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MORTALITY IN THE NATIVE RACES OF THE TERRITORY OF ALASKA, WITH SPECIAL REFERENCE TO TUBERCULOSIS

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Soon after arrival in Alaska in the fall of 1931, to take over the duties in connection with the direction of the health work being done among the natives of Alaska, the writer made inquiry for statistics concerning the death rates from various diseases in the Territory. This inquiry revealed that no satisfactory statistics were available, and that they had never been compiled in an acceptable form, although deaths had been recorded for many years. In order to secure some information concerning death rates in the Territory, the available records were gathered, tabulated, and placed in the form herewith presented.

Alaska is divided into four judicial divisions, primarily for law-enforcement purposes, and all death certificates are filed according to the division in which the deaths occur. These divisions are shown on the map of Alaska, presented in figure 1.

Deaths have been reported to the Territorial auditor since 1927, and for several years previous to that time to the secretary of the Territory of Alaska. The reports are on file alphabetically by year and judicial division. A 5-year study was considered desirable, and the death certificates were examined for the years 1926–30, inclusive.

Death certificates in Alaska are filled out by some interested person in the village or city where the death occurs. In the larger cities and in other places where a physician is located, it is, of course, the physician's duty to complete the certificate. The Bureau of Indian Affairs maintains 20 nurses in the larger native villages scattered throughout the Territory. The various mission boards maintain nurses in several of the villages where no Government nurse is stationed. It is frequently necessary for these nurses to diagnose conditions, treat the sick natives, and, if death occurs,

complete the death certificate. In still other villages the teacher, trader, missionary, or even the parents of the deceased must attend to the completion and filing of the certificate. After completion it is recorded by the nearest United States commissioner and forwarded by him to the auditor of the Territory for final check and filing. For the Territory as a whole, about two fifths of the death certificates are completed by persons other than physicians or nurses, and in the northern divisions the percentages completed by lay persons are even larger. In southeastern Alaska about three fourths of the certificates are filed by physicians, the remainder being filed mostly

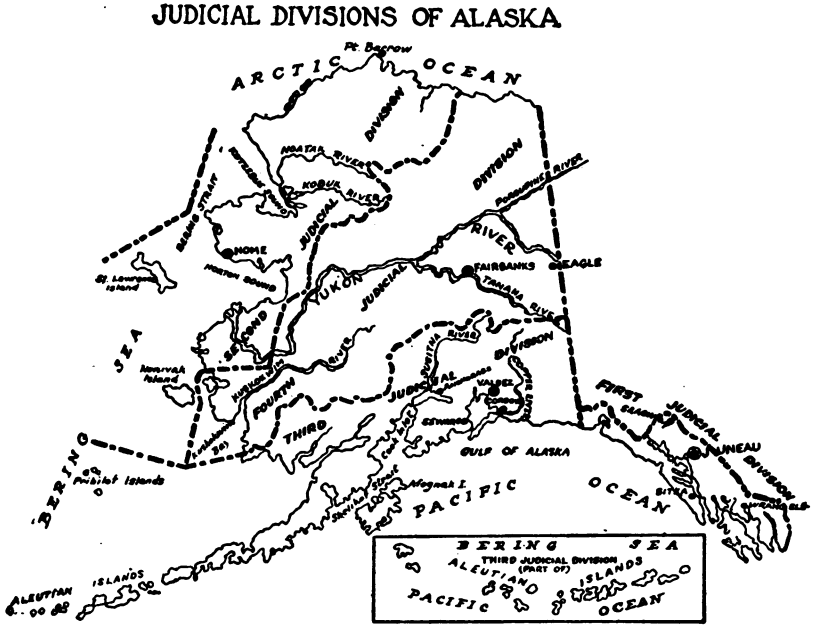

FIGURE 1.

by nurses. The statement of the cause of death is necessarily less reliable for the northern districts.

Before entering into a discussion of the various causes of death some explanation of the characteristics of the population of Alaska may be made. The official United States census for 1930 shows that approximately 60,000 people reside permanently within the boundaries of the Territory. This population may be roughly divided into one half native and one half white and other races. Table 1 gives the figures as obtained from the census reports. In tabulating the deaths, and in the census reports, a native was considered as anyone who claimed any degree of Indian, Aleut, or Eskimo blood.

TABLE 1.—*Mortality from all causes among the native Indians and Eskimos and the white and other population of Alaska during the 5 years 1926–30*

	All Alaska	Judicial division			
		1	2	3	4
Population according to United States census of Oct. 1, 1929:					
All races	59,278	19,304	10,127	16,309	13,538
Native Indians and Eskimos	29,983	5,990	8,686	7,298	8,009
White	28,640	12,877	1,427	8,848	5,488
Other	655	437	14	163	41
Number of deaths from all causes during the 5 years:					
All races	4,572	1,565	860	1,143	1,004
Native Indians and Eskimos	2,767	755	775	556	681
White	1,704	755	83	546	320
Other	101	55	2	41	3
Average annual death rate from all causes per 1,000 population:					
Native Indians and Eskimos	18.5	25.2	17.8	15.2	17.0
White	11.9	11.7	11.6	12.3	11.7
Number of deaths from all causes reported by—					
Physicians	2,293	1,120	194	614	365
Nurses	409	187	120	19	83
Others	1,870	258	546	510	556
Percentage of deaths from all causes reported by—					
Physicians	50.2	71.6	22.5	53.7	36.4
Nurses	8.9	11.9	14.0	1.7	8.3
Others	40.9	16.5	63.5	44.6	55.3
Number of tuberculosis deaths	1,073	298	258	240	277
Number reported by—					
Physician or nurse	629	258	119	119	133
Others	444	40	139	121	144
Percentage reported by—					
Physician or nurse	58.6	86.6	46.1	49.6	48.0
Others	41.4	13.4	53.9	50.4	52.0

The white population of Alaska is found chiefly in the larger cities; but white traders, missionaries, and school teachers live in practically every village. A large proportion of the white people live in southeastern Alaska, another large group in the seaport cities south of the Alaska Peninsula, and a third large group in the territory adjacent to the Alaska railroad. Other smaller groups are to be found in the various mining and fishing cities scattered throughout the Territory. It may be noted that the number of white people in the judicial divisions decreases as we go north, while the native population increases. Fishing, mining, agriculture, and seafaring furnish work for a large percentage of the white people. Most of the industries give work to single men; and it is noted in the 1930 census report that there were 228 white males for each 100 white females.

The native population in Alaska, as in the United States, is becoming mixed with the whites and other races. Figure 2, based on the 1930 census of Alaska, shows the increasing amount of mixed bloods among the younger natives. The natives of Alaska are to be found in all inhabited sections. Villages exist from Metlakatla in the south, to Barrow in the extreme north, and from Eagle on the Yukon River near the Canadian border, to Attu in the eastern hemisphere. The mixing of population is especially noticeable in southeastern Alaska and in the fishing and mining districts. In the more isolated sections the predominance of pure native blood among the inhabitants is easily recognizable.

