2.—Ratio of the average annual number of absences per 1,000 males on account of respiratory diseases disabling for a specified number of calendar days, t or more, during the first quarter of 1943 to the corresponding rate for 1942; experience of male employees of an eastern manufacturing company.

Ratios with an approximately level trend would indicate that no great difference existed in the relative distribution of 8 to 21-day or longer absences for the 2 years.

The ratios are presented graphically in figure 2. An examination of the figure reveals that all three types of trends are present. The ratios for the group of all respiratory diseases, influenza and grippe, and "all other respiratory diseases," respectively, exhibit approxi-

mately level trends, the rates for 1943 for each of these disease classifications being about twice the corresponding rates for 1942. Thus for these three classifications, and within the chosen duration limits, little difference is shown in the two experiences with respect to duration of absence.

The ratios for pneumonia show a decreasing trend, indicating a relatively greater number of shorter absences in 1943; however, each of these ratios is greater than 3, the frequency of absences of 21 days or longer being 3.5 times the corresponding rate for 1942. The ratios for bronchitis and diseases of the pharynx and tonsils, respectively, tend to increase; the frequency of 8-day or longer absences for each cause is only slightly higher in the first quarter of 1943 than in the corresponding quarter of 1942, but the frequency of 14-day or longer absences and 21-day or longer absences is approximately twice the corresponding rate for 1942.

Thus in the comparison of the first quarters of 1943 and 1942 this particular company yields for pneumonia, bronchitis, and diseases of the pharynx and tonsils an excess of 8-day or longer absences which is not uniformly distributed with respect to the selected absence-durations.

THE MECHANISM OF ANTITOXIC IMMUNITY IN *CLOSTRIDIUM PERFRINGENS* (WELCHII) INFECTIONS IN GUINEA PIGS [1]

By Sarah E. Stewart, *Bacteriologist, United States Public Health Service*

It has been shown that it is possible to immunize guinea pigs with perfringens toxoid so that the guinea pigs are resistant to many lethal doses of toxin or to viable culture injected either intraperitoneally or intramuscularly (*1*). Recently (*2*) a comparative study was made on the amount of protection afforded by immunized guinea pigs having definite antitoxin levels against viable culture and against toxin. It was found that guinea pigs immunized with toxoid alone were more resistant to massive doses of whole culture than to equivalent doses in M. L. D.'s of toxin. In the present study it is shown that the greater resistance of immunized guinea pigs to viable bacteria as compared to toxin is due to the active part taken by phagocytic cells, in the presence of antitoxin, in removing the bacteria.

METHODS

Guinea pigs were immunized with concentrated perfringens toxoid produced from 12-hour culture filtrates, using the procedure described earlier (*1*).

[1] From the Division of Biologics Control, National Institute of Health.

Clostridium perfringens, strain WX obtained from Dr. G. B. Reed, Queen's University, Kingston, Ontario, was used as the challenge organism. This strain was chosen because of its high virulence and its rapidly invasive properties. For a 300 to 400 gm. guinea pig the M. L. D. of an 18-hour meat culture was found to be 5×10^{-6} to 5×10^{-7} cc. when injected intramuscularly using the technique described by Reed and Orr (*3*). The intraperitoneal dose for guinea pigs of the same size was found to be much larger, being between 0.05 and 0.1 cc. of undiluted culture. For the intraperitoneal injections the tissue was not traumatized.

In the preliminary work two immunized guinea pigs, Nos. 43 and 6, having 0.25 to 0.5 and 0.5 to 1.0 unit of circulating antitoxin per cc. of serum, respectively, were each inoculated intraperitoneally with 0.1 cc. of an 18-hour culture. Two control guinea pigs, Nos. 292 and 293, were inoculated in the same manner. The guinea pigs were inoculated at 9 a. m., then 6 hours and 20 hours later fluid for examination was removed by puncture from the peritoneal cavity. Puncture was made with a sterile 20-gage needle and fluid that rose into the needle was withdrawn with a sterile Pasteur pipette. Stained preparations were then made from air-dried films and these were examined microscopically.

OBSERVATIONS

The 6-hour films made from the immunized guinea pigs showed a great increase in leucocytes, especially polymorphonuclear cells, and these were very actively phagocytic. In guinea pig No. 6 no free bacteria were observed and many polymorphonuclear cells were found which contained masses of phagocytosed bacilli. In No. 43, which had a lower antitoxin level, free bacteria were observed but marked phagocytosis was also present. No. 6 at no time showed any signs of a toxemia or of an infection, while No. 43 developed a small local infection in the subcutaneous tissue at the site of the injection. This cleared in a few days. The 20-hour films from No. 43 showed very few free bacteria.

In the control guinea pigs, although there was an increase in leucocytes as observed in the 6-hour films, very little phagocytosis was found and there were a great number of free bacteria. The number of free bacteria increased and the phagocytic cells decreased as the guinea pigs became more ill. One guinea pig died in 12 hours and the other in 26 hours. The 6- and 20-hour films of immune guinea pig No. 6 and of non-immune guinea pig No. 292 are shown in Plate I.

A series of eight other toxoid immunized guinea pigs having from 0.25 to 6.0 units of antitoxin per cc. of serum were checked for immunity in a similar manner, making the challenge culture injections

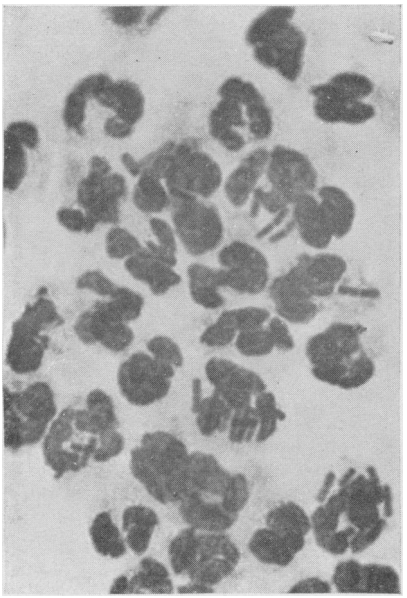

FIGURE 1.—Six-hour slide from immune guinea pig No. 6.

