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POLIOMYELITIS IN THE UNITED STATES IN 1942, AND A SUMMARY OF ITS PREVALENCE FROM 1933 TO 1942, INCLUSIVE

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As compared with recent years, the incidence of poliomyelitis in the United States during the year 1942 was relatively low, 4,167 cases¹ being reported. In the past 10 years, 1933 to 1942 inclusive, fewer cases were reported only in 1938. The States reporting the largest number of cases, as shown in table 1, were Illinois with 493, New York with 297, California with 353, New Jersey with 254, and Texas with 246. However, the States with the highest rates of incidence per 100,000 population were Nebraska (10.7), Vermont (9.1), Arkansas (7.8), and Arizona (6.8).

The disease did not occur in widespread epidemic form in any part of the country in 1942 but rather in small localized outbreaks. The accompanying map indicates the various areas which were involved. Almost simultaneously cases began to be reported in increasing numbers in Kentucky, Tennessee, and Arkansas late in June and the peak in number of cases was reached in August. In the outbreak occurring in the group of counties in south central Kentucky and north central Tennessee there were two counties which had reported relatively high rates in 1941. Warren County in Kentucky had a rate of 27 in 1941 (10 cases) and a rate of 43 in 1942 (16 cases). Sumner County in Tennessee reported 22 cases in 1941 and 20 cases in 1942, or case rates of 66 and 60, respectively. Simpson County in Kentucky, another county in this group, had a rate of 198 per 100,000 population in 1942. Only 1 case had been reported from this county in the previous 10 years, that being in 1935. Five of the seven counties in Arkansas having relatively high incidence rates in 1942 were among those having high rates in 1937.

The incidence of poliomyelitis was relatively high and more widely distributed in the western parts of Kansas and Nebraska but in these States the increase in number of cases reported did not begin until late in August. The peak in number of cases was reached in October. Several counties involved in the 1942 outbreak in western Kansas

¹ All data for 1942 in this report are provisional.

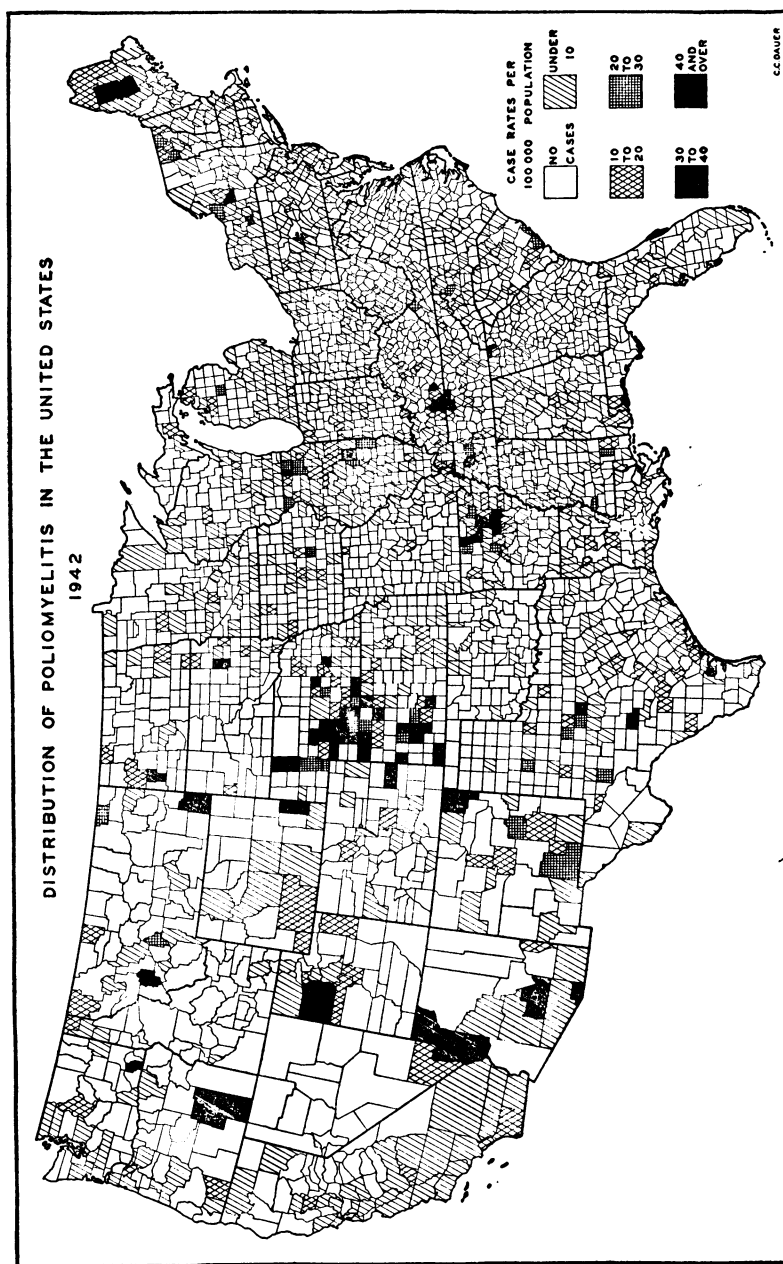


FIGURE 1.

had high rates of incidence in previous years, some in 1937 and some in 1940. Morton County reported an extremely high rate, 826 per 100,000 population in 1942 (19 cases) and had reported only 1 case in 1930, 1 in 1935 and 1 in 1940. Rawlins County had a rate of 91 (6 cases) in 1942 and had reported no cases since 1930 when 6 cases were also reported. The populations of these two counties in 1940 were 2,186 and 6,618, respectively. Cheyenne County, another with a small population (6,221 in 1940), reported 3 cases in 1930, 4 in 1940, and 6 in 1942, or rates of 43, 64, and 96, respectively.

The occurrence of the disease in Nebraska is also worth noting. Five counties which had not reported any cases from 1933 to 1941, inclusive, reported 1, 1, 2, 2, and 4 cases, respectively. (Case rates were 10.2, 27.7, 25.8, 31.2, and 45.6 per 100,000 population.) This does not indicate an unusually high incidence especially since these counties were located in an area where a general outbreak was occurring. Lincoln County with a rate of 141.7 had the highest incidence for any county in Nebraska in 1942. During the 10-year period from 1933 to 1942, 2 cases were reported in this county in 1934, 1 in 1937, 6 in 1939, 10 in 1940, and 36 in 1942.

Small outbreaks also occurred in Illinois, New York, and New Jersey. Vermont had a relatively high rate of incidence in 1942 as compared with most other States, but none of the counties had excessively high rates. About two-thirds of the cases occurred in a few counties in the northern part of the State. During the 10-year period from 1933 to 1942 this same section of Vermont reported higher rates on the average than the southern half. Caverly's (1) reports of the disease from 1910 to 1917, inclusive, also indicated a greater incidence in the northern group of counties.

In Texas the incidence of poliomyelitis was relatively low throughout the spring and summer but late in October increasing numbers of cases were reported and this continued until late in December. One third of all the cases reported in the State in 1942 was reported from Bexar and Nueces Counties, in which are located the cities of San Antonio and Corpus Christi, respectively. In California the increase in number of cases reported began in September and reached a peak in November. Sixty percent of all the cases reported in California in 1942 occurred in Los Angeles County. In States as far south as Texas it is unusual for the incidence of poliomyelitis to be high late in the fall unless an epidemic has occurred during the summer; many of the outbreaks in Southern California in previous years have begun in late spring or early summer. In certain areas of the United States in some years the occurrence of cases late in the fall without an epidemic immediately preceding has appeared to be a forerunner of a more widespread outbreak in the same general area during the following summer.

POLIOMYELITIS CASES AND DEATHS FROM 1933 TO 1942, INCLUSIVE

This report on the prevalence of poliomyelitis by counties in the United States is one of a series (2) begun in 1933. Data are therefore now available for 10 consecutive years. During this period 69,451 cases (see table 1) were reported in the country as a whole and approximately 7,800 deaths were registered. California with 7,595 cases accounted for slightly over 10 percent of all the cases reported and New York State with 7,094 cases accounted for another 10 percent. The largest number of cases reported in any one of the 10 years was 10,839 in 1935 and the smallest number was 1,705 in 1938. The largest number of deaths registered in any one of the 9 years from 1933 to 1941 was 1,004 in 1940, and the smallest number was 478 in 1938. Although a larger number of cases was reported in 1935 with fewer deaths as compared with 1940, the apparent lower fatality rate of 1935 might be explained by the fact that the disease occurred in epidemic form in 1935 in a region in which are located several States which constantly report a relatively large ratio of cases to deaths. Several of these same States also reported a fairly large proportion of nonparalytic cases.

Completeness of reporting.—The completeness of reporting of poliomyelitis cases during the 10-year period from 1933 to 1942 showed a considerable amount of variation among the different States. Various reports have indicated a case fatality rate of about 5 percent during epidemic periods while during periods of low prevalence a fatality rate of 15 to 20 percent is not uncommonly reported. In this discussion the ratio of cases to deaths will be used to indicate the relative completeness of reporting rather than case fatality rates since the latter give an erroneous impression in many instances.

If 5 percent represents a fairly reasonable estimate of the actual fatality rate then there should be about 20 clinical cases reported for each death. During the 9-year period from 1933 to 1941 the highest average ratio of cases to deaths was 17.2 which was recorded in Connecticut. During the same period Massachusetts reported 16.5 cases per death and California reported 15.6. As shown in table 1, Rhode Island, Michigan, Maryland, New York, Montana, and Utah reported more than 10 cases per death which was above the average for the country as a whole. Texas had the lowest ratio with 2.6 cases per death, while Arkansas reported 3.2, and Oklahoma 4.3 cases per death. In many States, especially those with a low general average of cases reported per death, there was a very decided increase in the ratio during years of high prevalence.