The scarcity of old natives, the large number of children born to each native mother, and the large number of children seen in the native villages, together with the large number of deaths among the children suggested a comparison of the percentage of population in

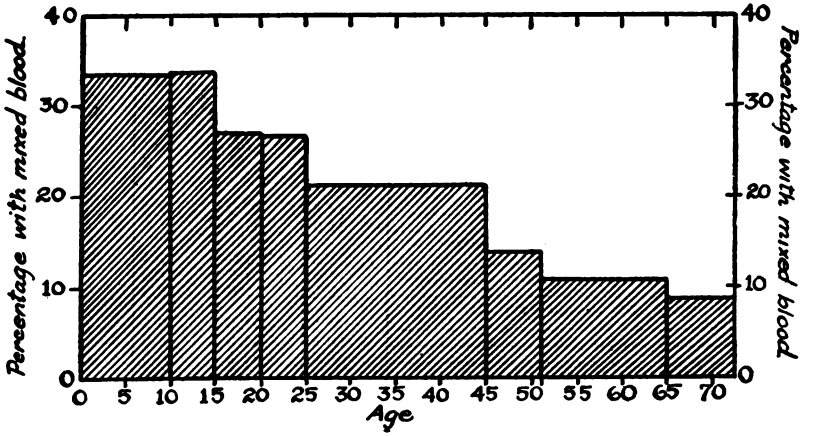

FIGURE 2.—Percentage of native Alaskan Indian and Eskimo population with mixed blood, by specific ages, 1930. (From the 1930 Census of Outlying Territories, p. 21. U.S. Bureau of the Census, Department of Commerce. Government Printing Office, Washington.)

each age group. Figure 3, based on the 1930 census of Alaska, presents this comparison graphically. From this chart it can readily be seen that a large percentage of the native deaths occur before the age 20.

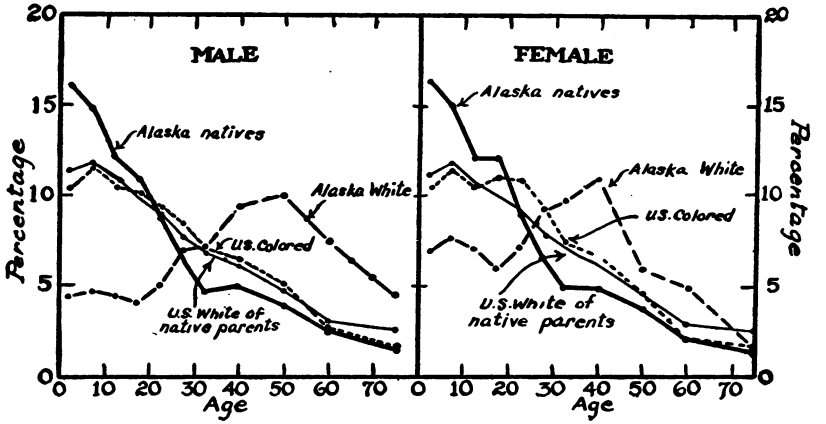

FIGURE 3.—Percentage of various racial groups in each 5-year age group according to the census of 1930. (For ages above 35, data are available in 10-year groups only. These 10-year groups for the older ages have been divided by 2 to make them comparable with 5-year age groups.) (From the 1930 census of the United States and Alaska.)

The total deaths and the death rates are shown by race and judicial division in table 1. In the First Division, southeastern Alaska, the average annual death rate in the 5-year period among the native Indians and Eskimos is 25 per 1,000, as compared with 12 per 1,000

among the whites. In the other divisions the reported death rate among the native races ranges from 15 to 18 per 1,000, but the scattered population, absence of physicians and nurses, and other circumstances make for incomplete registration of deaths. It is probable that the death rate in southeastern Alaska more nearly represents the true rate among natives in the whole territory than the incomplete reports for the other districts.

TABLE 2.—*Actual and relative mortality from important causes among the native Indians and Eskimos and among the white population of Alaska, during the 5 years, 1926–30*

Judicial division, and race	All causes	Tuberculosis (all forms)	Pneumonia (all forms)	Influenza	Accidents	Cardiac	Cerebral hemorrhage	Malignancy	Gastrointestinal	Suicide	Senility	Unknown	All other causes
	Average annual death rate per 100,000												
All Alaska:													
Native [1]	1,846	655	160	122	103	63	15	24	51	6	71	165	408
White	1,190	56	57	15	202	226	103	89	32	52	38	36	284
1st division:													
Native [1]	2,521	888	271	50	160	130	37	70	57	10	154	130	564
White	1,173	42	68	23	177	213	121	92	28	28	34	25	322
2d division:													
Native [1]	1,785	592	161	81	101	62	16	14	92	7	58	159	442
White	1,163	14	14	0	224	294	154	126	14	42	56	42	182
3d division:													
Native [1]	1,524	532	121	49	85	38	8	22	27	6	52	154	430
White	1,234	90	52	9	240	224	81	75	52	81	34	32	265
4th division:													
Native [1]	1,701	662	112	287	80	38	5	3	25	3	43	210	235
White	1,166	44	51	7	193	241	84	98	15	66	47	66	255
	Percent of all deaths due to indicated cause												
All Alaska:													
Native [1]	100.0	35.5	8.7	6.6	5.6	3.4	0.8	1.3	2.8	0.3	3.9	9.0	22.1
White	100.0	4.7	4.8	1.2	17.0	19.0	8.7	7.5	2.7	4.4	3.2	3.0	23.9
1st division:													
Native [1]	100.0	35.2	10.7	2.0	6.4	5.2	1.5	2.8	2.3	.4	6.1	5.2	22.4
White	100.0	3.6	5.8	2.0	15.1	18.1	10.3	7.8	2.4	2.4	2.9	2.1	27.4
2d division:													
Native [1]	100.0	33.2	9.0	4.5	5.7	3.5	.9	.8	5.2	.4	3.2	8.9	24.8
White	100.0	1.2	1.2	0	19.3	25.3	13.3	10.8	1.2	3.6	4.8	3.6	15.7
3d division:													
Native [1]	100.0	34.9	7.9	3.2	5.6	2.5	.5	1.4	1.8	.4	3.4	10.1	28.2
White	100.0	7.3	4.2	.7	19.4	18.1	6.6	6.0	4.2	6.6	2.7	2.6	21.4
4th division:													
Native [1]	100.0	38.9	6.6	16.9	4.7	2.2	.3	.1	1.5	.1	2.5	12.3	13.8
White	100.0	3.8	4.4	.6	16.6	20.6	7.2	8.4	1.3	5.6	4.1	5.6	21.9
	Number of deaths												
All Alaska:													
Native [1]	2,767	982	240	183	155	95	23	36	77	9	107	248	612
White	1,704	80	82	21	289	323	148	128	46	75	54	51	407
1st division:													
Native [1]	755	266	81	15	48	39	11	21	17	3	46	39	169
White	755	27	44	15	114	137	78	59	18	18	22	16	207
2d division:													
Native [1]	775	257	70	35	44	27	7	6	40	3	25	69	192
White	83	1	1	0	16	21	11	9	1	3	4	3	13
3d division:													
Native [1]	556	194	44	18	31	14	3	8	10	2	19	56	157
White	546	40	23	4	106	99	36	33	23	36	15	14	117
4th division:													
Native [1]	681	265	45	115	32	15	2	1	10	1	17	84	94
White	320	12	14	2	53	66	23	27	4	18	13	18	70

[1] Including all Indians and Eskimos.