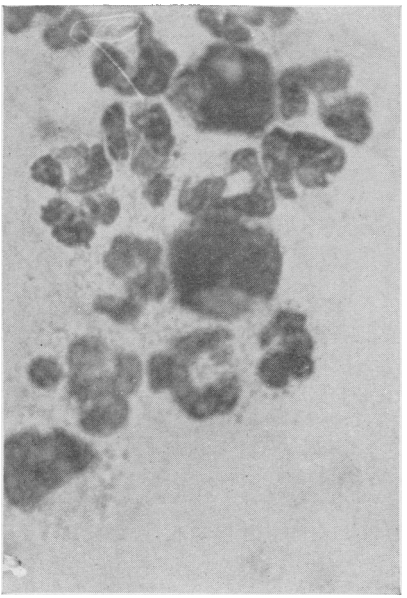

FIGURE 2.—Twenty-hour slide from immune guinea pig No. 6.

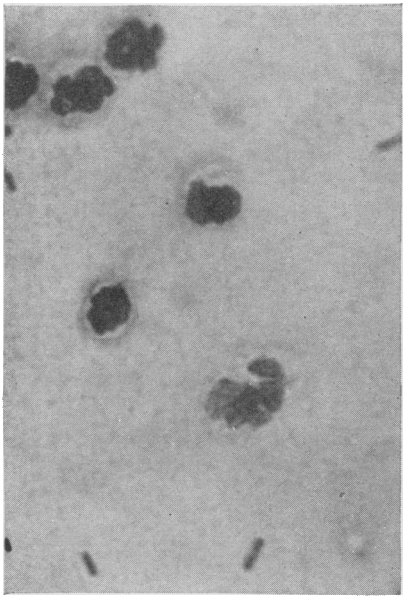

FIGURE 3.—Six-hour slide from non-immune guinea pig No. 292.

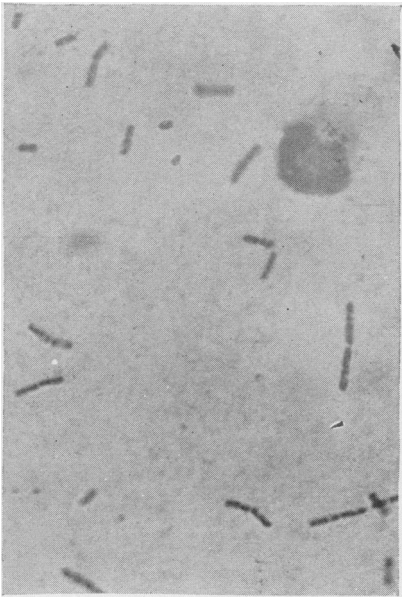

FIGURE 4.—Twenty-hour slide from non-immune guinea pig No, 292.

(Wright's stain. × 1350.)

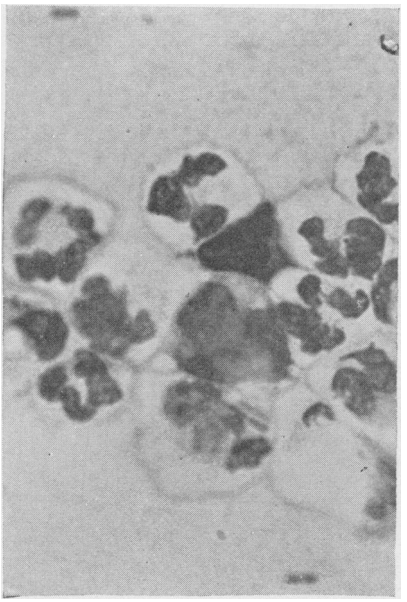

FIGURE 5.—Four-hour slide from immune guinea pig inoculated with 0.1 cc. 18-hour culture *Cl. perfringens* plus 0.3 MLD perfringens toxin.

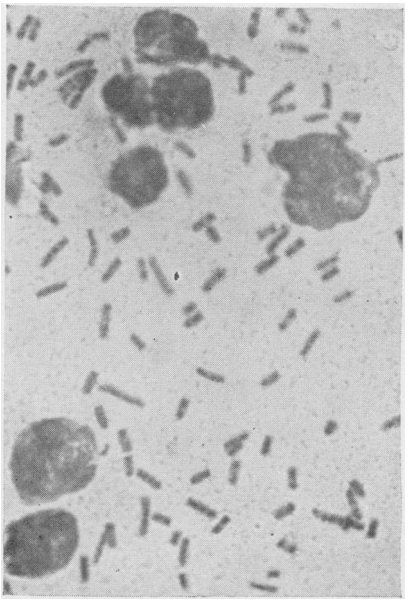

FIGURE 6.—Four-hour slide from non-immune guinea pig inoculated with 0.1 cc. 18-hour culture *Cl. perfringens* plus 0.3 MLD perfringens toxin.

(Wright's stain. × 1350.)

either intraperitoneally or subcutaneously. Punctures were made at hour intervals up to the twelfth hour. Differences could be observed between the immune and non-immune as evidenced by phagocytosis as early as two hours after inoculation. In every instance guinea pigs with circulating antitoxin all showed a high degree of phagocytosis with few if any free bacteria. When free bacteria were present they were found to decrease with time until all had been removed as evidenced by peritoneal or subcutaneous puncture. All immunized guinea pigs, even those with as little as 0.25 unit of antitoxin, remained free of infection.

In a similar series of control guinea pigs all died in from 6 to 36 hours. In the controls if the culture had little free toxin, phagocytic activity was quite marked within the first 6 hours. However, as time passed, this was found to decrease with a corresponding increase in the number of free bacteria. Prior to death of the animals phagocytic cells were very few and the number of bacteria in the peritoneal cavity and other tissues was enormous.

Effect of adding toxin to the culture.—Culture WX, although highly virulent and very invasive as shown by intramuscular injections, was found to be only a fair toxin producer in comparison with strains PB6H and SR12 which are generally used for toxin production. For this reason a series of experiments were tried where a small amount of perfringens toxin was added to the culture prior to injection. When 0.25 to 0.5 M.L.D. of toxin was added to 0.1 cc. of culture, control guinea pigs were found to die within 4 to 6 hours, as compared to 6 to 36 hours for culture alone. Films from the peritoneal fluid 3 and 6 hours after inoculating, made while the guinea pig showed much toxemia, had masses of free bacteria with few phagocytic cells and no phagocytosis. In immunized guinea pigs the added toxin had little effect on phagocytic activity; it was retarded to some extent but as the toxin became neutralized phagocytosis increased and the guinea pigs remained normal. Four-hour films from immune and control guinea pigs having received both toxin and culture intraperitoneally are shown in plate II.