One factor which may have influenced the ratio of reported cases to deaths was the proportion of nonparalytic cases included in the totals reported. Data for the years 1936 to 1940, inclusive, which were available for a few States, show that 34 percent of all cases

TABLE 1.—*Poliomyelitis morbidity and mortality data by States, 1933-42*

Division and State	1942		1933 to 1941			Case rates 1933-42		
	Cases re-ported	Case rate	Cases re-ported	Deaths registered	Ratio cases to deaths	Mean	Median	Maximum
NEW ENGLAND:								
Maine.....	43	5.1	502	52	9.6	6.4	4.9	19.0
New Hampshire.....	10	2.3	159	26	6.1	3.0	1.8	9.5
Vermont.....	33	9.1	252	28	9.0	6.6	4.9	17.7
Massachusetts.....	38	.9	2,540	154	16.5	5.9	1.7	32.0
Rhode Island.....	5	.7	472	32	14.8	6.7	1.1	51.5
Connecticut.....	49	2.8	793	46	17.2	5.0	2.2	23.4
MIDDLE ATLANTIC:								
New York.....	297	2.1	6,797	537	12.6	5.5	2.8	22.2
New Jersey.....	254	6.1	1,673	171	9.8	4.5	4.5	11.8
Pennsylvania.....	116	1.2	2,645	339	7.8	2.8	1.9	7.4
EAST NORTH CENTRAL:								
Ohio.....	157	2.3	2,944	370	7.9	4.6	4.7	9.5
Indiana.....	99	2.9	1,241	194	6.4	3.9	1.7	19.9
Illinois.....	493	6.2	3,391	358	9.7	5.2	4.8	9.9
Michigan.....	163	3.1	3,971	277	14.3	8.4	5.0	23.0
Wisconsin.....	46	1.4	1,352	151	8.9	4.8	2.6	15.7
WEST NORTH CENTRAL:								
Minnesota.....	82	2.9	2,133	252	8.5	7.9	6.2	20.5
Iowa.....	73	2.9	1,676	190	8.8	6.9	2.9	36.9
Missouri.....	87	2.3	1,036	226	4.6	2.9	1.2	9.9
North Dakota.....	18	2.8	218	23	9.5	3.1	2.2	11.8
South Dakota.....	14	2.2	320	44	7.3	4.8	4.1	12.7
Nebraska.....	141	10.7	570	127	4.5	5.1	1.8	16.0
Kansas.....	111	6.1	1,153	134	8.6	6.9	3.6	30.1
SOUTH ATLANTIC:								
Delaware.....	17	6.3	63	10	6.3	2.2	1.6	6.4
Maryland.....	15	.8	596	44	13.5	3.5	1.9	13.1
District of Columbia.....	5	.6	275	37	7.4	4.4	2.6	14.3
Virginia.....	48	1.8	1,448	157	9.2	5.5	2.1	25.7
West Virginia.....	50	2.6	1,142	192	5.9	6.3	3.4	34.8
North Carolina.....	80	2.2	1,316	174	7.6	4.2	2.2	19.8
South Carolina.....	67	3.5	849	143	5.9	4.7	1.7	23.8
Georgia.....	42	1.8	1,316	173	7.6	4.1	1.6	23.5
Florida.....	43	2.2	522	92	5.7	3.1	1.8	14.4
EAST SOUTH CENTRAL:								
Kentucky.....	137	4.8	1,364	309	4.4	5.2	4.6	11.5
Tennessee.....	153	5.3	1,439	258	5.6	5.5	3.7	18.4
Alabama.....	74	2.6	1,683	210	8.0	6.2	2.4	30.5
Mississippi.....	58	2.7	844	186	4.5	5.0	2.4	21.0
WEST SOUTH CENTRAL:								
Arkansas.....	152	7.8	630	195	3.2	3.7	2.0	16.2
Louisiana.....	57	2.4	600	113	5.3	2.9	2.2	6.2
Oklahoma.....	17	.7	958	224	4.3	3.6	1.6	18.1
Texas.....	246	3.8	1,594	597	2.6	3.0	2.2	10.7
MOUNTAIN:								
Montana.....	15	2.7	543	48	11.3	10.3	2.9	60.3
Idaho.....	6	1.1	331	43	7.7	7.0	3.1	33.0
Wyoming.....	15	6.0	135	25	5.4	6.1	4.1	16.7
Colorado.....	38	3.3	519	106	4.9	5.4	2.9	19.4
New Mexico.....	27	5.1	246	41	6.0	6.2	4.2	26.1
Arizona.....	34	6.8	358	52	6.9	9.1	6.0	32.0
Utah.....	28	5.0	300	24	12.5	6.0	4.6	19.0
Nevada.....	3	2.7	34	5	6.8	3.3	2.0	16.3
PACIFIC:								
Washington.....	31	1.8	1,611	171	9.4	9.7	4.4	45.8
Oregon.....	27	2.5	488	70	6.9	4.8	4.9	8.1
California.....	353	5.1	7,242	465	15.6	12.5	9.1	56.6
UNITED STATES	4,167	3.2	65,284	7,357	8.9	5.3	5.7	8.6

reported in Massachusetts were nonparalytic, while Connecticut and California reported 23 and 22 percent nonparalytic cases, respectively. Each of these States, as stated above, had reported a high ratio of cases to deaths. On the other hand, in Tennessee where the ratio was only 5.5 cases per death for the period from 1933 to 1941, inclusive, only 4.4 percent of all the cases were recorded as nonparalytic. In 1936, which was a year of high prevalence in Tennessee, approximately

the same proportion (4.0 percent) were recorded as nonparalytic but the ratio of cases to deaths was 8.5; in 1941 the ratio was 11.7. Alabama and Mississippi reported all cases as paralytic in 1936 and Arkansas did likewise in 1937. These three States reported an average of 8.0, 4.5, and 3.2 cases per death, respectively, from 1933 to 1941, inclusive. In the outbreaks of 1936 and 1941 in Alabama the ratio of cases to deaths rose to 9.7 and 13.4, respectively, for the 2 years. However, the differences in ratios in the two groups of States, i. e., Massachusetts, Connecticut, and California as compared with Alabama, Mississippi, Tennessee, and Arkansas, are not entirely explained by differences in the proportion of nonparalytic cases included in the totals reported. There still remains a significant difference in ratios which probably is due to an actual difference in completeness of reporting.

It should also be noted that during years of high prevalence of poliomyelitis, the States which generally report a large proportion of nonparalytic cases usually report a smaller proportion of such cases than in years of low prevalence of the disease. This may be due to more frequent use of lumbar puncture and other diagnostic procedures during epidemics which might tend to eliminate a greater percentage of questionable cases.

Periodicity of poliomyelitis outbreaks.—During the 10-year period from 1933 to 1942 there was no evidence of cyclic occurrence or any regularity in periods of high and low prevalence. This was true for the country as a whole, in individual States, and in groups of counties. The interval between fairly widespread outbreaks in the country as a whole since 1916 has varied from 1 to 5 years. The interval between outbreaks was as short as 1 year in some States and as long as 8 years in others during the period from 1933 to 1942, inclusive. Outbreaks occurred in Michigan in 1939 and 1940 but different sections of the State were involved in each outbreak. On the other hand, in Alabama where epidemics occurred in 1936 and 1941 the northwestern part of the State was involved in each instance. The outbreak in 1941 involved a larger number of counties, some of which had rather low rates of incidence in 1936. About 3 percent of the counties in the United States had high rates of incidence during 2 or more of the 10 years from 1933 to 1942, inclusive. In this small group, except for the few counties which had high rates for 2 consecutive years, in which case it is probable that the same outbreak extended over from one year to the next, the most common interval between years of high prevalence was between 3 and 5 years.

Intensity of outbreaks of poliomyelitis.—The intensity of outbreaks of poliomyelitis showed wide variations from year to year and also in different parts of the country. The States which showed excessively high rates of incidence (30 or more cases per 100,000 population) in the

1934 outbreak as determined by reported cases were Montana with a rate of 60.3, Idaho with 33.0, Arizona with 32.0, Washington with 45.8, and California with 56.6. In 1935 Massachusetts and Rhode Island had incidence rates of 32.0 and 51.5, respectively. Iowa reported 36.9, Kansas 30.1, and West Virginia 34.8 cases per 100,000 population in 1940. Alabama had a rate of 30.5 in 1941. These data indicate that epidemics of considerable intensity may occur in States with a large proportion of urban population as well as those which are predominately rural, and that in general no section of the country has been free of severe outbreaks.

Slightly over 900, or about 30 percent, of the counties in the United States had incidence rates of 30 or more per 100,000 population during one or more of the 10 years from 1933 to 1942, inclusive. Rates of 100 or more were not an unusual occurrence; the counties in which such rates occurred were located in all sections of the country. An incidence in excess of 300 cases per 100,000 population was reported in 9 counties, the highest recorded being a rate of 1,145 in Luce County, Mich., in 1940. This would mean an attack rate of over 1 percent for the entire county.

On the other hand, certain States or sections of States had relatively low rates of incidence in each of the 10 years from 1933 to 1942. For instance, in most of New Hampshire and in the western part of Pennsylvania the incidence rates based on reported cases were relatively low even in years when severe outbreaks were occurring in nearby areas. Similar conditions were to be found in parts of Missouri, North Dakota, Maryland, Florida, Louisiana, Texas, and Nevada.

Many counties (approximately 8 percent of all counties in the United States) reported no cases of poliomyelitis during the 10-year period. The majority of these have small populations and are located for the most part in the midwest and western sections of the country. In some counties when the disease had not been reported for periods of 5 to 9 years only sporadic cases would be reported while in others the disease appeared as an explosive outbreak.

Between the two extremes of an occasional or no cases reported and definite outbreaks of the disease there were many instances of single or groups of counties which reported cases in small numbers during 5 or more of the 10 years. Such counties for the most part are located in the more densely populated areas of the country.

The question may be raised whether or not certain sections of some States actually have more poliomyelitis than other areas in the same State or in adjoining States. For instance, Vermont has reported more cases than New Hampshire. The former reported 252 cases with 28 deaths from 1933 to 1941, inclusive, while the latter reported 159 cases with 26 deaths. The ratio of cases to deaths was 9.0 and

6.1, respectively. If it can be assumed that the disease is equally severe in both States and that the ratio of cases to deaths is more nearly correct in Vermont, then New Hampshire should have reported 234 cases instead of 159. On this assumption the incidence of the disease actually would be about the same in the two States. As for certain groups of counties having more poliomyelitis than others, as in northern and southern Vermont, no definite conclusions seem warranted without additional data collected over a period longer than 10 years, and for a number of groups of counties.

Age distribution of poliomyelitis cases.—The age distribution of poliomyelitis, like that of certain other acute infectious diseases, has been reported to have undergone some change since the disease first began to be observed and reported in this country. As a basis for comparison data from Caverly's (1) reports of the disease in Vermont, Hill's (3) report of an epidemiological study of poliomyelitis in Minnesota, Frost's (4) report of epidemics in Iowa, Cincinnati, and Buffalo, and Lavinder, Freeman, and Frost's (5) report of the 1916 epidemic have been assembled in table 2. These data give a fairly good idea of the age distribution of poliomyelitis cases 25 years ago.