Death rates from important causes among the natives and the whites are shown in table 2 and figure 4. Among the native Indians and Eskimos tuberculosis stands out far above any other cause of death, with a death rate of 655 per 100,000 for the whole native population of Alaska. In the southeastern division, where deaths are more completely reported, the rate is 888 per 100,000 natives. Tuberculosis constitutes 35 percent of all deaths among the natives, a figure which does not vary greatly in the different divisions.

The relative preponderance of young natives and old white people in Alaska is shown in figure 3. The large number of deaths from

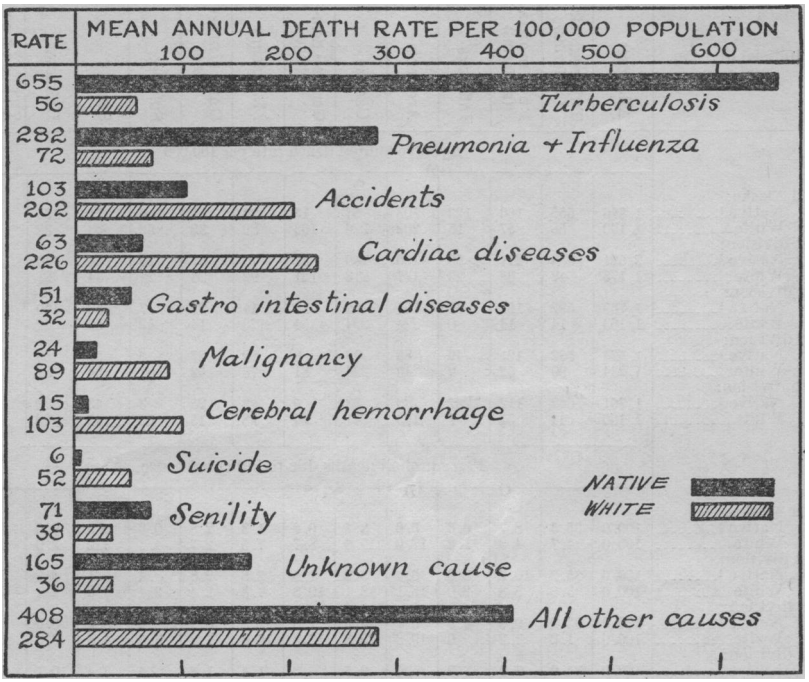

FIGURE 4.—Mortality from important causes among native Indians and Eskimos and among whites in Alaska during the years 1926–1930.

cardiac diseases, malignancy, and cerebral hemorrhage in the white population is therefore to be expected. The large number of accidental deaths among the whites when compared with the natives is due chiefly to the fact that a great many white men are engaged in hazardous occupations, such as mining and seafaring. The native, who lives more or less by fishing and hunting, is not exposed to the dangers connected with more hazardous occupations.

Deaths from unknown causes are much higher in the native than in the white population, because many natives die away from contact with a physician or nurse, and the person completing the death certificate hesitates to make a statement as to the cause of death when

he is not familiar with the symptoms of the various diseases. It is interesting to note that 69 percent of the deaths among the natives classified as cause unknown occurred in children under 20 years of age.

Suicide is a fairly common cause of death among the white population and is much higher in Alaska than in continental United States. The Mortality Statistics for 1929, issued by the Bureau of the Census, Department of Commerce, show the rate in the United States to be 14 per 100,000 population. The average rate among whites in Alaska during the years 1926–30 was 52 per 100,000. Many white men come to Alaska with the idea of making a fortune, and as failure is more usual than success, a great many of them resort to suicide as the easiest way out of their plight. Pat O'Cotter has apparently, although perhaps undesignedly, stated the reason for the high suicide rates in the following lines:

The lure of the Land had gripped him,
The Land where you die if you fail;
The Land of the fabled fortune,
The Land of the endless trail,
The Land of the lonely silence,
The Land of the cruel cold,
The Land of the lost ambitions,
Alaska, the Land of Gold.

Table 2 shows also for both natives and whites the percentage of all deaths that were due to each cause. Percentages as well as the rates are more reliable for southeastern Alaska for the reason that a large proportion of the deaths in this district (72 percent) have been reported by physicians. With reference to most of the diseases, and to tuberculosis especially, one can see that the percentages for the other districts compare closely with those from southeastern Alaska, Judicial Division No. 1. The one large discrepancy is found in the deaths listed for influenza. This is explained by an influenza epidemic that occurred in Judicial Division No. 4 in 1927 and did not extend into any of the other divisions.

TABLE 3.—*Annual mortality from tuberculosis (all forms) among the native Indians and Eskimos and the white population of Alaska, 1926–32*

Judicial division and race	Total, 1926–30	1926	1927	1928	1929	1930	1931	1932
	Annual death rate per 100,000							
All Alaska:								
Native Indians and Eskimos	655	644	590	600	694	747	----	----
White	56	77	59	49	45	49	----	----
1st division:								
Native Indians and Eskimos	888	1,052	818	751	918	902	1,119	1,302
White	42	31	70	31	31	47	93	78
2d, 3d, and 4th divisions:								
Native Indians and Eskimos	597	542	534	563	638	709	----	----
White	67	114	51	63	57	51	----	----

TABLE 3.—*Annual mortality from tuberculosis (all forms) among the native Indians and Eskimos and the white population of Alaska, 1927–32*—Continued

Judicial division and race	Total, 1926–30	1926	1927	1928	1929	1930	1931	1932
	Number of deaths							
All Alaska:								
Native Indians and Eskimos	982	193	177	180	208	224	-------	-------
White	80	22	17	14	13	14	-------	-------
1st division:								
Native Indians and Eskimos	266	63	49	45	55	54	67	78
White	27	4	9	4	4	6	12	10
2d division:								
Native Indians and Eskimos	257	47	51	58	44	57	-------	-------
White	1	0	1	0	0	0	-------	-------
3d division:								
Native Indians and Eskimos	194	34	28	39	43	50	-------	-------
White	40	14	4	8	8	6	-------	-------
4th division:								
Native Indians and Eskimos	265	49	49	38	66	63	-------	-------
White	12	4	3	2	1	2	-------	-------