Kropp and Smith (*4*) in studying the effect of sulfanilamide on gas gangrene infection also found that perfringens toxin inhibited phagocytosis and that it brought about a destruction of the phagocytic cells. Sulfanilamide, however, was not found to increase phagocytic activity but to a very slight degree.

Passive immunization.—Guinea pigs passively immunized by intraperitoneal inoculation of perfringens antitoxin showed the same immune reactions as evidenced by phagocytosis as did the actively immunized guinea pigs. This indicates that the phagocytic activity is not due to any inherent factor in the phagocytic cells of immune

animals but due only to the neutralization of the toxin produced by the bacilli.

Effect of benzene on the immune reaction.—To demonstrate further that the adequacy of antitoxic immunity in infections due to *Cl. perfringens* is dependent on the efficient functioning of a complex system of phagocytic cells, guinea pigs treated with benzene in order to induce a leukopenia were checked for their resistance to perfringens infection.

Two toxoid immunized guinea pigs, Nos. 20 and 23, having 6 units and 3.0 to 4.0 units of circulating antitoxin, respectively, per cc. of serum and two control guinea pigs were each given daily intraperitoneal injections of 0.25 cc. of benzene for 5 consecutive days. Each guinea pig was then injected intraperitoneally with 0.1 cc. of an 18-hour culture of WX. Films were made from the peritoneal fluid 4 and 6 hours after the culture injections. All guinea pigs showed a decided leukopenia and the immunized as well as the controls had masses of free perfringens bacilli and only an occasional polymorphonuclear leucocyte. From the films no differences could be observed in the immunized and control guinea pigs.

The circulating antitoxin of immunized guinea pigs which, together with phagocytic cells, had been found so efficient in combating infection with *Cl. perfringens* was ineffective in preventing the growth of *Cl. perfringens* in the absence of leucocytes. All four animals died within 24 hours after the culture inoculation; the controls showed macroscopic lesions characteristic of perfringens infection while the immunized guinea pigs, although they showed no lesions, had masses of free living bacilli in the peritoneal cavity.

In a later series of guinea pigs treated with benzol a variation was observed in the degree of leucopenia produced. If polymorphonuclear cells were not greatly decreased, those present in the immunized guinea pigs were still capable of phagocytic activity.

CONCLUSIONS

It has been shown that in guinea pigs a purely antitoxic immunity affords effective protection against infection with an invasive toxicogenic strain of *Cl. perfringens*. This protection is made possible by the action of the antitoxin which renders the toxicogenic bacteria nontoxic and susceptible to the action of phagocytic cells.

REFERENCES

(1) Stewart, S. E.: Antigenic value of *Clostridium perfringens* (Cl. welchii) toxoid in prevention of gas gangrene. War Medicine, 2: 87 (1942).
(2) Stewart, S. E.: Unpublished data.
(3) Reed, G. B., and Orr, J. H.: Local chemotherapy of experimental gas gangrene. War Medicine, 2: 59 (1942).
(4) Kropp, B., and Smith, D. G.: Connective tissue and phagocytes in experimental gas gangrene infection in guinea pigs. Effect of sulfanilamide. War Medicine, 1: 682 (1941).

HEALTH OF THE UNITED STATES AT WAR

Morbidity and mortality reports indicate that the health of the people of the United States has not as yet been significantly affected by conditions incident to our participation in the present World War. It has now been more than a year and a half since the United States entered the conflict. During the first year of our participation, 1942, the death rate for the United States was the lowest ever recorded (10.4 per 1,000 population), and only one important communicable disease—meningococcus meningitis—assumed epidemic proportions. Typhoid fever and smallpox established new low records during the year. It is of especial interest to note that there has been no indication of increased mortality from respiratory tuberculosis in this country since the beginning of the war, such as occurred in Great Britain and some continental countries. In fact the death rate from this cause has been lower than in 1939 and 1940.

The high health level of 1942 has been maintained during the first half of 1943. With the exception of meningococcus meningitis, poliomyelitis, and the dysenteries, the incidence of the communicable diseases reported to the Public Health Service during the first half, even the first 7 months, of 1943 is below or approximately the same as that for the corresponding period of 1942. Meningococcus meningitis, the incidence of which began to increase during the spring of 1942 and developed into an incipient epidemic toward the end of the year, rose sharply early in 1943 and assumed epidemic proportions during the first half year, remaining at a rather high level during July. Up to the week ended July 31, a total of 12,982 cases had been reported in 1943. This is a larger number of cases than has been reported to the Public Health Service for any entire year since 1914, when the collection of morbidity reports by the Service was begun. The largest number of cases for any year during that period was 10,551, reported in 1929.

While poliomyelitis has followed the curve of seasonal expectancy, recording a rise during the early summer of this year, the incidence has exceeded the normal expectancy and, up to the latter part of July, was above that for any other year since 1934. As is usually the case, the above-normal incidence recorded for the country as a whole is due to the occurrence of the disease in epidemic proportions in a few States, to date this year in California, Texas, Oklahoma, and Kansas.

There has been an increased incidence of the dysenteries during the first half of 1943. About 60 percent more cases were reported up to the end of July than were reported for the same period last year. This increase is probably due, at least in large measure, to the lack of adequate sanitary precautions in food establishments and carelessness among food handlers.

Preliminary figures indicate that a new low record will be established in 1943 for typhoid morbidity and mortality and possibly for smallpox. Up to July 31, a total of 2,661 cases of typhoid fever had been reported in the United States, as compared with 3,390 for the same period last year.

The provisional mortality figures for the first six months of 1934 are slightly less favorable than for the same period last year. The provisional death rate for the first half of 1943 is 11.0 per 1,000 estimated population, or only 3.8 percent higher than the rate of 10.6 for the comparable period last year. Although higher than the rate for the first six months of last year, it is lower than that for any year prior to 1938.