TABLE 2.—*Age distribution of reported cases of poliomyelitis in certain States and cities, 1909–17*

	Number of cases reported by age groups (years)						Percentage distribution of cases by age groups (years)			
	Under 5	5 to 9	10 to 14	15 to 19	20 and over	Age not known	Under 5	5 to 9	10 to 19	20 and over
Vermont, 1910–17.....	317	195	157		73	-----	42.7	26.2	21.2	9.8
Minnesota, 1909.....	157	88	34	22	24	-----	47.1	26.4	16.8	7.2
Iowa, ¹ 1910.....	151	97	40	26	32	7	43.6	28.0	19.1	9.2
Buffalo, 1912.....	206	52	7	7	2	7	75.3	18.9	5.2	.7
Cincinnati, ² 1911.....	124	20	4	2			82.6	13.3	4.0	-----
Massachusetts, 1916.....	1,247	363	71	46	87	22	68.7	20.0	6.4	4.8
Rhode Island, 1916.....	132	43	15	6	1	25	66.8	21.8	10.6	.6
Connecticut, 1916.....	497	179	64	27	34	55	62.0	22.3	11.9	4.2
New Jersey, 1916.....	1,912	577	129	54	79	23	69.5	21.3	6.5	2.8
New York City, 1916.....	7,231	1,483	225	78	114	-----	79.2	16.2	3.3	1.2
Northeastern United States, 1916:										
Metropolitan districts.....	1,657	377	81	37	60	41	74.9	17.0	5.4	2.7
Cities over 100,000.....	397	85	14	14	15	22	75.6	16.2	5.4	2.8
Cities 50,000 to 100,000.....	146	35	4	4	6	1	74.8	17.9	4.2	3.1
Cities 25,000 to 50,000.....	165	67	7	6	14	6	63.7	25.9	5.0	5.4
Cities 10,000 to 25,000.....	398	130	28	10	14	8	68.6	22.4	6.5	2.5
Cities under 10,000 and rural.....	1,025	468	145	62	90	47	57.2	26.1	11.6	5.1

¹ Mostly rural cases. Total number of cases in Iowa in 1910 reported to be 654.

² Includes cases reported in the vicinity of Cincinnati.

In the epidemic of poliomyelitis in Vermont in 1894, which was studied by Caverly, there were 120 cases reported, 75 percent of which were under 5 years of age, 12.5 percent were 6 to 14 years old, and the remainder, 12.5 percent, were 15 years of age and older. The proportion of cases under 5 years of age in Vermont showed a marked drop for the years 1910 to 1917, inclusive, as compared with the 1894 epidemic, and a still further decrease in the years from 1930 to 1941,

inclusive (see tables 2 and 3). The age distribution of cases reported in Minnesota and Iowa for the years 1909 and 1910, respectively, when compared with recent years also indicates a marked shift in distribution from the younger to older persons. The distribution according to age in Vermont, Minnesota, and Iowa was quite similar not only for the earlier but also for recent years.

The very definite difference in age distribution of cases in urban as compared with rural areas about 1910 to 1916 is quite apparent, as shown in table 2.

In New York City there were 9,131 cases of poliomyelitis reported in 1916, of which 79 percent were under 5 years of age. Buffalo and Cincinnati showed approximately the same distribution. The proportion in this age group in New York City for the period from 1930 to 1941, inclusive, was about one-half for the 1916 epidemic. The shift in distribution was as marked in Massachusetts, Connecticut, and New Jersey. However, the difference in distribution of urban and rural cases according to age has been less marked in recent years than was the case 25 years ago.

The age distribution of reported cases for recent years for certain States and cities is shown in table 3. The data were obtained from official reports or by requests to the various State and city health departments. States not listed were unable to furnish the requested information.

The percentage of cases under 5 years of age has been highest in southern States as compared with other sections of the country. A similar geographical difference is also found in the age distribution of some other infectious diseases. The data for a few cities located in the South, for which information was secured, suggest that there was no higher concentration of cases under 5 years of age in urban than in rural areas. As a matter of fact, a somewhat smaller percentage of reported cases were under 5 years of age in Louisville as compared with the whole State of Kentucky and in Birmingham as compared with the whole of Alabama. The age distribution in Baltimore was no different from that of Maryland as a whole. The distribution in Washington, D. C., has been more like that of northern States which are predominantly rural.

The relatively small proportion of reported cases under 5 years of age and the large percentage of cases 20 years of age and over is quite striking in most of the North Central, Mountain, and Pacific States. Detroit, Cleveland, and Chicago did not show any great difference in distribution when compared with the East North Central States for which data are available. California had a relatively high concentration of cases in the older age groups and Los Angeles and San Francisco differed very little from the State as a whole. In New York City there

TABLE 3.—Number of cases of poliomyelitis reported by age groups and percentage distribution of cases of known age in certain States and cities, 1930-41

State and city	Number of cases reported by age groups (years)						Percentage distribution by age groups (years)			
	Under 5	5 to 9	10 to 14	15 to 19	20 and over	Age not known	Under 5	5 to 9	10 to 19	20 and over
Vermont, 1930-41	114	93	70	43	70	21	29.3	23.9	28.9	17.9
Massachusetts, 1930-41	1,313	1,620	838	370	378	14	29.0	35.8	26.7	8.4
Connecticut, 1930-41	649	710	349	154	122	18	32.7	35.8	25.3	6.1
New York, ¹ 1930-41	1,941	2,244	1,291	634	611	—	28.9	33.4	28.6	9.1
New Jersey, 1931-41	1,062	1,012	512	218	203	4	35.3	33.6	24.2	6.7
Pennsylvania, 1930-41	1,697	1,244	649	335	280	17	40.3	29.7	23.4	6.6
Illinois, 1930-41	1,378	1,534	906	440	438	20	29.3	32.7	28.7	9.3
Wisconsin, 1930-41	488	542	358	204	282	433	26.0	28.9	30.0	15.0
Minnesota, 1930-41	781	1,094	704	454	526	13	21.9	30.7	32.4	14.8
Iowa, 1930-41	289	453	327	189	188	623	20.0	31.3	35.7	13.0
North Dakota, 1930-41	62	79	51	84	52	65	18.9	24.1	41.3	15.9
South Dakota, 1930-41	119	139	96	60	54	53	25.4	29.7	33.3	11.5
Kansas, 1930-41	532	544	361	237	243	1	27.7	28.3	31.1	12.7
Delaware, 1933-41	11	22	14	8	5	2	18.3	36.6	36.6	8.3
Maryland, 1930-41:										
White	208	215	116	60	47	—	31.2	33.3	27.3	7.3
Colored	49	15	3	7	2	—	64.5	19.7	13.1	2.6
District of Columbia, 1930-41:										
White	68	98	52	27	31	—	24.6	35.5	28.6	11.3
Colored	24	30	10	3	2	—	34.8	43.8	18.8	2.9
Virginia, 1933-41:										
White	407	353	203	113	135	1	33.5	29.1	26.0	11.1
Colored	96	69	37	17	19	—	41.9	26.2	23.5	8.3
North Carolina, 1935, white	384	255	97	41	38	6	47.1	31.3	16.9	4.7
1939-41	111	33	11	7	18	—	61.6	18.3	10.0	10.0
Georgia, 1933-41:										
White	524	250	125	59	60	6	51.4	24.5	18.1	5.9
Colored	177	49	23	14	12	2	64.4	17.8	13.3	4.4
Florida, 1939-41:										
White	123	80	62	18	26	10	40.0	25.9	25.7	8.4
Colored	24	11	6	3	—	—	54.5	25.0	20.4	—
Kentucky, 1932-41:										
White	709	209	156	68	41	8	55.7	23.5	17.5	3.2
Colored	33	21	12	4	1	1	46.5	29.6	22.5	1.4
Tennessee, 1936-41:										
White	545	262	136	48	42	8	52.7	25.4	17.8	4.1
Colored	72	24	12	8	8	1	58.0	19.3	16.2	6.5
Alabama, 1936-41:										
White	741	257	130	60	61	13	59.3	20.6	15.2	4.9
Colored	152	43	31	11	20	3	59.1	16.7	16.4	7.8
Mississippi, 1937-41:										
White	210	123	54	22	16	1	49.4	28.9	17.8	4.1
Colored	171	69	26	15	14	2	58.0	23.4	13.9	4.7
Louisiana, 1930-41:										
White	343	166	87	25	46	22	51.4	24.9	13.7	5.9
Colored	123	51	33	16	15	5	51.7	21.4	20.5	6.3
Montana, 1931-41	116	156	136	65	120	13	19.6	26.3	33.8	20.2
Idaho, 1939-41	31	21	21	13	22	3	28.7	19.4	31.4	20.4
Wyoming, 1940-41	10	13	7	14	9	1	18.8	24.5	39.6	17.0
Colorado, 1938-41	44	56	10	23	30	1	27.6	35.2	20.8	18.8
New Mexico, 1930-41	155	81	43	12	19	1	50.0	26.1	17.7	6.1
Arizona, 1939-41	34	37	17	8	18	6	29.8	32.5	22.0	15.8
Utah, 1932-41	94	89	63	31	27	5	30.9	29.2	30.9	8.8
Washington, 1930-41	272	441	394	249	236	210	17.1	27.7	40.3	14.8
California, 1930-41	1,913	2,621	1,622	991	2,174	89	20.5	28.1	28.0	23.3
New York City, 1930-41	3,424	2,838	1,157	384	276	13	42.3	35.1	19.0	3.4
Cleveland, 1930-41	253	236	164	72	53	—	32.5	30.3	30.3	6.8
Chicago, 1930-41	514	588	361	131	143	2	29.6	33.8	28.3	8.2
Detroit, 1930-41	399	578	280	87	78	—	28.1	40.5	25.8	5.5
Baltimore, 1930-41:										
White	85	100	47	17	23	—	31.2	36.7	23.4	8.4
Colored	25	9	1	3	—	—	65.8	23.6	10.6	—
Louisville, 1933-41:										
White	62	59	28	10	10	10	36.6	34.9	22.4	5.9
Colored	8	12	6	2	—	—	28.5	42.5	28.5	—
Birmingham, 1930-41:										
White	56	32	24	10	10	—	42.4	24.2	25.8	7.6
Colored	38	9	10	2	7	—	57.6	13.6	18.1	10.6
Los Angeles, 1930-41	646	812	577	375	942	4	19.6	24.6	27.3	28.5
San Francisco, 1931-41	48	89	70	25	50	1	17.0	31.5	33.6	17.7

¹ New York State exclusive of New York City.

continued to be a greater concentration of cases under 5 years of age than in the remainder of New York State.

In epidemics the proportion of cases under 5 years of age and those 5 to 9 years usually increased slightly in most of the States and cities for which data are available. Occasionally, as in Los Angeles in 1934, there was an increase in the percentage of reported cases in the older age groups.

EPIDEMIOLOGY OF POLIOMYELITIS

The epidemiological and experimental studies which have been reported during the period covered by this series of reports (1933-42) have not produced any radical changes in our concept of poliomyelitis nor have they yielded information essential for practical control of the disease. However, these studies have suggested certain revisions in the prevailing opinions regarding the portal of entry of the virus and transmission of the disease in man. It seems rather remarkable that in spite of all the time and effort spent in studies on poliomyelitis during the past 20 years so little new information on the epidemiology of the disease has been produced. One can improve very little on Frost's discussion on the epidemiology of poliomyelitis published in Hygienic Laboratory Bulletin No. 90 in 1913, which except for a few minor revisions could be used to outline the prevailing views on the epidemiology of this disease.