TABLE 4.—*Mortality from tuberculosis (all forms) of males and females of different ages in the native Indian and Eskimo population of Alaska, 1926–30*

Age	All Alaska			1st judicial division			2d, 3d, and 4th judicial divisions		
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
	Average annual tuberculosis death rate per 100,000								
All ages	655	633	678	888	814	964	597	589	606
Under 1	934	979	885	1,881	2,366	1,468	702	685	722
1 to 9	444	503	382	711	759	664	382	447	315
10 to 19	610	553	667	941	883	996	536	481	591
20 to 29	936	744	1,134	1,373	1,059	1,704	826	663	993
30 to 39	743	639	851	499	179	850	809	768	851
40 to 49	580	530	634	735	704	769	540	486	599
50 to 59	605	708	488	567	451	697	617	782	424
60 and over	588	819	305	782	1,116	412	513	711	260
	Number of deaths								
All ages	982	486	496	266	123	143	716	363	353
Under 1	48	26	22	19	11	8	29	15	14
1 to 9	184	106	78	55	29	26	129	77	52
10 to 19	216	98	118	61	28	33	155	70	85
20 to 29	213	86	127	63	25	38	150	61	89
30 to 39	111	49	62	16	3	13	95	46	49
40 to 49	77	37	40	20	10	10	57	27	30
50 to 59	56	35	21	12	5	7	44	30	14
60 and over	43	33	10	16	12	4	27	21	6
Unknown	34	16	18	4	-------	4	30	16	14

As tuberculosis is the most important cause of death among the native population of Alaska, some further data on this cause seem desirable. Rates based on the reported deaths during the 5-year period under study are reasonably similar for divisions 2, 3, and 4, but are higher for southeastern Alaska, probably because of more accurate reporting. Table 3 shows rates by years from 1926 to 1932 for Division No. 1 and from 1926 to 1930 for all Alaska except Division No. 1. The periods are too short to give much information about the trend, but there is a suggestion of a rising rate, particularly in south-

eastern Alaska for 1931 and 1932. Data from the other districts for these 2 years are not yet available.

Figures submitted for the number of tuberculosis deaths among the natives are probably low, owing to the fact that many of the deaths listed as unknown occurred in children under 20 and no doubt a large percentage of these was due to tuberculosis. Other deaths listed as cold, fever, convulsions, meningitis, etc., might well have been

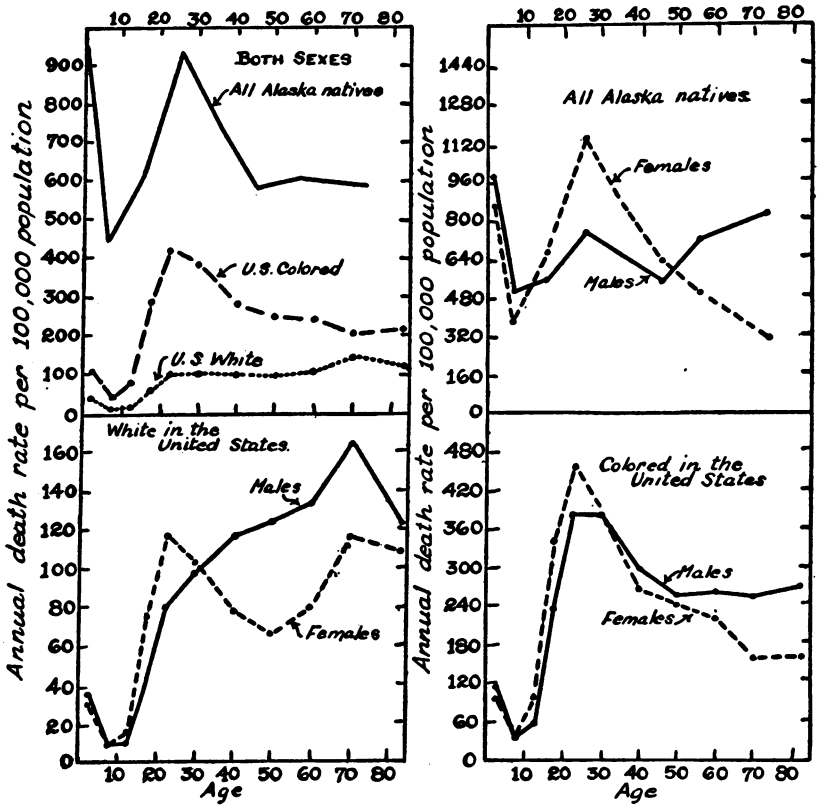

FIGURE 5.—Tuberculosis mortality at specific ages among Alaskan native Indians and Eskimos during the period 1926–30, with comparative data for colored and white persons in the United States during 1927.

tuberculosis. The number of incorrectly diagnosed tuberculosis deaths should not equal the number of tuberculosis deaths incorrectly listed under the above causes.

The figures submitted for the tuberculosis deaths among the white population of Alaska probably do not tell a true story. This is due to the fact that most of the white people contracting the disease in Alaska go "outside" for treatment as soon as a diagnosis is made and never return. This is, of course, impossible for the native people.

Figure 5 shows tuberculosis mortality by age and sex for the Alaska natives and for colored and white persons in the United States, as

given in "Facts and Figures about Tuberculosis," by Jessamine S. Whitney. In the upper left section of figure 5, rates for both sexes are shown by age for the three groups. The rates for Alaskan natives are far above even the colored population of the United States. In the other three sections of the chart, rates for males and females of each group have been plotted on scales appropriate for comparing the two sexes rather than comparison from one racial group to another. In both the white and colored population of the United States, tuberculosis mortality above 30 years of age is higher among males than females. In the Alaskan natives the rates are distinctly higher for females from 10 to 50 years of age.

In presenting this article, the purpose is to give the mortality picture as accurately as the data will permit; it is not within the scope of this paper to discuss methods for correction of existing conditions. It might be said, however, that the poor economic conditions, the unhygienic methods of living, ignorance, superstitions, difficulties of communication and travel, expense of transporting supplies, and the lack of interest on the part of most whites and natives in the Territory will probably tend to make an attempt to eradicate tuberculosis from the native a very difficult, tedious, and expensive undertaking.

FURTHER OBSERVATIONS ON THE AGGLUTINATION OF PROTEUS X STRAINS IN ROCKY MOUNTAIN SPOTTED FEVER (II)[1]

By GORDON E. DAVIS, *Bacteriologist*, R. R. PARKER, *Special Expert*, and MARY E. WALKER, *Laboratory Assistant, United States Public Health Service*

In a former report (1932) we presented the results of agglutination tests in which 10 strains of *proteus* X were used with 89 Rocky Mountain spotted fever sera, as follows: 36 single serum samples, 21 sera from 9 additional cases, 6 sera from fatal cases, and 26 sera from individuals recovered from 1 month to 33 years.