The increase in mortality appears to be much more marked in large cities than in the country as a whole. According to provisional reports from 88 major cities, the number of deaths in the first half of 1943 was 10.8 percent higher than that reported for the same period of 1942. It is possible that some of this increase is due to the greater use of hospital facilities in the large cities in 1943 by residents of areas adjacent thereto. Also, there has probably been some in-migration to these cities, which would tend to increase the number of deaths without an actual corresponding increase in the death rate.

There are probably several causes contributory to the increased death rate this year as compared with that for last year. There are indications that, because of the increase in the virus pneumonias, which are not amenable to treatment by the sulfa drugs, the mortality from pneumonia has increased. The preliminary returns from mortality sampling indicate that while there has also been some slight excess mortality from some of the diseases of childhood and from meningococcus meningitis, the increased mortality from the cardiovascular-renal diseases, small in percentage change though comparatively large numerically, is chiefly responsible for keeping the general death rate somewhat high.

The home health front has been defended. Emergency conditions and the various restrictions which have been imposed upon the American people as the result of war have not as yet seriously affected the public health. However, this good record is no occasion to relax the safeguards. It is, rather, a challenge to all health workers to maintain it in the future. And to do so will undoubtedly require even greater effort in view of the possibilities of epidemics, effects of fatigue in industries running in high gear, malnutrition as the result of lack of the application of knowledge regarding adequate food substitutes, the introduction of tropical diseases by returning troops, the depletion of medical and nursing services for the civilian population, and numerous other factors in our social life which adversely affect the health of the people.

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

REPORTS FROM STATES FOR WEEK ENDED AUGUST 14, 1943

Summary

A total of 546 cases of poliomyelitis was reported for the current week, as compared with 450 for the preceding week and a 5-year (1938–42) median of 261. States reporting the largest numbers, aggregating 417 cases, or 76 percent of the total, are as follows (last week's figures in parentheses): California, 94 (111); Kansas, 89 (43); Illinois, 70 (34); Texas, 67 (62); Oklahoma, 40 (52); New York, 30 (18); Connecticut, 27 (24). Increases occurred in 19 other States, but no other State reported more than 13 cases. The cumulative total reported for the first 32 weeks of the year is 3,312, as compared with 1,322 for the same period last year and a 5-year median of 1,681. The peak week of incidence of poliomyelitis occurred by the second week of September in each of the past 8 years except in 1936, when it was not reached until the first week of October.

A total of 185 cases of meningococcus meningitis was reported, as compared with 201 last week and 33 for the 5-year median. The largest numbers reported were 21 in New York and 19 in California. No other State reported more than 12 cases. The cumulative total for the first 32 weeks of the year is 13,368, as compared with 2,354 for the same period last year and a 5-year median of 1,392. The lowest weekly median of the past 5 years was 25 cases, recorded for the week ended August 27, 1938, and the least number for any week of that period was 15 for the week ended September 2, 1939.

The incidence of influenza, measles, scarlet fever, and whooping cough is currently above the corresponding 5-year medians, while that of diphtheria, smallpox, and typhoid fever is below; but, of these diseases, the cumulative total for the first 32 weeks of the year for only one—measles—is above the comparable median.

Deaths recorded for the week in 86 large cities of the United States aggregated 7,063, as compared with 7,304 for the preceding week and a 3-year (1940–42) average of 6,450. The cumulative total for the first 32 weeks of the year is 268,368, as compared with 243,950 for the same period last year..

Telegraphic morbidity reports from State health officers for the week ended August 14, 1943, and comparison with corresponding week of 1942 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1938–42	Week ended		Median 1938–42	Week ended		Median 1938–42	Week ended		Median 1938–42
	Aug. 14, 1943	Aug. 15, 1942		Aug. 14, 1943	Aug. 15, 1942		Aug. 14, 1943	Aug. 15, 1942		Aug. 14, 1943	Aug. 15, 1942	
NEW ENGLAND												
Maine	1	0	0	-----	-----	-----	28	12	12	0	1	0
New Hampshire	0	0	0	-----	-----	-----	0	0	1	0	0	0
Vermont	0	0	0	-----	-----	-----	19	32	10	2	0	0
Massachusetts	3	3	3	-----	-----	-----	121	70	83	11	3	0
Rhode Island	0	0	0	-----	-----	-----	12	4	4	4	0	0
Connecticut	0	0	0	2	1	-----	26	9	9	5	1	1
MIDDLE ATLANTIC												
New York	2	7	9	-----	11	11	310	101	202	21	9	3
New Jersey	1	1	1	3	5	2	153	42	42	12	6	1
Pennsylvania	5	2	10	-----	-----	-----	47	32	118	12	2	2
EAST NORTH CENTRAL												
Ohio	5	0	3	2	4	4	87	32	32	6	1	1
Indiana	7	5	5	-----	4	2	23	6	6	9	0	0
Illinois	6	13	13	2	2	2	58	16	30	11	1	0
Michigan [3]	2	1	5	1	1	-----	96	48	88	3	2	0
Wisconsin	2	0	0	7	7	7	240	103	134	4	0	0
WEST NORTH CENTRAL												
Minnesota	0	0	1	1	-----	-----	39	9	11	2	0	0
Iowa	4	0	2	-----	-----	-----	5	11	21	1	0	0
Missouri	1	3	1	-----	1	1	16	3	3	5	0	0
North Dakota	0	0	3	-----	3	-----	23	6	5	0	0	0
South Dakota	2	1	1	-----	-----	-----	9	2	2	0	0	0
Nebraska	2	0	0	2	2	-----	3	16	1	0	0	0
Kansas	3	1	3	-----	-----	-----	10	4	7	0	0	0
SOUTH ATLANTIC												
Delaware	0	0	0	-----	-----	-----	2	0	0	2	0	0
Maryland [3]	1	2	3	1	-----	-----	30	5	6	2	1	1
District of Columbia	0	0	1	-----	-----	-----	7	1	3	3	0	0
Virginia	3	10	10	26	37	37	20	7	33	8	2	1
West Virginia	2	5	5	-----	2	4	6	1	3	0	0	0
North Carolina	9	10	15	-----	-----	-----	29	45	45	7	1	1
South Carolina	7	13	11	101	98	110	11	6	7	1	0	1
Georgia	7	9	15	24	21	5	10	5	6	2	1	0
Florida	2	2	2	5	1	1	1	8	4	10	0	0
EAST SOUTH CENTRAL												
Kentucky	1	3	3	-----	-----	1	4	0	4	0	0	1
Tennessee	5	1	4	5	4	6	27	9	9	0	0	2
Alabama	11	7	11	9	17	16	20	0	4	0	3	2
Mississippi [3]	3	5	5	-----	-----	-----	-----	0	-----	4	0	1
WEST SOUTH CENTRAL												
Arkansas	3	7	7	1	14	14	21	4	4	0	1	0
Louisiana	8	2	2	1	4	4	4	7	4	0	4	1
Oklahoma	1	3	3	2	6	10	10	2	2	4	0	0
Texas	22	21	21	201	74	96	50	41	41	4	1	2
MOUNTAIN												
Montana	2	2	0	-----	-----	-----	36	3	8	0	0	0
Idaho	0	0	0	-----	-----	-----	3	3	1	0	0	0
Wyoming	2	0	1	1	5	-----	5	7	5	1	1	0
Colorado	3	3	6	16	9	6	23	3	8	2	0	0
New Mexico	1	1	0	-----	-----	-----	0	4	5	1	0	0
Arizona	3	1	1	40	25	18	16	10	9	1	0	0
Utah [3]	0	0	0	-----	-----	-----	12	46	12	0	0	0
Nevada	0	0	-----	-----	-----	-----	13	2	-----	0	0	-----
PACIFIC												
Washington	10	1	1	-----	2	-----	21	80	12	3	1	0
Oregon	0	2	1	4	3	3	20	30	19	3	1	1
California	13	10	10	26	13	13	126	133	113	19	4	2
Total	165	157	176	483	366	366	1,852	1,020	1,371	185	47	33
32 weeks	7,053	7,241	8,688	81,161	80,391	151,299	535,508	465,780	465,780	13,368	2,354	1,392