In 1933 it was still the opinion of many investigators that the olfactory tract was a common portal of entry of the virus in human poliomyelitis. Since then numerous examinations of olfactory bulbs from fatal human cases have failed except in a few instances to demonstrate the presence of virus in this organ or to show inflammatory reactions which are common in the experimental disease in monkeys infected intranasally.

Although the presence of virus in the stools of some human cases had been demonstrated many years previously, it was not until 1937 that the gastrointestinal tract was seriously considered as a portal of entry by many investigators. The frequency and ease with which virus could be recovered in relatively large amounts from the stools of paralytic and abortive cases, convalescents, and contacts of the disease soon led many to consider the intestinal tract as the principal portal of entry.

The pharyngeal mucosa is still regarded by many investigators as a common portal of entry, an opinion based in part on the fact that the virus may be recovered from the nasopharyngeal secretions in certain cases and contacts. The concensus of opinion regarding the portal of entry of virus in human poliomyelitis would appear to be somewhat as follows at the present time. Infection seldom occurs by way of the olfactory tract but mainly through mucous membrane of

the pharyngeal or the lower gastrointestinal tract, or both. The relative frequency of these sites as portals of entry is still a matter of dispute and should be considered a subject for further investigation.

Little advance has been made in our knowledge of the manner in which infection is transmitted from person to person. The recovery of virus from sewage as well as from fresh stools suggested to some that poliomyelitis might be water-borne. The marked concentration of cases in the summer time has been suggested as favoring such a hypothesis. Maxcy (6) recently summed up the evidence for and against the hypothesis that poliomyelitis may be water-borne, and his conclusion was that "there is at present insufficient evidence to justify the belief that water is a medium which is of practical importance in spread."

The impression that the paralytic case or the occasionally recognized abortive case does not represent the extent of active infection in a family or other aggregations of persons living in close contact with each other has been strengthened by several studies in recent years. It appears that abortive or mild infections which do not result in paralysis are the rule rather than the exception in family and other groups, especially during epidemic periods. Langmuir's (7) studies during a recent epidemic in New York State seem to verify this impression as have other studies of outbreaks in institutions.

Neither experimental nor epidemiological investigations have produced any convincing evidence that poliomyelitis is transmitted by an insect vector or that reservoirs of infection are to be found in any lower animals. Armstrong's (8) demonstration that the Lansing strain of virus when given intracerebrally to cotton rats could produce typical lesions in these animals and could further be adapted to white mice cannot be interpreted to suggest an animal reservoir.

Laboratory studies on poliomyelitis have revealed the existence of several strains of poliomyelitis virus which show some immunological differences. Serum from some adults living in different parts of the world may neutralize a number of strains of the virus which would seem to indicate a fairly wide distribution of the various strains. Aycock (9) suggests that more than one strain may circulate freely in a given outbreak.

Although there have not been developed any practical measures for control of the spread of poliomyelitis or a method for protecting susceptible persons against infection, there has been introduced in the United States in the past few years a new form of therapy which is now generally referred to as the Kenny treatment. It promises much toward relieving many of the crippling effects of the disease.

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LEPTOSPIROSIS IN RATS (*R. NORVEGICUS*) IN AND ABOUT WASHINGTON, D. C.¹

AN EVALUATION OF THE METHODS USED FOR DIAGNOSIS

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Many surveys of the incidence of leptospirosis among wild rats (*Rattus norvegicus*) have been made, but in only a few instances have these studies been carried out with a view of determining the relative efficiency of the various methods available for the detection of this disease among rats. It is proposed to present evidence regarding the value of certain tests in the diagnosis of leptospirosis among animal reservoirs.

Walch-Sorgdrager (1) adequately reviews the results obtained from the majority of surveys which have been made and discusses the methods used. It has been established that the leptospirae are localized in the kidneys during the chronic stage of the disease and that specific antibodies are produced against *Leptospira icterohaemorrhagiae* following infection with this organism. Practical attempts to determine the incidence of infection due to *L. icterohaemorrhagiae* in rats should include serological studies and methods to isolate or visualize the organisms in the kidney of all animals examined. As many as 86 percent of the rats examined during some surveys have been found to be infected, but as a rule about 30 to 40 percent of the

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

rats studied have been infected. Walch and Walch-Sorgdrager (2) found that 17, or 33 percent, of 51 rats examined in Baltimore, Md., were harboring *L. icterohaemorrhagiae*. Syverton, Stiles, and Berry (3) found 37.3 percent of rats trapped in Rochester, N. Y., infected, and 16.7 percent in Detroit, Mich., and San Francisco, Calif., were also infected. Otteraaen (4) found only 1 infected rat in 30 examined in Chicago. Lewis (5) noted 11 of 100 rats studied in Philadelphia to be infected. He found inoculation of guinea pigs with an emulsion of rat kidney to be the most efficient method for the detection of leptospiral infections, but he did not use serological tests.

Walch-Sorgdrager gives the experience of Dutch workers concerning the incidence of leptospirosis among young and old specimens of *R. norvegicus*. They found the incidence of infection to be about eight times as great in rats over 20 cm. in length as in rats under that length.

As cases of Weil's disease have occurred in and near Washington, D. C., it was considered of value to determine the extent of infection with *L. icterohaemorrhagiae* existing among rats in this area, as well as to evaluate the methods available and the influence of sex and age upon the incidence of infection.

MATERIALS AND METHODS

Wild rats (*R. norvegicus*) were trapped alive in the area in and about Washington during the period from June 1940 to September 1941. They were caught in private dwellings, stores, a jail, and in two areas used for the dumping and incineration of refuse. Ninety-two rats were obtained and examined by the methods to be described.

Examinations of the animals were started following administration of ether. The length from tip of the nose to base of the tail was measured and recorded. Blood was drawn from the heart under precautions to insure sterility. In order to obtain a maximum amount of serum for serologic study it is essential to withdraw the blood from the heart before the chest wall is opened and the animal expires. The abdomen and thorax were then opened and observations made to determine the sex of the animal and the presence of any abnormalities. The kidneys were removed and placed in a sterile Petri plate. Slices of both kidneys were placed in 10 percent formalin for pathologic study and sections were stained with hematoxylin-eosin and with Levaditi's silver impregnation stains. Finely minced bits of each kidney were dropped into tubes containing 5 cc. of Schuffner's modification of Verwoort's medium and incubated at 32° C. The cut surfaces of both kidneys were scraped with a sterile wire, the scrapings were emulsified in a drop of salt solution on a microscope slide, covered with a cover glass, and examined with dark-field illumination using a magnification of 450. The remainder of the kidney and a roughly equivalent amount of liver were ground in a mortar with alundum and sufficient salt solu-

tion was added to make a 10 percent suspension. This suspension was also examined for the presence of organisms. It was then inoculated into four or five young white mice and two guinea pigs regardless of whether or not organisms were noted. The amounts given by intraperitoneal injection were 0.5 cc. for the mice and 2.0 cc. for the guinea pigs.

The agglutination-lysis test of Schuffner and Mochtar has been adequately described. Titres of 1:100 or above are considered to be of diagnostic significance.

With regard to the primary isolation of *L. icterohaemorrhagiae* in artificial culture medium it may be pointed out that portions of the original culture fluid should be examined microscopically daily for the presence of organisms. Cultures which have been positive on the first or second day after inoculation have subsequently become sterile especially where fairly large amounts of tissue were used for the original inoculum. It has been found that the best results are obtained when subcultures are made from the original culture media about 24 hours after inoculation. Both the original culture and the subculture are then incubated and observed for growth.

Every rat studied was not examined by all the methods described. The kidneys of only 42 rats were subjected to microscopic pathological examination; guinea pig and mouse inoculation with tissue emulsion was practiced in 81 and 74 instances, respectively. The white mice used in these experiments were 3 weeks of age and the guinea pigs weighed about 200 gm.

EXPERIMENTAL

The distribution of sex and the size of the rats are shown in table 1. It will be noted that 54.3 percent of the 92 rats examined were females. Of the males and females, 76.2 percent and 68 percent, respectively, were 20 cm. or over in length. Only 26 rats, or 28.2 percent of the total, were under 20 cm., but the number appears to be sufficient to determine differences in the rate of infection among large and small rats.

TABLE 1.—*Wild rats, R. norvegicus, trapped in and about Washington D. C.*

Sex	Number of rats	Size of rats	
		Over 20 cm. in length	Under 20 cm. in length
Total.....	92	66	26
Female.....	50	34	16
Male.....	42	32	10

Using all methods available for diagnosis, a considerable variation was found in the rate of infection with *L. icterohaemorrhagiae* among

rats above and below 20 cm. in length. These results are tabulated in table 2. There were 44, or 47.8 percent, of the entire group which gave evidence of infection with *L. icterohaemorrhagiae*. While 60.6 percent of the 66 rats over 20 cm. in length were infected, only 15.4 percent of 26 rats under 20 cm. in length were found to be infected with *L. icterohaemorrhagiae*. There was no significant variation between the percentage of males and females which had findings pointing to infection with this organism. It is to be observed that there is a considerable difference between the rate of infection among the large and small members of either sex. This is especially apparent among the females. Here 73.6 percent of the larger specimens harbored leptospirae, and only 18.8 percent of those under 20 cm. in length were involved. In general, these results are comparable to those obtained by the Dutch workers who found that while 33.4 percent of 919 rats over 20 cm. in length gave evidence of infection, only 4.4 percent of 456 rats under 20 cm. in length showed signs of leptospirosis.

TABLE 2.—Incidence of infection with *L. icterohaemorrhagiae* in wild rats trapped in and about Washington, D. C.

Size	Number	Infected with <i>L. icterohaemorrhagiae</i>	
		Number	Percent
Both sexes:			
All sizes.....	92	44	47.8
Over 20 cm.....	66	40	66.6
Under 20 cm.....	26	4	15.4
Female:			
All sizes.....	50	28	56.0
Over 20 cm.....	34	25	73.6
Under 20 cm.....	16	3	18.8
Male:			
All sizes.....	42	16	38.1
Over 20 cm.....	32	15	46.9
Under 20 cm.....	10	1	10.0

Table 3 summarizes the results obtained by the various methods of diagnosis employed in the study. Agglutination tests performed on serum yielded the best results. The observed agglutination titres varied from 1 to 100, to 1 to 10,000. Only one animal which was found positive on any other test failed to give a positive reaction when its serum was tested for the presence of agglutinins against *L. icterohaemorrhagiae*. In this instance organisms were detected in the kidney when stained by Levaditi's method, but not noted by any of the other methods. In every rat in which agglutinins were demonstrated further evidence of the presence of *L. icterohaemorrhagiae* was also obtained.

Among 42 rats, the kidneys of which had been examined microscopically after having been stained by Levaditi's method, 19, or 45.2 percent, were found to harbor leptospirae. In three cases where other

methods of examination gave evidence of the presence of leptospirae, the organisms were not demonstrable in stained sections of the kidney.