Attention was called to the irregularity with which titers of diagnostic significance were obtained, to the optimum time for securing blood samples as indicated by these tests, and to the relatively high titers obtained with occasional sera when using OX_2 as the test antigen.

The present report concerns similar agglutination tests made during 1932. Eighty-one cases are involved, from 57 of which there were single samples, and from 24, multiple samples. A maximum of 13 strains of *proteus* X were used. Two of these, $X_{19}(1)Z$ and $X_{19}(2)Z$, both Weil strains not formerly used by us, were re-

[1] Contribution from the Rocky Mountain Spotted Fever Laboratory of the United States Public Health Service, Hamilton, Mont.

ceived from Professor Zinsser, of the Harvard Medical School, and the third (N.I.H. No. 504) (Breinl) was obtained from the National Institute of Health, Washington, D.C. These three strains were O variants, while one was an intermediate type uniformly showing only a narrow fringe of growth about a discrete colony. All other X_{19} strains were H variants.

For test purposes, 18- to 24-hour growths of these strains on dry agar were suspended in saline and standardized to 500 parts per million (silica standard). The sera were used unheated and without preservative. Incubation was at 37° C. for 2 hours, followed by 48 hours in the electric refrigerator. In the tables of results, the upper figures represent the dilution of serum in which there was 100 percent agglutination, the lower give the highest serum dilution in which there was definite agglutination.

TABLE 1.—*The agglutination of proteus X strains by sera from 57 cases of Rocky Mountain spotted fever*

Serum no.	Days after onset	Agglutinin titer for proteus X strains						
		OXK	HXK	OX_2	HX_2	OX_{19} (1) Z	OX_{19} (2) Z	OX_{19} (504)
313	1	0	0	0	0	0	0	40
		40	40	20	0	20	0	160
337	3	0	0	0	0	40	0	80
		80	40	40	20	160	160	320
262	3	0	0	0	0	0	0	40
		0	40	0	40	40	0	160
272	4	0	0	0	0	0	0	0
		40	40	20	80	20	0	40
293	4	0	-----	0	-----	0	0	0
		0	-----	0	-----	20	0	40
261	5	0	0	-----	0	40	40	40
		0	0	-----	0	80	80	80
263	5	0	0	0	0	0	0	0
		0	0	0	0	0	0	80
260	6	0	0	0	0	0	0	160
		0	20	0	0	40	0	320
319	6	0	0	0	0	0	0	0
		0	20	20	0	20	20	40
391	6	-----	-----	-----	-----	0	0	0
		-----	-----	-----	-----	20	20	80
271	7	0	0	0	0	0	0	160
		0	0	0	0	640	320	640
369	7	0	0	0	0	0	0	0
		0	0	20	40	40	40	80
384	7	-----	-----	-----	-----	0	0	---------
		-----	-----	-----	-----	0	20	---------
312	8	0	0	0	0	0	0	0
		20	20	20	0	20	40	40
354	8	0	-----	0	-----	0	0	0
		0	-----	20	-----	0	0	20
281	9	0	0	0	0	0	0	0
		20	40	0	20	0	20	40
295	9	0	0	0	0	0	40	80
		20	40	20	20	160	160	320
296	10	0	0	0	0	640	640	1,280
		20	20	20	20	2,560	2,560	5,120
347	10	0	0	0	0	320	320	320
		40	40	40	40	640	1,280	1,280
390	10	-----	-----	-----	-----	0	0	40
		-----	-----	-----	-----	40	40	80
258	11	0	0	0	0	1,280	640	640
		0	0	0	0	2,560	1,280	2,560
349	11	0	0	0	0	0	80	40
		80	80	0	20	40	160	160
373	11	0	0	0	0	160	160	80
		40	80	20	40	320	320	320

See footnotes at end of table.

TABLE 1.—*The agglutination of proteus X strains by sera from 57 cases of Rocky Mountain spotted fever*—Continued

Serum no.	Days after onset	Agglutinin titer for proteus X strains						
		OXK	HXK	OX_2	HX_2	OX_{19} (1) Z	OX_{19} (2) Z	OX_{19} (504)
279	12	0	0	0	0	40	80	80
		40	40	20	20	80	160	320
368	12	0	0	0	0	0	0	0
		0	0	0	0	40	40	40
323	13	0	20	0	0	160	80	160
		20	0	0	0	320	160	640
330	13	0	0	0	0	320	160	320
		20	0	0	0	1, 280	640	1, 280
361	13	0	----	0	0	80	80	40
		80	----	0	0	320	320	80
336	15	0	0	0	0	0	0	40
		0	40	40	40	80	80	160
286	16	0	0	0	0	0	0	0
		20	20	0	0	40	20	80
329	16	0	0	0	0	80	160	160
		20	20	0	0	160	320	640
338	16	0	0	0	0	320	320	320
		40	40	0	0	1, 280	1, 280	1, 280
325	17	0	0	0	0	40	40	160
		20	20	0	0	160	160	320
360	17	0	0	0	0	0	0	0
		20	40	0	0	40	20	80
275	18	0	0	0	0	640	640	640
		80	160	40	40	1, 280	1, 280	2, 560
302	18 [1]	0	0	0	0	320	320	320
		20	40	40	40	640	640	1, 280
315	18	0	0	0	0	80	160	320
		20	20	0	0	320	320	1, 280
335	18	0	0	80	80	2, 560	2, 560	2, 560
		20	40	320	160	10, 240	10, 240	2, 560
326	20	160	160	0	0	1, 280	1, 280	2, 560
		320	320	20	0	2, 560	2, 560	5, 120
278	21	0	0	0	0	0	0	)
		40	40	40	20	20	0	40
299	21	0	0	0	0	160	80	320
		20	40	40	40	320	320	640
310	21	0	0	0	0	160	320	320
		80	80	20	20	320	640	640
317	21	0	0	0	0	0	0	40
		20	20	0	0	80	40	160
324	21	0	0	0	0	640	320	640
		80	80	0	0	1, 280	640	2, 560
267	22	0	0	0	0	320	640	640
		20	20	20	40	1, 280	2, 560	2, 560
377	22	0	0	0	0	80	80	80
		0	0	0	0	160	160	320
314	24	0	0	0	0	1, 280	640	1, 280
		20	20	20	20	2, 560	1, 280	2, 560
339	24	----	----	0	----	0	0	0
		----	----	0	----	80	80	160
346	24	0	0	0	0	0	0	0
		160	160	0	0	20	20	80
284	30	0	0	0	0	80	320	320
		20	20	20	20	320	1, 280	640
341	30	0	0	0	0	640	640	640
		40	40	0	0	1, 280	2, 560	2, 560
366	32	0	0	0	0	20	20	40
		80	40	0	0	80	80	80
371	45	0	0	0	0	0	0	160
		0	0	0	0	640	320	640
386	2 months, 16 days	----	----	----	----	0	0	0
		----	----	----	----	20	20	80
363	1 year	0	0	0	----	0	0	0
		0	0	0	----	20	20	40
277	11 years	0	0	0	0	0	0	0
		0	0	0	0	0	0	20
247	13 years	0	0	0	0	0	0	0
		20	40	0	20	20	20	40

[1] Convalescent.