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended August 14, 1943, and comparison with corresponding week of 1942 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever [3]		
	Week ended		Median 1938–42	Week ended		Median 1938–42	Week ended		Median 1938–42	Week ended		Median 1938–42
	Aug. 14, 1943	Aug. 15, 1942		Aug. 14, 1943	Aug. 15, 1942		Aug. 14, 1943	Aug. 15, 1942		Aug. 14, 1943	Aug. 15, 1942	
NEW ENGLAND												
Maine	0	4	0	2	2	2	0	0	0	0	0	1
New Hampshire	0	2	0	2	5	2	0	0	0	0	1	1
Vermont	0	2	1	6	3	1	0	0	0	0	1	1
Massachusetts	1	1	1	45	71	23	0	0	0	1	7	2
Rhode Island	8	0	0	0	1	1	0	0	0	0	0	0
Connecticut	27	1	1	6	4	4	0	0	0	3	1	1
MIDDLE ATLANTIC												
New York	30	11	11	48	40	61	0	0	0	8	17	17
New Jersey	5	23	4	11	25	18	0	0	0	8	3	4
Pennsylvania	3	1	1	32	32	42	0	0	0	10	9	15
EAST NORTH CENTRAL												
Ohio	1	3	9	49	12	50	0	0	0	10	6	10
Indiana	3	7	7	6	10	11	1	0	0	5	9	6
Illinois	70	27	8	33	28	52	2	0	1	4	6	16
Michigan [3]	4	8	10	18	29	46	0	0	0	4	2	6
Wisconsin	1	2	2	44	27	31	0	0	0	0	1	1
WEST NORTH CENTRAL												
Minnesota	5	7	7	13	21	13	1	0	0	0	0	1
Iowa	5	3	2	9	13	6	0	0	0	5	0	5
Missouri	11	4	1	9	23	13	0	1	1	7	6	14
North Dakota	2	1	1	3	3	3	0	0	0	0	0	0
South Dakota	0	0	0	10	3	5	0	0	1	0	0	0
Nebraska	5	0	0	3	0	5	0	0	1	0	0	1
Kansas	89	1	1	15	18	18	0	0	0	0	2	5
SOUTH ATLANTIC												
Delaware	0	0	0	0	1	0	0	0	0	0	0	0
Maryland [3]	0	2	1	10	6	9	0	0	0	3	2	11
District of Columbia	0	1	1	5	3	3	0	0	0	1	1	2
Virginia	3	3	3	13	11	11	0	0	0	7	9	9
West Virginia	2	4	1	22	14	12	0	0	0	5	5	12
North Carolina	4	5	5	27	24	24	0	0	0	3	8	12
South Carolina	0	2	2	6	4	1	0	0	0	4	4	10
Georgia	0	1	1	5	7	7	0	0	0	12	5	26
Florida	0	2	2	1	6	2	0	0	0	2	11	5
EAST SOUTH CENTRAL												
Kentucky	3	6	6	11	15	15	0	0	0	11	22	22
Tennessee	1	12	3	22	9	12	0	1	1	8	10	12
Alabama	1	2	2	4	8	13	0	0	0	4	9	13
Mississippi [3]	0	2	2	4	4	3	0	0	0	11	3	7
WEST SOUTH CENTRAL												
Arkansas	5	6	1	2	5	6	0	0	0	7	19	20
Louisiana	7	2	2	2	1	1	0	0	0	10	7	14
Oklahoma	40	1	1	5	6	6	0	0	0	10	2	15
Texas	67	2	2	22	22	12	1	0	0	17	20	49
MOUNTAIN												
Montana	0	1	1	3	5	5	1	0	0	3	0	1
Idaho	0	0	0	1	1	1	0	0	0	0	0	0
Wyoming	0	1	0	5	1	1	0	0	0	0	0	1
Colorado	7	1	1	19	7	8	0	0	0	1	1	2
New Mexico	5	0	0	1	1	1	1	3	0	3	2	2
Arizona	2	3	0	8	1	1	0	0	0	5	0	1
Utah [3]	9	0	0	14	1	2	0	0	0	0	0	1
Nevada	0	0	------	1	0	------	0	0	------	0	0	------
PACIFIC												
Washington	13	0	0	16	4	8	0	0	0	0	0	0
Oregon	13	0	0	8	5	6	0	0	0	5	1	3
California	94	6	7	62	36	36	0	0	1	0	6	6
Total	546	173	261	660	578	593	7	5	22	197	218	384
32 weeks	3,312	1,322	1,681	96,866	88,532	115,792	607	609	1,952	3,090	3,813	4,592

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended August 14, 1943 and comparison with corresponding week of 1942 and 5-year median—Con.