Dark-field examination of smears from kidneys of 92 rats showed 37, or 40.2 percent, to be harboring leptospirae, but this method failed to detect these organisms in seven cases where other types of positive evidence were obtained.

TABLE 3.—Results obtained from various methods of testing wild rats for evidence of infection with *L. icterohaemorrhagiae*

Sex	Agglutination-lysis test		Dark-field examination		Cultural methods		Stained sections		Inoculation of mice		Inoculation of guinea pigs	
	Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative
Over 20 cm.:	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Male	14	18	14	18	11	21	2	4	9	19	4	19
Female	25	9	19	15	18	16	14	5	13	13	10	24
Under 20 cm.:												
Male	1	9	1	9	1	9	0	7	1	5	0	8
Female	3	13	3	13	1	15	3	7	3	11	3	13
Total	43	49	37	55	31	61	19	23	26	48	17	64
Percent positive	46.7		40.2		33.7		45.2		35.1		20.9	

Cultures yielded *L. icterohaemorrhagiae* from 31, or 33.7 percent, of the rats and were deficient in 13 instances.

Groups of young white mice were inoculated intraperitoneally with tissue emulsion from 74 rats and of these attempts to isolate the organism, 26, or 35.1 percent, gave positive results and in 9 instances this method failed when other tests indicated the presence of the organism. Inoculation of comparable material from 81 rats injected into pairs of guinea pigs resulted in the isolation of the organism from 19, or 20.9 percent, of the rats tested, and in failure to isolate the organism from 21 rats which were found to be positive by some other test.

TABLE 4.—Comparison of methods for the diagnosis of leptospirosis in a series of 27 rats in which all tests were performed

Test	Rats having negative reaction		Rats having positive reaction	
	Number		Number	Percent
Agglutination-lysis	12		15	55.5
Dark-field	16		11	40.7
Culture	18		9	33.3
Stained sections	15		12	44.4
Inoculation of mice	17		10	37.0
Inoculation of guinea pigs	17		10	37.0

In a series of 27 rats, upon which all tests were performed, results roughly comparable to those cited above were obtained. The results are given in table 4. There were 15, or 55.5 percent, positive in

this group when all tests were used. The presence of agglutinins was demonstrated in each of the 15 rats and in no case were these detected when some other method of diagnosis did not also yield positive results. It is evident that serologic tests result in a greater proportion of positive results than can be obtained by any other single method, and it appears that the results obtained from this test are reliable.

DISCUSSION

The results obtained from this study demonstrate the value of using multiple methods for determination of the extent of infection with *L. icterohaemorrhagiae* among rodent populations. No single method of specific diagnosis is infallible, but each serves to substantiate the other methods. The most reliable method was the agglutination test. In only 1 of 44 animals infected with *L. icterohaemorrhagiae* were agglutinins absent. Studies of sections of kidney stained by Levaditi's silver impregnation method and of emulsions made from fresh kidney examined by dark-field illumination yielded the next greatest number of positive results. Cultures and inoculation of young mice or guinea pigs with kidney emulsions from rats were of least value. For practical purposes, from the standpoint of expense, effort, and time, the agglutination test may be recommended as the method of choice for surveys designed to determine the incidence of leptospirosis among rodent hosts.

The difference in the number of infections among the young and old members of either sex is remarkable. The influence of sex and age of rats examined during the course of a survey is apparent and due note should be made of these in interpreting results.

CONCLUSIONS

Wild rats (*R. norvegicus*) trapped in and about Washington, D. C., were found to be infected with *L. icterohaemorrhagiae*.

A greater incidence of infection was noted among specimens over 20 cm. in length than among those of smaller size.

The most reliable methods for the detection of leptospirosis among rats were serologic examinations of serum and study of Levaditi-stained sections of kidney.

It is recommended that the agglutination test be used whenever surveys of the incidence of murine leptospirosis are made.

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THE EFFECT OF ARSENATES ON THE STORAGE OF LEAD¹

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In a preceding study of the toxicity of lead arsenate (1) it was found that less lead was stored in animals receiving lead arsenate by oral administration than in animals similarly receiving an equivalent amount of lead as lead carbonate. It is not likely that this is due to the insolubility of lead arsenate—that it passes through the gastrointestinal tract unchanged—since experiments in man have shown that it is broken down in the alimentary canal with practically complete absorption of the arsenic which is later excreted by the kidneys (2). It would appear, therefore, that the arsenate group either decreases the absorption or increases the excretion of absorbed lead, so that storage is markedly reduced. However, lead arsenate was shown to be more toxic ultimately in the quantities fed (10 mg. of lead arsenate per rat per day) than equivalent amounts of lead carbonate.

The recent investigation of Moxon and Dubois (3) has shown that rats fed a diet 11 p. p. m. of selenium from seleniferous wheat are completely protected against selenium poisoning when they were given 5 p. p. m. of arsenic as sodium arsenite in the drinking water. It is somewhat difficult to hypothesize the mechanism of this protective action, but it is of interest that arsenic in the trivalent form in one case and in the pentavalent form in the other tends to diminish the toxicity of selenium and the retention of lead, respectively.

Further investigation has been made to find whether a soluble arsenate such as sodium arsenate fed with lead carbonate would have an effect similar to that of lead arsenate.

In this experiment a group of 145 rats was given a basic diet containing 1,230 p. p. m. of lead carbonate; a second group of 142 rats received food containing 1,230 p. p. m. of lead carbonate and 930 p. p. m. of sodium arsenate; a third group of 51 rats was given food

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containing 930 p. p. m. of sodium arsenate alone, and a fourth group of 46 rats on the basic diet alone served as controls.

The animals were kept under experiment for 20 weeks and were then sacrificed. Tissues were removed for chemical analysis and microscopical examination. The primary purpose of this experiment was to determine whether the storage of lead was similar to that with lead arsenate feeding. At the end of 1 year the average amount of lead stored in the bone tissue of rats fed lead arsenate was found to be decidedly less than that found when the animals were fed lead carbonate alone.

While the growth curves of the various groups show no abnormality, growth was retarded most in the sodium arsenate group, less in the lead carbonate-sodium arsenate group, and still less in the lead carbonate group.

Table 1 summarizes the analytical values for the lead and arsenic content of the various tissues of the animals in each group. Each animal was autopsied, the liver, kidneys, and bones weighed and sampled for chemical analysis, and the tissues individually analyzed. Group values rather than individual values are given owing to the large number of animals used.

TABLE 1.—*The effect of sodium arsenate on the storage of lead*

Group	Lead carbonate		Lead carbonate-sodium arsenate			Sodium arsenate	Controls		
	Mg. Pb/10 gm.		Mg. Pb/10 gm.		Mg. As/10 gm.	Mg. As/10 gm.	Mg. Pb/10 gm.		Mg. As/10 gm.
	Kidney	Bone	Kidney	Bone	Kidney	Kidney	Kidney	Bone	Kidney
A	0.505	4.69	0.283	2.47	0.104	0.153	0.000	0.006	0.009
B	.553	4.11	.207	2.28	.126	.266	.001	.017	.006
C	.350	4.19	.263	3.76	.063	.321	.001	.012	.004
D	.463	4.51	.200	3.08	.121	.125	.000	.016	.005
E	.291	3.69	.301	2.81	.135	.150	.000	.017	.008
F	.383	4.86	.351	2.24	.145	.265	.000	.013	.007
G	.369	4.50	.329	3.50	.118	.182	.000	.011	.003
H	.466	4.96	.459	2.95	.103	.139	.000	.008	.000
I	.586	4.51	.257	2.36	.129				
J	.449	5.63	.391	2.32	.153				
K	.583	5.63	.347	3.17	.136				
L	.426	5.24	.347	3.60	.099				
M	.386	4.55	.330	2.84	.090				
N	.408	3.76	.299	3.73	.128				
O	.535	4.23	.259	2.33	.082				
P	.624	4.89	.304	2.13	.102				
Q	.401	5.46	.280	3.22	.056				
R	.377	3.85	.281	3.79	.075				
S	.460	4.20	.135	3.28	.082				
T	.419	5.41	.182	2.56	.073				
U	.670	4.99	.256	2.56	.082				
Average	.462	4.65	.289	2.90	.105	.200		.008	.005

The concentration of arsenic in the kidneys was greater in the animals fed sodium arsenate than in those fed both lead carbonate and sodium arsenate. The proportion was nearly 2:1 (0.200:0.105). Since all the animals received identical amounts of sodium arsenate,

it would appear that administration of lead carbonate with sodium arsenate definitely affected the concentration of arsenic in the kidneys. The normal arsenic content of the kidneys of the control animals was negligible.

It is of interest to note that the concentration of lead in the kidneys was greater in those animals given lead carbonate than in those receiving lead carbonate and sodium arsenate. The latter amounted to only 62.3 percent of the former.

Despite the differences between the two groups with respect to the concentration of lead in the kidneys, the ratio of kidney lead to bone lead is as 1:10 in each group.

More significant than the storage of lead in the kidneys is its storage in bone tissue. Here the disparity is marked and is of greater significance because of the quantity stored. In the case of the animals fed lead carbonate the average amount of lead stored was 4.65 mg. of lead as Pb per 10 gm. of bone, while the average storage in the animals given lead carbonate-sodium arsenate was 2.90 mg. of lead as Pb per 10 gm. of bone, or 62.3 percent of the former. This compares well with the difference in bone storage noted with lead carbonate and lead arsenate feeding 3.99 and 2.49 mg./10 g. bone, respectively, or 60.0 percent (1).

It would thus appear from these two independent studies that arsenates definitely diminish the storage of lead in bone tissue.

PATHOLOGY

Tissue from a random number of animals in each of the groups fed sodium arsenate, lead carbonate, and sodium arsenate-lead carbonate mixture was submitted to histopathologic examination. Paraffin sections were made from the liver, spleen, kidneys, adrenals, heart, pancreas, stomach, duodenum, jejunum, ileum, large intestine, and mesenteric lymph nodes. The sections were stained routinely by Lillie's eosin-polychrome methylene blue method (4). Kidneys and spleens were stained by ferrocyanide to demonstrate the presence or absence of iron-bearing pigment. A number of kidney sections were stained with eosin as a check for the detection of oxyphil intranuclear inclusions. A total of 1,935 sections from 118 rats was examined.

Kidneys.—Oxyphil intranuclear inclusions in the cells of the convoluted tubules were present in all of the animals fed lead carbonate. They were occasionally seen in the animals fed the lead carbonate-sodium arsenate mixture and were absent in all of the animals receiving sodium arsenate. Brown intracellular pigment particles observed in other experiments (1) in which the animals were fed lead carbonate were also noted in this experiment. They were most marked in the rats fed lead carbonate; were present to a lesser extent both

in quantity and in numbers of animals fed the mixture, and were infrequently observed in the animals receiving sodium arsenate. Their presence in this same degree with reference to the materials administered occurred in the proximal convoluted tubules as compared with the distal convoluted tubules. Cells of the convoluted tubules were swollen and contained large vesicular nuclei. The frequency of this finding followed the same relative order of the substances fed the animals. A similar degree of all other renal changes was observed in this same order. All of the kidneys, regardless of compound, failed to show the presence of an iron-bearing pigment. No casts of any significance were noted. Subacute interstitial nephritis was noted in an inconsequential number of animals and appeared to have no reference to the lead or arsenic compounds.