0=Negative in a final serum dilution of 1:20.
----=Not tested.
The upper figures represent the dilution of serum in which there was 100 percent agglutination; the lower give the highest serum dilution in which there was definite agglutination.

TABLE 2.—*The agglutination of proteus X strains by 2 or more sera from each of 24 cases of Rocky Mountain spotted fever*

Serum no.	Days after onset	Agglutinin titer for proteus X strains						
		OXK	HXK	OX_2	HX_2	OX_{19} (1) Z	OX_{19} (2) Z	OX_{19} (504)
252 (a)	6	0	0	0	0	0	0	0
(b)	14	40	40	0	0	0	40	160
(c)	21	0	0	0	0	0	0	40
254 (a)	19	80	40	0	0	80	80	160
(b)	27	0	0	0	0	0	0	160
256 (a)	14	40	40	20	20	160	320	320
(b)	29	0	0	0	0	0	----------	0
257 (a)	12	40	40	20	20	40	----------	40
(b)	27	0	0	0	0	40	80	80
259 (a)	7	20	80	40	40	80	160	160
(b)	14	0	0	0	0	----------	160	640
(c)	20	0	40	0	0	----------	640	1, 280
265 (a)	7	0	0	0	0	0	0	80
(b)	14	0	0	0	0	40	40	320
266 (a)	13	0	0	0	0	160	160	640
(b)	23	0	0	40	40	640	640	1, 280
268 (a)	11	0	0	0	0	0	0	80
(b)	20	20	40	0	0	80	160	320
269 (a)	16	0	0	0	0	40	80	80
(b)	31	80	80	20	20	80	160	320
285 (a)	8	0	0	0	0	80	160	80
(b)	14	40	40	20	20	160	320	320
288(a)	8	0	0	0	0	160	160	160
(b)	13	0	0	0	0	320	320	640
297(a)	14	40	80	0	0	640	640	640
(b)	24	160	320	80	80	1, 280	1, 280	2, 560
300(a)	15	0	0	0	0	640	1, 280	1, 280
(b) [1]	20	80	80	80	20	2, 560	2, 560	5, 120
305(a)	10	0	0	0	0	80	80	80
(b)	13	40	40	0	0	160	160	320
(c)	18	0	0	0	0	320	160	160
308(a)	5	20	40	20	20	40	20	80
(b)	6	0	0	0	0	160	80	320
311(a)	12	20	20	0	40	320	320	640
(b)	14	0	0	0	0	320	320	320
316(a)	11	20	40	20	20	640	640	1, 280
(b)	21	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
		0	0	0	0	0	0	0
		0	0	0	0	0	0	40
		0	0	0	0	0	0	0
		40	40	40	80	20	80	40
		0	0	0	0	0	0	0
		20	0	40	40	0	0	160
		0	0	0	0	320	320	640
		0	0	0	0	1, 280	1, 280	5, 120
		0	0	0	0	320	640	320
		0	20	0	0	1, 280	1, 280	1, 280

See footnotes at end of table.

TABLE 2.—*The agglutination of proteus X strains by 2 or more sera from each of 24 cases of Rocky Mountain spotted fever*—Continued

Serum no.	Days after onset	Agglutinin titer for proteus X strains						
		OXK	HXK	OX_2	HX_2	OX_{19} (1) Z	OX_{19} (2) Z	OX_{19} (504)
327(a)	5	0	0	0	0	0	0	0
		0	20	0	0	40	20	80
(b)	14	0	0	0	0	40	40	80
		20	40	40	80	160	160	320
331(a)	10	0	0	0	0	160	0	80
		0	20	0	20	640	40	320
(b)	20	0	0	0	0	640	640	640
		20	40	20	40	1,280	1,280	2,560
332(a)	7	0	0	0	0	0	0	0
		0	0	0	0	40	20	80
(b)	17	0	0	0	0	0	40	80
		0	0	0	0	80	80	160
345(a)	6	0	0	0	0	0	0	40
		20	20	20	20	20	20	160
(b)	20	0	0	0	0	320	160	640
		0	0	0	0	1,280	320	1,280
375(a)	16	0	0	0	0	0	0	0
		40	20	20	20	0	20	40
(b)	27	0	------	0	------	0	----------	0
		0	------	80	------	40	----------	40
379(a)	4	0	------	0	------	0	----------	0
		20	------	0	------	0	----------	40
(b)	25	------	------	------	------	0	0	0
		------	------	------	------	40	80	160
383(a)	13	0	------	0	------	0	----------	80
		20	------	20	------	160	----------	320
(b)	28	------	------	------	------	80	80	80
		------	------	------	------	160	160	320

[1] Blood drawn 2 hours post mortem.
0=Negative in a final serum dilution of 1:20.
------=Not tested.
The upper figures represent the dilution of serum in which there was 100 percent agglutination; the lower give the highest serum dilution in which there was definite agglutination.

ANALYSIS OF AGGLUTINATION DATA (TABLES 1 AND 2)

The results of H-type agglutination have not been recorded in our tables; and since this type of agglutination is presumably of no diagnostic value (i.e., unless a "specific" strain of *proteus* should be isolated), no summarization of these data seems necessary. Strain X_{19} (1)Z, which was an O variant at the beginning of the work, later showed an O–HO reversion. This strain, therefore, has not been considered in the following analysis.

Of the two OX_{19} strains employed, (2)Z and 504, the latter is patently the more sensitive. Of the 96 sera with which these strains were used and with which agglutination occurred, both were agglutinated equally by 20 sera, but the latter (OX_{19} 504) was agglutinated in 1 dilution higher by 40 sera, in 2 dilutions higher by 18, in 3 dilutions higher by 7, in 4 dilutions higher by 3, in 5 dilutions higher by 3, and in 6 dilutions higher by 1. On the other hand, (2)Z was more sensitive to only 4 sera, 2 of which caused (2)Z agglutination by 1 dilution higher than it did 504, and 2 caused agglutination in 2 higher dilutions.

Using these results of OX_{19} (504) agglutinations as given in tables 1 and 2, the following data have been obtained that bear on the

relation of time of sample taking (after onset of symptoms) to the presence of OX_{19} agglutinins in diagnostic titer. It is not felt that a set statement is justified as to what agglutinin titer is or is not of diagnostic value; but in the light of several years' experience, we believe that a 2+, 3+, or 4+ agglutination at a dilution of 1:160 is significant in the great majority of tests, and this is the criterion which has been used in analyzing our data.