Division and State	Whooping cough			Week ended Aug. 14, 1943								
	Week ended		Median	Anthrax	Dysentery			Encephalitis, infectious	Leprosy	Rocky Mt. spotted fever	Tularemia	Typhus fever
	Aug. 14, 1943	Aug. 15, 1942	1938–42		Amebic	Bacillary	Unspecified					
NEW ENGLAND												
Maine	14	38	32	0	0	0	0	0	0	0	0	0
New Hampshire	0	3	0	0	0	0	0	0	0	0	0	0
Vermont	42	40	14	0	0	0	0	0	0	0	0	0
Massachusetts	75	165	147	0	0	1	0	1	0	0	0	0
Rhode Island	14	13	13	0	0	0	0	0	0	0	0	0
Connecticut	30	36	49	0	0	3	0	0	0	0	0	0
MIDDLE ATLANTIC												
New York	251	361	361	0	2	7	0	1	0	3	0	0
New Jersey	158	234	180	1	0	0	0	0	0	2	0	0
Pennsylvania	188	230	254	0	0	0	0	0	0	1	0	0
EAST NORTH CENTRAL												
Ohio	150	115	257	0	0	0	0	1	0	0	0	0
Indiana	83	51	21	0	0	0	0	0	0	0	0	0
Illinois	190	298	298	0	2	1	0	2	0	1	0	0
Michigan [3]	205	264	287	0	0	7	0	0	0	0	0	0
Wisconsin	236	220	220	0	0	0	0	0	0	0	0	0
WEST NORTH CENTRAL												
Minnesota	58	51	51	0	1	1	0	0	0	0	0	0
Iowa	20	55	42	0	1	0	0	0	0	0	0	0
Missouri	99	4	18	0	0	0	3	0	0	0	0	0
North Dakota	29	13	13	0	0	0	0	1	0	0	1	0
South Dakota	5	4	4	0	0	0	0	0	0	0	0	0
Nebraska	22	2	13	0	0	0	0	0	0	0	0	0
Kansas	58	23	46	0	0	0	0	1	0	0	0	0
SOUTH ATLANTIC												
Delaware	1	3	3	0	0	0	0	0	0	0	0	0
Maryland [2]	124	31	57	0	0	0	9	1	0	8	1	0
District of Columbia	27	12	12	0	0	0	0	0	0	0	0	0
Virginia	163	31	67	0	0	0	377	0	0	4	1	0
West Virginia	44	14	35	0	0	0	0	0	0	0	0	0
North Carolina	136	145	146	0	2	2	0	0	0	1	0	2
South Carolina	71	31	35	0	0	12	0	0	0	0	0	7
Georgia	8	7	20	0	0	13	3	0	0	0	1	35
Florida	27	6	6	0	0	0	0	0	0	0	0	7
EAST SOUTH CENTRAL												
Kentucky	38	29	58	0	2	9	0	0	0	1	0	0
Tennessee	64	75	44	0	0	0	5	0	0	4	0	1
Alabama	26	22	21	0	0	0	0	0	0	0	1	7
Mississippi [2]	-------	-------	-------	0	0	0	0	0	0	0	0	9
WEST SOUTH CENTRAL												
Arkansas	21	14	14	0	0	8	0	0	0	0	0	0
Louisiana	13	0	27	0	0	16	0	0	0	0	0	7
Oklahoma	16	15	15	0	0	0	0	0	0	4	0	1
Texas	191	111	132	0	29	318	0	1	0	0	1	55
MOUNTAIN												
Montana	17	21	21	0	0	0	0	0	0	2	5	0
Idaho	0	2	3	0	0	0	0	0	0	0	0	0
Wyoming	1	4	4	0	0	0	0	0	0	0	3	0
Colorado	40	20	22	0	0	16	0	1	0	1	0	0
New Mexico	10	4	8	0	0	5	1	0	0	0	0	0
Arizona	13	11	11	0	0	0	18	0	0	0	0	0
Utah [2]	89	22	37	0	0	0	0	0	0	0	1	0
Nevada	2	3	-------	0	0	0	0	0	0	0	0	0
PACIFIC												
Washington	80	31	40	0	0	0	0	0	0	0	0	0
Oregon	43	32	26	0	0	0	0	0	0	0	0	0
California	155	123	167	0	2	9	0	12	0	0	0	0
Total	3,347	3,039	3,302	1	41	428	416	22	0	32	15	131
32 weeks	128,864	119,319	137,946	40	1,310	9,682	4,288	398	18	332	575	2,054
32 weeks, 1942	-------	-------	-------	56	682	5,320	4,023	299	34	370	637	1,670

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Including paratyphoid fever cases reported separately as follows: Massachusetts, 1; Connecticut, 2; New Jersey, 3; Illinois, 1; Michigan, 1; South Carolina, 3; Georgia, 1: Louisiana, 2.