Spleen.—No great variation was noted in the size and appearance of the splenic corpuscles in the three groups of animals. They varied from large to small in size and were generally well defined. The cavernous veins were usually filled with blood and, as in previous experiments, the degree of relative perfollicular anemia, characterized by zones of pale staining cells, varied inversely with the amount of blood in the cavernous veins. Diffuse iron reactions of cells of the pulp were most marked in the animals fed sodium arsenate, less in those given the sodium arsenate-lead carbonate mixture, and least in the animals fed lead carbonate. This hemosiderosis, however, was present to some degree in all of the animals exposed to these compounds. Splenic myelosis followed the same order, being least in the animals fed lead carbonate.

This is consistent with a previous finding in rats fed lead carbonate for 1 and 2 years. Follicular phagocytosis, characterized by the presence of nuclear fragments in the follicles, appeared of no significance. Lymphocytic infiltration of the trabeculae, while present, also appeared of no importance.

Liver.—A slight periportal lymphocytic infiltration was noted in about half the rats receiving sodium arsenate but was absent in those receiving the lead carbonate-sodium arsenate mixture. Large nuclei were occasionally seen in the liver cells in the animals fed lead carbonate but appeared to be of no significance because of infrequency. No oxyphil intranuclear inclusions such as those described by Blackman (5) were noted.

No changes of note were observed in the other organs examined.

SUMMARY

A soluble arsenate, such as sodium arsenate, when fed to rats receiving lead carbonate, was shown to produce effects similar to those produced by lead arsenate alone. The administration of sodium arsenate with lead carbonate diminished the concentration of lead in

the kidneys, while the concentration of arsenic amounted to only half that of the sodium arsenate group. More significant is the fact that arsenates in general definitely diminish the storage of lead in bone tissue.

The amount of pathologic damage follows that observed in experiments previously described in which lead arsenate and lead carbonate were fed to animals for comparison of the relative toxicity of molecular components. In this study the spleen showed the most marked changes with sodium arsenate and the least with lead carbonate. Conversely the kidney showed more marked changes with lead carbonate. The tissues from the animals receiving both sodium arsenate and lead carbonate showed changes of an intermediate degree. No pathologic changes of any significance were observed in the liver.

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DEATHS DURING WEEK ENDED JUNE 5, 1943

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

	Week ended June 5, 1943	Correspond- ing week, 1942
Data for 89 large cities of the United States:		
Total deaths.....	8,870	8,192
Average for 3 prior years.....	8,302	
Total deaths, first 22 weeks of year.....	215,063	195,001
Deaths under 1 year of age.....	641	552
Average for 3 prior years.....	520	
Deaths under 1 year of age, first 22 weeks of year.....	14,853	12,434
Data from industrial insurance companies:		
Policies in force.....	65,548,808	64,984,131
Number of death claims.....	10,286	10,588
Death claims per 1,000 policies in force, annual rate.....	8.2	8.5
Death claims per 1,000 policies, first 22 weeks of year, annual rate.....	10.4	9.9

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 JUNE 12, 1943

Summary

As compared with the preceding week's totals, slight increases are shown in the incidence of all of the nine common communicable diseases included in the following table except influenza, meningococcus meningitis, and scarlet fever, and totals of five of these nine diseases (influenza, measles, meningococcus meningitis, poliomyelitis, and whooping cough) exceed the corresponding 5-year (1938-42) medians. Cumulative totals for the first 23 weeks of the year are also above the corresponding medians for measles, meningococcus meningitis, poliomyelitis, and whooping cough.

A sharp decline was recorded for meningococcus meningitis. A total of 382 cases was reported for the week, as compared with 439 for the preceding week and a 5-year median of 32.

A total of 60 cases of poliomyelitis was reported, as compared with 52 for the preceding week, 27 for the next earlier week, and a 5-year median of 29. Of the current total, 27 cases occurred in California and 10 in Texas. Of 658 cases reported to date this year, California has reported 188 cases, Texas 92, and Arizona 36.

Approximately one half of the current cases of scarlet fever were reported in the Middle Atlantic and East North Central States; of the current total for measles, nearly 80 percent were reported in the New England, Middle Atlantic, and East North Central areas; and of the current influenza cases approximately 40 percent occurred in Texas.

The incidence of typhoid fever continues low. A total of 109 cases was reported currently (less than the number reported for the corresponding week of any prior year), as compared with 80 cases for the preceding week and a 5-year median of 130.

Deaths registered in 88 large cities of the United States for the current week totaled 9,074, as compared with 8,844 for the preceding week and a 3-year (1940-42) average of 7,951. The accumulated number for the first 23 weeks of the year is 223,507, as compared with 202,603 for the corresponding period of 1942.

Telegraphic morbidity reports from State health officers for the week ended June 12, 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		Med- ian 1938- 42	Week ended		Med- ian 1938- 42	Week ended		Med- ian 1938- 42	Week ended		Med- ian 1938- 42
	June 12, 1943	June 13, 1942		June 12, 1943	June 13, 1942		June 12, 1943	June 13, 1942		June 12, 1943	June 13, 1942	
NEW ENGLAND												
Maine.....	0	0	0	2	-----	-----	191	113	113	5	4	0
New Hampshire.....	0	0	0	-----	-----	-----	36	5	10	2	1	0
Vermont.....	0	0	0	-----	-----	-----	293	163	96	0	0	0
Massachusetts.....	2	7	3	-----	-----	-----	1,532	856	1,078	19	2	2
Rhode Island.....	0	0	0	-----	-----	-----	81	170	106	6	0	0
Connecticut.....	2	0	0	-----	2	2	342	324	324	8	0	0
MIDDLE ATLANTIC												
New York.....	8	8	22	12	13	17	3,784	1,268	1,856	63	19	4
New Jersey.....	4	5	10	7	-----	2	2,172	568	568	23	2	1
Pennsylvania.....	15	14	14	-----	-----	-----	1,007	715	715	27	5	6
EAST NORTH CENTRAL												
Ohio.....	7	2	13	2	3	7	315	361	361	15	1	1
Indiana.....	3	2	4	1	3	3	372	73	73	5	1	1
Illinois.....	23	19	26	5	44	11	1,432	222	222	19	1	1
Michigan ¹	5	1	4	1	4	1	3,352	461	832	28	1	1
Wisconsin.....	1	0	0	13	21	20	2,497	1,207	1,219	3	1	0
WEST NORTH CENTRAL												
Minnesota.....	1	1	1	1	-----	1	377	309	166	3	0	0
Iowa.....	5	3	3	-----	-----	-----	97	235	177	0	0	0
Missouri.....	0	0	3	-----	3	1	185	496	98	14	3	0
North Dakota.....	0	1	1	2	2	7	51	19	19	1	0	0
South Dakota.....	0	1	1	-----	-----	-----	79	7	7	0	0	0
Nebraska.....	2	0	1	1	2	-----	158	89	89	2	0	0
Kansas.....	2	4	2	-----	3	2	287	177	257	7	1	0
SOUTH ATLANTIC												
Delaware.....	0	0	0	-----	-----	-----	30	7	7	0	0	0
Maryland ²	6	4	1	1	-----	2	226	178	178	13	12	1
District of Columbia.....	0	1	1	1	-----	-----	89	42	42	7	1	0
Virginia.....	1	2	6	60	86	86	219	83	339	5	0	1
West Virginia.....	3	2	6	1	-----	4	33	25	26	6	0	1
North Carolina.....	4	5	7	2	5	1	167	262	296	6	2	0
South Carolina.....	8	0	2	79	89	89	77	60	60	4	0	1
Georgia.....	1	3	3	17	6	8	97	33	148	4	0	0
Florida.....	0	5	5	4	2	2	18	71	71	3	0	0
EAST SOUTH CENTRAL												
Kentucky.....	2	4	6	2	3	5	63	33	144	1	3	1
Tennessee.....	7	3	3	11	16	16	103	77	107	10	2	1
Alabama.....	2	1	5	35	18	16	110	26	80	1	2	2
Mississippi ¹	2	2	6	-----	-----	-----	-----	-----	-----	3	0	0
WEST SOUTH CENTRAL												
Arkansas.....	7	4	4	6	12	11	55	68	68	3	0	0
Louisiana.....	1	6	6	-----	2	7	17	70	18	0	2	1
Oklahoma.....	4	2	2	9	23	16	13	38	117	0	0	1
Texas.....	29	11	16	298	145	153	228	225	437	9	2	2
MOUNTAIN												
Montana.....	0	1	1	4	-----	-----	110	148	97	3	0	0
Idaho.....	0	0	0	-----	-----	-----	29	54	23	9	0	0
Wyoming.....	0	0	0	19	13	-----	41	15	15	3	0	0
Colorado.....	13	9	8	56	22	4	151	166	145	2	0	0
New Mexico.....	0	5	1	6	2	1	3	12	38	1	0	0
Arizona.....	2	0	3	58	23	43	9	64	39	2	0	0
Utah ¹	0	0	0	-----	-----	-----	112	634	363	3	0	0
Nevada.....	0	0	-----	-----	-----	-----	17	25	-----	1	0	-----
PACIFIC												
Washington.....	9	3	2	7	1	-----	361	992	263	8	1	0
Oregon.....	2	0	1	10	9	9	105	49	69	6	2	0
California.....	17	13	16	42	49	49	1,163	3,367	871	22	4	2
Total.....	200	154	222	765	616	731	22,286	14,662	14,662	382	75	32
23 weeks.....	5,671	5,897	7,254	75,514	76,675	147,990	466,940	423,156	423,156	11,104	1,791	1,094