Of 27 samples taken during the first 9 days of illness, 10, or 37.03 percent, showed agglutination in sufficient titer to be of significance (6 at 1:160, 3 at 1:320, and 1 at 1:640). Of the remaining 17 samples, 2 were completely negative and 15 gave partial or complete agglutination in dilutions of from 1:20 to 1:80.

Of 31 samples taken from the tenth to fifteenth days, inclusive, 26, or 83.87 percent, showed a significant agglutinin titer (4 in 1:160, 7 in 1:320, 5 in 1:640, 4 in 1:1,280, 4 in 1:2,560, 1 in 1:5,120, and 1 in 1:10,240). The remaining 5 showed partial or complete agglutination in 1:40 or 1:80.

Of 26 samples taken from the sixteenth to twenty-first days, inclusive, 21, or 80.77 percent, showed a significant titer (2 in 1:160, 4 in 1:320, 4 in 1:640, 6 in 1:1,280, 4 in 1:2,560, and 1 in 1:5,120). The other 5 caused complete or partial agglutination in 1:20, 1:40, or 1:80.

Of 16 samples taken from the twenty-second to thirty-second days, 13, or 81.25 percent, showed a significant titer (3 in 1:160, 4 in 1:320, 1 in 1:640, 3 in 1:2,560, 1 in 1:5,120, and 1 in 1:10,240). The remaining 3 were agglutinated partially or completely in 1:40 or 1:80.

Of 2 samples taken forty-five and forty-seven days after onset, respectively, the former caused agglutination in a dilution of 1:640 and the latter in 1:80.

Three samples taken in 1, 11, and 13 years after recovery showed only partial agglutination in 1:20 and 1:40.

In table 3 the above data are summarized to indicate the period after onset during which the blood samples of significant titer were taken.

TABLE 3.—*Period after onset during which blood samples (tables 1 and 2) of significant agglutinin titer were taken and the titer of each for strain* OX_{19} *(504)*

Period, days inclusive	Total samples tested	Number of sample having agglutinin titer of—								Percent significant
		1:80 [1] or less	1:160	1:320	1:640	1:1,280	1:2,560	1:5,120	1:10,240	
1st to 9th	27	17	6	3	1					37.03
10th to 15th	31	5	4	7	5	4	4	1	1	83.87
16th to 21st	26	5	2	4	4	6	4	1		80.77
22d to 32d	16	3	3	4	1		3	1	1	81.25

[1] Not of significant titer.

Table 1 shows that, of 35 cases from which a single sample was taken at some time between the tenth and thirty-second days after onset, the agglutination test with strain 504 was significant for 27, i.e., for 77.14 percent. On the other hand, table 2 shows that, when two or more samples were taken, one of which was secured either after the ninth day or during early convalescence, the test was positive in 21 of 22 cases, i.e., for 95.45 percent. In a number of these cases the diagnostic sample was taken during convalescence.

A further analysis of table 2 shows that there were 15 cases from which blood samples were taken both between the tenth and seventeenth days (during the period when a definite rise in agglutinins has appeared in most cases) and during convalescence. In this connection we are assuming that samples after the seventeenth day were taken post febrile, an assumption that would be true in a considerable proportion of cases, though we lack definite data for most of those here concerned. The data of these 15 cases show that the highest agglutinin titer was during illness in 4 cases (256, 257, 268, 316), during early convalescence in 7 (252, 254, 297, 300, 305, 331, 345), and the titer for the two periods was equal in 4 (259, 266, 375, 383). The convalescent sera were taken at various times from the eighteenth to the twenty-ninth day, and only 1 before the twentieth day. One case (254) is of particular interest in that a sample taken the nineteenth day was not significant, whereas one taken the twenty-ninth day was of diagnostic titer.

The use of the strain OXK gave the following results: Of 51 first- to thirty-second-day serum samples, only one (326) caused complete agglutination in any dilution. This one serum caused 4+ agglutination in 1:160 and 2+ in 1:320. Of the other 50 samples, seventeen caused 2 + agglutination in 1:20; nine, 2+ in 1:40; seven, 2+ in 1:80; one, 2+ in 1:160, and sixteen were completely negative.

With regard to cases from which multiple samples were secured, we have these data: Only 2 cases (297 and 269) showed 4+ agglutination by any dilution; the former 4+ in 1:40, and 2+ in 1:160. The latter is of special interest. Sixteen days after onset, this serum completely agglutinated the OXK and HXK strains in a dilution of 1:320 and showed partial agglutination in a dilution of 1:1,280. It also agglutinated three X_{19} strains in a serum dilution of 1:10,240. Fifteen days following the first withdrawal of blood, a second large sample (approximately 400 cc, containing one-fifth part of 2 percent Na citrate) was obtained for experimental purposes. The agglutinin titer for OXK was only slightly changed, while the titer for OX_{19} (504) had dropped to 1:1,280. Had the original titer for OXK been "normal", i.e., unrelated to the infection, the dilution with Na citrate would have reduced it. It appears more reasonable to assume that

the agglutinins for OXK had not reached the maximum at the time the first blood specimen was taken and that the increase in the interim was sufficient to balance the reduction brought about by the diluent. This is in keeping with the findings of Felix (1933) with typhus sera, viz, that the minor agglutinins appear late. If the above assumption holds, it also appears that the minor agglutinins may remain at the maximum titer after the major agglutinins have diminished.

All other OXK tests gave incomplete agglutination in 1:20, 1:40, or 1:80. Of 3 cases from which 3 samples each were secured, one (6-, 14-, and 21-day samples) showed partial agglutination in 1:40 for the first and third samples and in 1:80 for the second. The second (7-, 14-, and 20-day samples) showed no agglutinins for the first sample, 2+ agglutination in 1:80 for the second, and 2+ in 1:40 for the last. The third gave 2+ agglutination in 1:20 for 10-, 13-, and 18-day samples. Of 16 two-sample cases, 7 showed a decreased titer in the second sample—1:80 to 1:40, 1:40 to 1:20, 1:40 to 0, and 1:20 to 0 (in this series the average day of the first sample was the thirteenth and the second the twenty-fourth); 6 showed an increased titer—0 to 1:20 and 1:20 to 1:40 (in this series the average day of the first sample was the eighth and the second the fourteenth); in 2 the titer remained constant, and in 3 it was negative for both of 2 samples.

As compared with these spotted fever sera data, 64 samples from "normal" individuals or from persons with infections not diagnosed as Rocky Mountain spotted fever gave the following titers for OXK: 27 were negative, while of the remaining 37, 2 were completely agglutinated in serum dilutions of 1:40 and partially agglutinated in 1:80 and 1:160, respectively. Partial reactions were shown by 15 in 1:20, 10 in 1:40, 7 in 1:80, and 2 in 1:160.