WEEKLY REPORTS FROM CITIES

City reports for week ended July 31, 1943

This table lists the reports from 87 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland	0	0	------	0	2	3	2	0	0	0	1	2
New Hampshire:												
Concord	0	0	------	0	0	0	0	0	0	0	0	0
Vermont:												
Barre	0	0	------	0	0	0	0	0	0	0	0	0
Massachusetts:												
Boston	0	1	------	0	24	10	7	0	22	0	0	22
Fall River	0	0	------	0	2	0	0	0	1	0	0	0
Springfield	0	0	------	0	2	0	0	0	3	0	0	1
Worcester	0	0	------	0	1	0	9	0	2	0	0	0
Rhode Island:												
Providence	0	0	------	0	52	2	1	1	0	0	0	29
Connecticut:												
Bridgeport	0	0	------	0	0	0	0	0	0	0	0	0
Hartford	0	0	------	0	0	0	1	0	1	0	0	2
New Haven	0	0	------	0	9	0	0	5	1	0	0	6
MIDDLE ATLANTIC												
New York:												
Buffalo	0	0	------	0	1	4	1	0	2	0	0	14
New York	3	0	------	0	223	23	25	5	33	0	5	78
Rochester	0	0	------	0	6	2	4	0	1	0	0	5
Syracuse	0	0	------	0	5	1	0	1	1	0	0	22
New Jersey:												
Camden	1	0	------	0	0	0	0	0	0	0	0	5
Newark	0	0	3	0	32	0	6	1	1	0	2	22
Trenton	0	0	------	0	0	0	0	0	0	0	0	1
Pennsylvania:												
Philadelphia	0	0	2	1	9	6	17	0	7	0	2	67
Pittsburgh	4	0	------	0	6	4	7	0	2	0	1	47
Reading	0	0	------	0	0	0	0	0	0	0	0	8
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	0	0	------	1	5	0	0	2	6	0	0	2
Cleveland	0	0	------	0	11	2	2	0	8	0	0	60
Columbus	0	0	------	0	8	0	2	0	1	0	0	11
Indiana:												
Fort Wayne	1	0	------	0	2	0	2	0	0	0	0	0
Indianapolis	0	0	------	0	5	0	6	0	4	0	1	23
South Bend	0	0	------	0	4	0	0	0	0	0	0	1
Terre Haute	0	0	------	0	0	1	3	0	0	0	1	0
Illinois:												
Chicago	7	1	------	0	64	5	17	5	6	0	1	100
Springfield	0	0	------	0	0	0	3	0	0	0	0	0
Michigan:												
Detroit	0	0	------	0	54	3	10	1	5	0	1	63
Flint	0	0	------	0	2	0	0	0	0	0	0	8
Grand Rapids	0	0	------	0	30	0	2	0	0	0	0	12
Wisconsin:												
Kenosha	0	0	------	0	2	0	0	0	0	0	0	6
Milwaukee	0	0	------	0	35	0	2	0	9	0	0	45
Racine	0	0	------	0	0	0	0	0	1	0	0	2
Superior	0	0	------	0	21	0	0	0	0	0	0	0
WEST NORTH CENTRAL												
Minnesota:												
Duluth	0	0	------	0	31	0	2	0	1	0	0	7
Minneapolis	0	0	------	0	3	1	2	2	5	0	0	7
St. Paul	0	0	------	0	11	0	2	0	1	0	0	34
Missouri:												
Kansas City	0	0	------	0	5	1	4	3	3	0	1	7
St. Louis	0	0	------	0	6	4	15	1	3	0	3	31

City reports for week ended July 31, 1943—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
WEST NORTH CENTRAL—Continued.												
North Dakota:												
Fargo	0	0	------	0	14	0	2	0	0	0	0	9
Nebraska:												
Omaha	0	0	------	0	0	0	5	0	1	0	0	0
Kansas:												
Topeka	0	0	------	0	4	0	0	1	0	0	0	3
Wichita	0	0	------	0	1	0	4	8	1	0	0	16
SOUTH ATLANTIC												
Delaware:												
Wilmington	1	0	------	0	1	1	3	0	1	0	0	0
Maryland:												
Baltimore	0	0	1	1	32	4	6	0	1	0	1	82
Cumberland	0	0	------	0	0	0	0	0	0	0	0	0
Frederick	0	0	------	0	0	0	0	0	0	0	0	0
District of Columbia:												
Washington	1	0	1	1	20	4	9	0	3	0	1	24
Virginia:												
Lynchburg	0	0	------	0	3	0	0	0	0	0	0	10
Richmond	0	0	------	0	3	1	2	0	1	0	1	4
Roanoke	0	0	------	0	0	0	0	0	0	0	0	0
West Virginia:												
Charleston	0	0	------	0	0	0	0	0	0	0	0	2
Wheeling	0	0	------	0	0	1	0	0	0	0	0	14
North Carolina:												
Wilmington	0	0	------	0	0	0	0	0	0	0	0	4
Winston-Salem	0	0	------	0	0	0	0	0	0	0	0	26
South Carolina:												
Charleston	0	0	------	0	0	0	3	0	0	0	0	0
Georgia:												
Atlanta	0	0	------	0	0	0	2	0	1	0	0	1
Brunswick	0	0	------	0	0	1	0	0	0	0	1	0
Savannah	0	0	------	0	0	0	0	0	1	0	0	1
Florida:												
Tampa	0	0	------	0	0	0	2	0	0	0	0	0
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	0	0	------	0	0	0	5	0	0	0	0	11
Nashville	0	0	------	0	0	0	4	0	0	0	0	13
Alabama:												
Birmingham	0	0	------	0	3	0	3	0	4	0	0	3
Mobile	0	0	------	0	0	1	5	0	0	0	0	0
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	0	0	------	0	1	0	1	0	0	0	0	1
Louisiana:												
New Orleans	2	0	6	0	1	1	15	0	0	0	3	3
Shreveport	0	0	------	0	0	0	1	1	0	0	0	0
Texas:												
Dallas	0	0	------	0	2	0	1	8	3	0	2	9
Galveston	0	0	------	0	0	0	2	0	0	0	0	0
Houston	0	0	------	0	1	1	9	8	0	0	2	7
San Antonio	0	0	------	1	0	0	4	0	0	0	1	0
MOUNTAIN												
Montana:												
Billings	0	0	------	0	2	0	1	0	0	0	1	0
Helena	0	0	------	0	0	0	0	0	0	0	0	1
Missoula	0	0	------	0	0	0	0	0	1	0	0	0
Idaho:												
Boise	0	0	------	0	0	0	0	0	2	0	0	0
Colorado:												
Denver	1	0	2	1	0	0	4	0	4	0	2	19
Pueblo	0	0	------	0	0	0	0	1	0	0	0	12
Utah:												
Salt Lake City	0	0	------	0	9	1	0	0	1	0	0	46

City reports for week ended July 31, 1942—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
PACIFIC												
Washington:												
Seattle	2	0	------	0	6	1	0	0	1	0	0	13
Spokane	0	0	------	0	2	0	2	0	1	0	0	10
Tacoma	0	0	------	0	2	1	0	0	0	0	0	6
California:												
Los Angeles	1	0	6	1	33	1	5	15	10	0	2	40
Sacramento	0	0	------	0	0	0	3	2	1	0	0	3
San Francisco	0	0	3	0	14	0	5	1	8	0	0	19
Total	24	2	24	7	827	91	262	72	176	0	36	1,162
Corresponding week, 1942	34	1	33	2	494	27	231	38	185	1	22	410
Average, 1938–42	55	------	29	[1] 7	[2] 580	------	[1] 233	------	239	2	44	1,044

Dysentery, amebic.—Cases: New York, 1; Richmond, 1; Los Angeles, 2.
Dysentery, bacillary.—Cases: Buffalo, 4; New York, 3; Detroit, 2; Baltimore, 1; Charleston, S. C., 18; Nashville, 3; Los Angeles, 8.
Dysentery, unspecified.—Cases: Baltimore, 1; San Antonio, 11.
Typhus fever.—Cases: New York, 2; Atlanta, 4; Brunswick, 1; Savannah, 6; Tampa, 3; Mobile, 1; Dallas, 4; Galveston, 1; Houston, 5; Los Angeles, 1.