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended June 12, 1943, and comparison with corresponding week of 1942 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and para-typhoid fever		
	Week ended		Medi-an 1938-42	Week ended		Medi-an 1938-42	Week ended		Medi-an 1938-42	Week ended		Medi-an 1938-42
	June 12, 1943	June 13, 1942		June 12, 1943	June 13, 1942		June 12, 1943	June 13, 1942		June 12, 1943	June 13, 1942	
NEW ENGLAND												
Maine.....	0	1	0	13	3	3	0	0	0	0	0	0
New Hampshire.....	1	0	0	9	9	1	0	0	0	0	0	0
Vermont.....	0	0	0	9	5	5	0	0	0	0	0	0
Massachusetts.....	0	0	0	360	197	166	0	0	0	4	4	1
Rhode Island.....	1	0	0	24	2	6	0	0	0	0	1	0
Connecticut.....	1	1	0	64	18	35	0	0	0	3	0	2
MIDDLE ATLANTIC												
New York.....	5	2	2	344	239	411	0	0	0	7	5	7
New Jersey.....	0	0	0	52	83	102	1	0	0	3	2	1
Pennsylvania.....	0	0	0	130	210	256	0	0	0	5	10	7
EAST NORTH CENTRAL												
Ohio.....	1	0	0	134	196	196	3	1	1	4	3	6
Indiana.....	1	0	0	54	20	34	1	0	2	5	0	1
Illinois.....	1	3	2	108	75	202	0	1	12	1	2	4
Michigan ¹	0	0	0	66	178	255	0	0	2	2	4	3
Wisconsin.....	0	0	0	237	93	93	0	0	1	1	2	1
WEST NORTH CENTRAL												
Minnesota.....	0	1	0	38	24	43	0	0	3	0	0	0
Iowa.....	0	1	0	12	14	37	0	0	0	0	1	0
Missouri.....	0	0	0	37	132	55	1	0	6	2	1	2
North Dakota.....	0	0	0	0	6	5	0	0	0	0	0	1
South Dakota.....	0	1	0	12	8	7	0	0	5	1	0	0
Nebraska.....	0	0	0	17	6	8	0	0	1	0	0	0
Kansas.....	0	0	0	24	17	29	0	0	0	2	1	1
SOUTH ATLANTIC												
Delaware.....	0	0	0	3	7	6	0	0	0	0	0	0
Maryland ¹	0	0	0	34	39	36	0	0	0	3	3	2
District of Columbia.....	0	0	0	6	6	6	0	0	0	0	1	0
Virginia.....	0	1	0	20	17	17	0	0	0	7	3	5
West Virginia.....	0	0	0	10	9	18	0	0	0	3	3	3
North Carolina.....	0	0	0	7	17	16	0	0	0	0	10	10
South Carolina.....	0	1	1	4	1	3	0	0	0	1	1	4
Georgia.....	0	0	0	11	4	5	0	0	0	15	13	13
Florida.....	0	1	1	0	1	3	0	0	0	7	4	5
EAST SOUTH CENTRAL												
Kentucky.....	2	0	0	10	35	35	0	0	1	4	2	9
Tennessee.....	0	1	0	10	24	26	0	0	2	3	6	4
Alabama.....	2	1	1	11	4	8	0	0	1	0	1	3
Mississippi ¹	0	1	1	3	3	2	0	1	1	2	2	2
WEST SOUTH CENTRAL												
Arkansas.....	1	1	0	5	5	2	1	2	2	7	1	7
Louisiana.....	0	3	1	2	4	6	1	0	0	5	4	6
Oklahoma.....	0	0	0	13	4	5	0	0	5	1	4	4
Texas.....	10	1	1	26	12	21	0	1	3	6	17	16
MOUNTAIN												
Montana.....	0	0	0	8	4	10	0	0	0	0	0	0
Idaho.....	0	0	0	66	2	2	0	0	1	0	0	0
Wyoming.....	0	0	0	17	5	2	0	0	0	0	0	0
Colorado.....	0	0	0	45	11	21	0	0	4	0	1	1
New Mexico.....	0	0	0	3	2	7	0	0	0	1	1	2
Arizona.....	3	0	0	11	0	3	0	0	0	0	0	1
Utah ¹	0	0	0	19	2	7	0	0	0	0	0	0
Nevada.....	1	0	---	1	0	---	0	0	---	0	0	---
PACIFIC												
Washington.....	3	0	0	20	16	19	0	0	1	0	0	2
Oregon.....	0	2	0	12	5	11	1	1	1	1	0	0
California.....	27	0	4	173	85	111	0	0	1	3	3	9
Total.....	60	23	29	2,294	1,859	2,338	9	7	62	109	116	130
23 weeks.....	658	476	532	87,636	80,809	106,053	553	514	1,607	1,425	1,939	2,088

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended June 12, 1943, and comparison with corresponding week of 1942 and 5-year median—Con.

Division and State	Whooping cough			Week ended June 12, 1943									
	Week ended		Median 1938-42	An- thrax	Dysentery			En- ceph- alitis, infect- ious	Lep- rosy	Rocky Mt. spot- ted fever	Tula- remia	Ty- phus fever	
	June 12, 1943	June 13, 1942			Ame- bic	Bacil- lary	Un- spec- ified						
NEW ENGLAND													
Maine.....	32	65	24	0	0	0	0	0	0	0	0	0	0
New Hampshire.....	15	2	2	0	0	0	0	0	0	0	0	0	0
Vermont.....	7	50	34	0	0	0	0	0	0	0	0	0	0
Massachusetts.....	132	187	162	0	0	0	0	0	0	0	0	0	0
Rhode Island.....	37	32	27	0	0	0	0	0	0	0	0	0	0
Connecticut.....	24	86	86	0	0	2	0	1	0	0	0	0	0
MIDDLE ATLANTIC													
New York.....	241	368	368	1	3	16	0	0	0	0	0	0	0
New Jersey.....	167	432	197	0	3	0	0	0	0	0	0	0	0
Pennsylvania.....	237	215	302	0	0	0	0	3	0	0	0	0	0
EAST NORTH CENTRAL													
Ohio.....	128	196	145	0	0	0	0	1	0	0	1	0	0
Indiana.....	57	34	35	0	0	0	0	0	0	0	0	0	0
Illinois.....	132	275	232	0	3	1	0	3	0	0	1	2	0
Michigan ¹	219	218	218	0	1	3	0	0	0	0	0	0	0
Wisconsin.....	246	206	125	0	0	0	0	0	0	0	0	0	0
WEST NORTH CENTRAL													
Minnesota.....	51	20	29	0	4	0	0	0	0	0	0	0	0
Iowa.....	23	29	29	0	0	0	0	0	0	0	0	0	0
Missouri.....	34	20	19	0	0	0	0	0	0	0	1	0	0
North Dakota.....	11	8	15	0	0	0	0	0	0	0	0	0	0
South Dakota.....	0	4	4	0	0	0	0	0	0	0	0	0	0
Nebraska.....	9	16	16	0	0	0	0	0	0	0	0	0	0
Kansas.....	75	55	55	0	0	0	0	1	0	0	2	0	0
SOUTH ATLANTIC													
Delaware.....	4	1	3	0	0	0	0	0	0	2	0	0	0
Maryland ¹	121	34	46	0	0	0	0	1	0	2	0	0	0
District of Columbia.....	41	24	11	0	1	0	0	0	0	0	0	0	0
Virginia.....	135	41	59	0	0	0	63	0	0	3	0	0	0
West Virginia.....	129	17	58	0	0	0	0	0	0	0	0	0	0
North Carolina.....	250	160	237	0	0	0	0	0	0	1	0	0	0
South Carolina.....	84	50	63	0	0	0	0	0	0	0	1	0	0
Georgia.....	90	14	25	0	0	12	1	1	0	1	2	14	0
Florida.....	21	10	10	0	0	0	0	0	0	0	0	5	0
EAST SOUTH CENTRAL													
Kentucky.....	55	80	80	0	0	0	0	0	0	0	0	0	0
Tennessee.....	69	67	54	0	0	0	4	1	0	0	1	0	0
Alabama.....	39	71	71	0	0	0	0	1	0	0	0	1	0
Mississippi ¹				0	0	0	0	0	0	0	2	0	0
WEST SOUTH CENTRAL													
Arkansas.....	47	42	39	0	0	1	0	0	0	0	10	0	0
Louisiana.....	7	12	12	0	0	3	0	0	0	0	0	1	0
Oklahoma.....	26	9	12	0	0	0	0	0	0	0	0	0	0
Texas.....	507	138	294	0	74	231	0	0	0	1	0	22	0
MOUNTAIN													
Montana.....	20	18	7	0	0	0	0	0	0	4	8	0	0
Idaho.....	0	1	4	0	0	0	0	0	0	0	0	0	0
Wyoming.....	0	7	6	0	0	0	0	0	0	3	0	0	0
Colorado.....	25	29	32	0	1	1	0	0	0	2	0	0	0
New Mexico.....	5	20	20	0	0	1	0	0	0	0	0	0	0
Arizona.....	23	10	17	0	0	0	30	0	0	0	0	0	0
Utah ¹	65	42	62	0	0	0	0	1	0	0	0	0	0
Nevada.....	2	6		0	1	0	0	0	0	0	0	0	0
PACIFIC													
Washington.....	60	67	67	0	0	0	0	0	0	0	0	0	0
Oregon.....	20	16	27	0	0	0	0	0	0	0	0	0	0
California.....	518	274	423	0	1	7	0	0	0	0	0	1	0
Total.....	4,240	3,778	3,778	1	92	278	98	14	0	22	28	44	
23 weeks.....	93,259	88,081	90,631	31	769	4,890	1,237	258	11	108	415	1,061	
23 weeks, 1942.....				35	407	2,034	1,181	201	30	148	427	826	

¹ New York City only.

² Period ended earlier than Saturday.

³ Exclusive of delayed report of 2 cases in Arkansas for the week ended June 5.

WEEKLY REPORTS FROM CITIES

City reports for week ended May 29, 1943

This table lists the reports from 86 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												
New Hampshire:												
Concord.....	0	0	-----	0	1	0	0	0	2	0	0	0
Vermont:												
Barre.....	0	0	-----	0	0	0	0	0	0	0	0	0
Massachusetts:												
Boston.....	0	0	-----	0	248	5	10	0	175	0	0	24
Fall River.....	0	0	-----	1	99	1	0	0	0	0	0	7
Springfield.....	0	0	-----	0	14	1	2	0	38	0	0	0
Worcester.....	0	0	-----	0	36	0	3	0	12	0	0	0
Rhode Island:												
Providence.....	0	0	-----	0	41	6	4	0	20	0	0	12
Connecticut:												
Bridgeport.....	0	0	-----	0	6	4	0	0	6	0	0	0
Hartford.....	1	0	-----	1	26	0	2	0	0	0	1	1
New Haven.....	0	0	-----	1	15	0	0	0	0	0	0	3
MIDDLE ATLANTIC												
New York:												
Buffalo.....	0	0	-----	0	77	4	10	0	8	0	0	10
New York.....	13	5	-----	10	1601	60	66	0	261	0	0	80
Rochester.....	0	0	-----	0	158	2	5	0	5	0	0	4
Syracuse.....	0	0	-----	0	67	4	3	0	2	0	1	11
New Jersey:												
Camden.....	0	0	-----	0	10	0	2	0	5	0	0	0
Newark.....	0	0	-----	4	311	5	2	0	9	0	0	39
Trenton.....	0	0	-----	0	24	0	4	0	3	0	0	0
Pennsylvania:												
Philadelphia.....	3	0	-----	1	252	8	26	0	98	0	1	53
Pittsburgh.....	1	0	-----	1	30	9	9	0	7	0	1	41
Reading.....	0	0	-----	0	43	0	1	0	1	0	0	10
EAST NORTH CENTRAL												
Ohio:												
Cincinnati.....	0	0	-----	1	48	0	3	0	20	0	0	9
Cleveland.....	4	0	-----	7	33	3	9	0	40	0	0	43
Columbus.....	0	0	-----	0	55	1	3	0	10	0	0	0
Indiana:												
Fort Wayne.....	0	0	-----	0	20	0	2	0	1	0	0	0
Indianapolis.....	0	0	-----	2	181	3	5	0	30	0	0	19
South Bend.....	0	0	-----	0	5	0	0	0	0	0	0	0
Illinois:												
Chicago.....	27	0	-----	2	671	13	30	0	87	0	0	67
Springfield.....	0	0	-----	0	47	0	3	0	0	0	0	1
Michigan:												
Detroit.....	3	1	-----	0	1,605	19	7	0	39	0	0	93
Flint.....	0	0	-----	0	266	0	0	0	2	0	0	13
Grand Rapids.....	0	0	-----	0	95	1	2	0	10	0	0	11
Wisconsin:												
Kenosha.....	0	0	-----	0	2	0	0	0	5	0	0	5
Milwaukee.....	0	0	-----	0	553	0	5	0	152	0	0	39
Racine.....	0	0	-----	0	6	0	0	0	14	0	0	1
Superior.....	0	0	-----	0	40	0	0	0	1	0	0	0

City reports for week ended May 29, 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												
Minnesota:												
Duluth.....	0	0	.....	1	21	0	3	0	0	0	0	9
Minneapolis.....	0	0	.....	0	422	2	4	0	14	0	0	14
St. Paul.....	0	0	.....	0	24	0	3	0	4	0	0	41
Missouri:												
Kansas City.....	1	0	.....	0	80	0	8	0	32	0	0	2
St. Joseph.....	0	0	.....	0	15	1	2	0	0	0	0	0
St. Louis.....	1	0	.....	1	60	11	11	0	9	0	0	7
North Dakota:												
Fargo.....	0	0	.....	0	3	0	1	0	0	0	0	0
Nebraska:												
Omaha.....	1	0	.....	0	5	0	7	0	5	0	0	0
Kansas:												
Topeka.....	0	0	.....	0	58	0	1	0	0	0	0	21
Wichita.....	0	0	.....	0	5	0	3	0	0	0	0	11
SOUTH ATLANTIC												
Delaware:												
Wilmington.....	0	0	.....	0	21	2	2	0	1	0	0	0
Maryland:												
Baltimore.....	3	0	.....	2	150	8	11	0	30	0	2	109
Cumberland.....	0	0	.....	0	0	0	0	0	0	0	0	0
Frederick.....	0	0	.....	0	1	0	0	0	1	0	0	0
Dist. of Col.:												
Washington.....	0	0	.....	1	92	10	11	0	12	0	3	39
Virginia:												
Lynchburg.....	0	0	.....	0	0	0	0	0	0	0	0	7
Richmond.....	0	0	.....	0	22	2	2	0	6	0	0	15
Roanoke.....	0	0	.....	0	1	0	0	0	0	0	1	0
West Virginia:												
Charleston.....	0	0	.....	0	0	0	0	0	1	0	0	0
Wheeling.....	0	0	.....	0	1	0	1	0	1	0	0	8
North Carolina:												
Wilmington.....	0	0	.....	0	6	0	1	0	0	0	0	23
Winston-Salem.....	0	0	.....	0	2	0	6	0	0	0	4	23
South Carolina:												
Charleston.....	0	0	.....	0	2	0	0	0	0	0	0	4
Georgia:												
Atlanta.....	0	0	.....	0	0	0	4	0	1	0	0	0
Brunswick.....	0	0	.....	0	2	0	0	0	0	0	0	0
Savannah.....	0	0	.....	0	0	0	1	0	0	0	0	1
Florida:												
Tampa.....	1	0	.....	0	1	0	0	0	0	0	0	0
EAST SOUTH CENTRAL												
Tennessee:												
Memphis.....	0	0	.....	1	120	1	6	0	1	0	0	9
Alabama:												
Birmingham.....	0	0	.....	2	7	1	4	0	0	0	0	2
Mobile.....	0	0	.....	1	0	0	0	0	0	0	1	0
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock.....	0	0	.....	1	1	1	2	0	0	0	0	0
Louisiana:												
New Orleans.....	1	0	.....	1	18	1	16	1	0	0	1	4
Shreveport.....	0	0	.....	0	0	0	0	0	0	0	0	0
Texas:												
Dallas.....	1	0	.....	0	1	0	0	0	7	0	1	22
Galveston.....	0	0	.....	0	0	0	1	0	0	1	0	0
Houston.....	0	0	.....	1	3	0	3	2	1	0	1	4
San Antonio.....	0	0	.....	0	0	0	4	0	2	0	1	0

City reports for week ended May 29, 1943—Continued

	Diphtheria cases	Enecephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox case	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
MOUNTAIN												
Montana:												
Billings.....	0	0	-----	9	9	0	0	0	0	0	0	0
Great Falls.....	0	0	-----	0	4	0	1	0	0	0	0	0
Helena.....	0	0	-----	0	7	0	0	0	0	0	0	2
Missoula.....	0	0	-----	0	117	0	0	0	8	0	0	0
Idaho:												
Boise.....	0	0	-----	0	0	0	0	0	0	0	0	0
Colorado:												
Denver.....	4	0	18	0	139	1	6	0	7	0	0	6
Pueblo.....	0	0	-----	0	4	0	0	0	3	0	0	2
Utah:												
Salt Lake City.....	0	0	-----	0	54	0	3	0	6	0	1	27
PACIFIC												
Washington:												
Seattle.....	1	0	-----	1	123	2	5	0	3	0	0	7
Spokane.....	2	0	1	1	37	0	4	0	1	0	0	1
Tacoma.....	0	0	-----	0	7	0	1	0	2	0	0	0
California:												
Los Angeles.....	1	0	9	0	159	2	5	2	27	0	0	73
Sacramento.....	4	0	1	1	1	2	3	0	1	0	0	16
San Francisco.....	0	0	3	0	58	8	8	2	19	0	1	32
Total.....	73	6	66	22	8,549	204	372	7	1,268	1	21	1,137
Corresponding week, 1942.....	63	5	63	23	5,437	31	275	6	927	2	23	1,205
Average, 1938-42.....	76	-----	55	16	5,235	-----	297	-----	1,296	10	24	1,214

Dysentery, amebic.—Cases: St. Louis, 1; Los Angeles, 1.

Dysentery, bacillary.—Cases: Detroit, 2; Charleston, S. C., 6; Los Angeles, 3.

Dysentery, unspecified.—Cases: Richmond, 1; San Antonio, 16.

Typhus fever.—Cases: Mobile, 1; Houston, 1.

¹ 3-year average, 1940-42.

² 5-year median.

Rates (annual basis) per 100,000 population, by geographic groups, for the 86 cities in the preceding table (estimated population, 1942, 34,402,100)

	Diphtheria case rates	Enecephalitis, 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.....	2.6	0.0	5.2	2.6	1,253	43.8	54.1	0	652	0	2.6	121
Middle Atlantic.....	7.6	2.2	7.1	1.3	1,148	41.0	57.1	0	178	0	1.3	111
East North Central.....	20.0	6	5.9	3.5	2,133	23.5	40.6	0	242	0	0	177
West North Central.....	5.9	0	0	3.9	1,354	27.4	84.0	0	125	0	0	205
South Atlantic.....	6.8	0	5.1	3.4	515	37.7	66.8	0	91	0	17.1	392
East South Central.....	0.0	0	14.9	14.9	949	14.9	74.7	0	8	0	7.5	82
West South Central.....	5.9	0	2.9	8.8	67	5.9	76.3	8.8	29	2.9	11.7	88
Mountain.....	32.2	0	144.7	0	2,685	8.0	80.4	0	193	0	8.0	297
Pacific.....	14.0	0	24.5	5.2	673	24.5	45.4	7.0	93	0	1.7	225
Total.....	11.1	.9	10.0	3.3	1,296	30.9	56.4	1.1	192	0.2	3.2	172

PLAGUE INFECTION IN NEW MEXICO

Plague infection has been reported proved in pools of fleas and tissue from rodents in New Mexico as follows:

Quay County: Infection proved on May 22 and 24 in pools of fleas and tissue from wood rats (*Neotoma albigula*) and grasshopper mice (*Onychomys leucogaster*) collected on U. S. Highway No. 66 at locations 15, 19, and 20 miles east of Tucumcari, Quay County, N. Mex., as follows: 330 fleas from 18 rats, 218 fleas from 23 rats, and 40 fleas from 23 mice; tissue from 1 mouse.

Sandoval County: Infection proved May 24 in a pool of 25 fleas from 30 grasshopper mice (*Onychomys* sp.) taken 2 miles west of Bernalillo on New Mexico Highway No. 44.

Torrence County: Collected May 8, a pool of 49 fleas from 2 thirteen-striped ground squirrels (*C. tridecemlineatus*) taken 2 miles south of Moriarty on State Highway No. 41.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended May 15, 1943.—During the week ended May 15, 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	Que- bec	On- tario	Mani- toba	Sas- katch- ewan	Al- berta	British Colum- bia	Total
Chickenpox.....	1	23	-----	84	259	33	13	27	70	510
Diphtheria.....	-----	18	14	24	1	7	1	-----	-----	65
German measles.....	-----	10	-----	26	127	24	7	27	16	237
Influenza.....	-----	6	2	-----	38	8	2	-----	8	63
Measles.....	1	117	3	518	1,708	135	182	257	776	3,697
Meningitis, meningococ- cus.....	-----	1	1	1	6	-----	-----	-----	-----	9
Mumps.....	1	80	2	18	997	76	43	103	182	1,602
Polymyelitis.....	-----	-----	-----	1	-----	1	-----	3	-----	5
Scarlet fever.....	3	26	24	84	341	56	37	38	47	656
Tuberculosis (all forms).....	-----	10	3	89	74	18	-----	15	35	244
Typhoid and para- typhoid fever.....	-----	-----	-----	6	1	-----	-----	1	-----	8
Undulant fever.....	-----	-----	-----	1	1	-----	-----	-----	-----	2
Whooping cough.....	-----	-----	1	85	191	81	6	31	79	474

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

Basutoland.—For the period March 1–15, 1943, 4 cases of plague with 3 deaths were reported in Basutoland.

Indochina—Cochinchina.—For the week ended February 27, 1943 1 case of plague with 1 death was reported in Cochinchina, Indochina.

Typhus Fever

Guatemala.—For the month of April 1943, 78 cases of typhus fever with 17 deaths were reported in Guatemala.

Turkey.—According to information dated May 31, 1943, typhus fever has reached the epidemic stage in Turkey, and is said to be the worst since 1905. In one day 62 new cases were reported in Ankara.