[1] 3-year average, 1940–42.
[2] 5-year median.

Rates (annual basis) per 100,000 population, by geographic groups, for the 87 cities in the preceding table (estimated population, 1942, 34,625,300)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza		Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
			Case rates	Death rates								
NEW ENGLAND	0.0	2.5	0.0	0.0	229	37.3	49.7	14.9	74.5	0.0	2.5	154
MIDDLE ATLANTIC	3.6	0.0	2.2	0.4	126	17.8	26.8	3.1	21.0	0.0	4.5	120
EAST NORTH CENTRAL	4.7	0.6	0.0	0.6	142	6.4	28.6	4.7	23.4	0.0	2.3	194
WEST NORTH CENTRAL	0.0	0.0	0.0	0.0	150	12.0	72.2	30.1	30.1	0.0	8.0	229
SOUTH ATLANTIC	3.4	0.0	3.4	3.4	101	20.5	46.2	0.0	13.7	0.0	6.8	288
EAST SOUTH CENTRAL	0.0	0.0	0.0	0.0	18	5.9	101.0	0.0	23.8	0.0	0.0	160
WEST SOUTH CENTRAL	5.9	0.0	17.6	2.9	15	5.9	96.8	49.9	8.8	0.0	23.5	59
MOUNTAIN	8.4	0.0	16.8	8.4	92	8.4	42.0	8.4	67.3	0.0	25.2	656
PACIFIC	5.2	0.0	15.7	1.7	100	5.2	26.2	31.5	36.7	0.0	3.5	159
TOTAL	3.6	0.3	3.6	1.1	125	13.7	39.5	10.8	26.5	0.0	5.4	175

PLAGUE INFECTION IN COLORADO AND WYOMING

Plague infection has been reported proved in fleas and ticks from ground squirrels, *C. richardsoni elegans*, and prairie dogs, *Cynomys ludovicianus*, collected in Colorado and Wyoming, as follows:

COLORADO

Las Animas County.—July 23, in a pool of 845 fleas and 4 ticks from 127 prairie dogs taken at a ranch 30 miles northwest of Springfield.

WYOMING

Carbon County.—July 21, in a pool of 61 fleas from 35 ground squirrels taken at Separation Flats, 20 miles north of Rawlins.

TERRITORIES AND POSSESSIONS

Hawaii Territory

Honolulu—Dengue fever.—An outbreak of dengue fever has been officially reported in Honolulu, T. H. About 40 cases, occurring in widely separated areas of the city, had been reported up to August 11. The probable source of the infection was reported to be airplane crews from the South Pacific. Intensive mosquito eradication measures were stated to be under way.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended July 17, 1943.—During the week ended July 17, 1943, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		26		33	89	25	41	12	20	246
Diphtheria	2	4		29		3	2			40
Dysentery (amebic)					2					2
Dysentery (bacillary)				4						4
German measles		1		1	32	6	6	7	15	68
Influenza					32	1			17	50
Measles		100	3	116	432	42	33	199	76	1,001
Meningitis, meningococcus				5	2	1				8
Mumps		24		13	98	34	18	27	20	234
Poliomyelitis					1					1
Scarlet fever		9	4	22	49	14	9	25	5	137
Smallpox							2			2
Tuberculosis (all forms)	2	2	3	91	40	21		10	95	264
Typhoid and paratyphoid fever			2	20	1	2				25
Undulant fever				6				1		7
Whooping cough		6		88	102	23	14	30	35	298

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Except in cases of unusual prevalence, only those places are included which had not previously reported any of the above-mentioned diseases, except yellow fever, during the current year. All reports of yellow fever are published currently.

A cumulative table showing the reported prevalence of these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday in each month.

(Few reports are available from the invaded countries of Europe and other nations in war zones.)

Plague

Morocco (French).—For the month of June 1943, 27 cases of plague were reported in French Morocco.

Smallpox

Algeria.—For the period July 1–10, 1943, 38 cases of smallpox were reported in Algeria.

Morocco (French).—For the month of June 1943, 28 cases of smallpox were reported in French Morocco.

Spain.—During the 2 weeks ended June 12, 1943, 29 cases of smallpox were reported in Spain.

Typhus Fever

Algeria.—For the period July 1–10, 1943, 141 cases of typhus fever were reported in Algeria.

Bulgaria.—For the period March 11 to July 14, 1943, 1,015 cases of typhus fever were reported in Bulgaria.

Morocco (French).—For the month of June 1943, 1,225 cases of typhus fever were reported in French Morocco.

Rumania.—For the period July 24–31, 1943, 82 cases of typhus fever were reported in Rumania.

Slovakia.—For the period July 17–22, 1943, 11 cases of typhus fever were reported in Slovakia.

Spain.—For the 2 weeks ended July 12, 1943, 57 cases of typhus fever were reported in Spain.

* * *

DEATHS DURING WEEK ENDED AUGUST 7, 1943

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Aug. 7, 1943	Corresponding week, 1942
Data from 89 large cities of the United States:		
Total deaths	8,149	7,330
Average for 3 prior years	7,404	
Total deaths, first 31 weeks of year	291,784	265,640
Deaths under 1 year of age	617	559
Average for 3 prior years	533	
Deaths under 1 year of age, first 31 weeks of year	20,547	17,512
Data from industrial insurance companies:		
Policies in force	65,698,468	64,941,222
Number of death claims	10,889	11,150
Death claims per 1,000 policies in force, annual rate	8.6	9.0
Death claims per 1,000 policies, first 31 weeks of year, annual rate	10.1	9.5