Strain OX_2 gave results as follows: Of 52 single samples, only one (335) causes 4+ agglutination in any dilution, 4+ in 1:80, and 2+ in 1:320. Of the other 51 samples, 16 caused 2+ agglutination in 1:20, 7 in 1:40, and 28 were negative.

Concerning cases from which multiple samples were secured, we have these data: Of 3 cases from which 3 samples each were secured, one showed an absence of agglutinins on the seventh day and 2+ agglutination in 1:20 on the fourteenth and twentieth days; the second showed absence on the sixth and fourteenth days and 2+ in 1:20 on the twenty-first day; and the third 1:20 on the tenth day, absence on the thirteenth, and 2+ in 1:80 on the eighteenth. Of 17 two-sample cases, 5 showed a decreased titer in the second sample—1:40 to 1:20, 1:40 to 0, or 20 to 0; 4 showed an increased titer—0 to 1:20, 0 to 1:40, or 1:20 to 1:80; 3 remained constant at 1:40 or 1:80; and 5 were negative in both samples, 3 of these being the same that gave a negative titer with OXK.

The 64 serum samples (from other than spotted fever cases) which were tested with OXK gave the following results with OX_2: There were no complete agglutinations; 37 were negative; and partial reactions were shown by 15 in 1:20, 11 in 1:40, and 1 in 1:80.

EXPERIMENTAL STUDIES

Test methods.—The agglutination test as made by our standard method with suspensions of living *proteus* X organisms (which, in our experience, has proved superior to formalinized material) requires at least 48 hours before a final report can be rendered to the physician. It has been deemed desirable to attempt to shorten this period, even though a prompt check on diagnosis is not essential from a public health standpoint nor of great value to the attending physician, since a significant result is seldom secured with blood samples taken before the tenth day. Accordingly, our standard method was checked with three others. Ten sera and 2 strains of OX_{19} ((1) Z and 504) were used. The results are given in table 4.

TABLE 4.—*The agglutination of proteus X strains by Rocky Mountain spotted fever sera—A comparative study of 4 methods*

Serum no.	Proteus X strains	Standard method 37° C. 2 hours, 8° C. 48 hours				Water bath 55° C. 1 hour, 8° C. 48 hours						Shaking 3 minutes 37° C. 2 hours, 8° C. 48 hours					Reagents concentrated, shaking 3 minutes 37° C. 2 hours, 8° C. 48 hours				
		Time of reading				Time of reading						Time of reading					Time of reading				
		1 hour	2 hours	24 hours	48 hours	10 minutes	20 minutes	30 minutes	1 hour	24 hours	48 hours	3 minutes	1 hour	2 hours	24 hours	48 hours	3 minutes	1 hour	2 hours	24 hours	48 hours
266	$OX_{19}(1)Z$	0	0	1,280	1,280	0	0	0	0	640	1,280	0	0	640	1,280	1,280	------	------	------	------	------
		40	1,280	2,560	2,560	0	320	640	640	1,280	2,560	320	640	1,280	2,560	2,560	------	------	------	------	------
	$OX_{19}(504)$	0	0	640	1,280	0	0	0	0	320	640	0	0	320	640	1,280	------	------	------	------	------
		160	640	2,560	2,560	40	320	320	640	1,280	1,280	320	640	640	2,560	5,120	------	------	------	------	------
275	$OX_{19}(1)Z$	0	0	320	320	0	0	0	0	80	160	0	0	0	320	320	0	40	40	80	160
		160	320	1,280	1,280	0	160	160	160	160	640	40	320	320	640	1,280	160	160	640	1,280	1,280
	$OX_{19}(504)$	0	0	160	320	0	0	0	0	80	320	0	0	0	320	320	0	80	80	160	160
		160	160	640	1,280	80	160	160	320	320	640	80	160	320	640	1,280	320	320	320	640	1,280
296	$OX_{19}(1)Z$	0	0	640	1,280	0	0	0	0	640	640	0	0	320	640	1,280	0	80	320	640	640
		0	320	2,560	2,560	0	320	640	640	1,280	1,280	320	320	640	2,560	5,120	1,280	1,280	2,560	10,240	10,240
	$OX_{19}(504)$	0	0	640	1,280	0	0	0	0	640	320	0	0	320	640	1,280	0	160	640	640	1,280
		0	640	1,280	2,560	0	320	320	640	1,280	1,280	320	640	640	2,560	2,560	1,280	1,280	5,120	5,120	10,240
303	$OX_{19}(1)Z$	0	0	640	1,280	0	0	0	0	320	640	0	0	320	640	1,280	------	------	------	------	------
		0	640	1,280	2,560	0	160	320	320	640	1,280	160	320	640	1,280	2,560	------	------	------	------	------
	$OX_{19}(504)$	0	0	640	640	0	0	0	0	320	320	0	0	160	640	1,280	------	------	------	------	------
		80	320	2,560	2,560	0	160	320	320	640	640	160	320	640	1,280	2,560	------	------	------	------	------
314	$OX_{19}(1)Z$	0	0	640	640	0	0	0	0	320	640	0	0	320	640	1,280	0	40	160	640	640
		20	320	1,280	2,560	0	40	160	160	640	1,280	320	640	640	1,280	2,560	320	320	320	2,560	10,240
	$OX_{19}(504)$	0	0	640	640	0	0	0	0	0	320	0	0	320	640	640	0	160	320	640	640
		80	320	1,280	1,280	0	0	80	80	640	640	160	320	640	1,280	2,560	320	640	1,280	2,560	5,120
316	$OX_{19}(1)Z$	0	0	640	640	0	0	0	0	160	160	0	80	160	640	640	0	20	80	320	320
		160	320	1,280	1,280	0	160	160	160	640	1,280	160	320	320	1,280	1,280	320	320	640	1,280	10,240
	$OX_{19}(504)$	0	0	320	320	0	0	0	0	160	160	0	160	160	320	320	0	80	80	160	320
		160	640	1,280	1,280	160	320	320	320	640	640	160	320	640	640	640	320	320	320	1,280	2,560

TABLE 4.—*The agglutination of proteus X strains by Rocky Mountain spotted fever sera—A comparative study of 4 methods*—Continued

Serum no.	Proteus X strains	Standard method 37° C. 2 hours, 8° C. 48 hours				Water bath 55° C. 1 hour, 8° C. 48 hours						Shaking 3 minutes 37° C. 2 hours, 8° C. 48 hours					Reagents concentrated, shaking 3 minutes 37° C. 2 hours, 8° C. 48 hours				
		Time of reading				Time of reading						Time of reading					Time of reading				
		1 hour	2 hours	24 hours	48 hours	10 minutes	20 minutes	30 minutes	1 hour	24 hours	48 hours	3 minutes	1 hour	2 hours	24 hours	48 hours	3 minutes	1 hour	2 hours	24 hours	48 hours
322	$OX_{19}(1)Z$	0 640	0 640	640 2,560	1,280 2,560	0 160	0 320	0 320	0 640	320 640	640 1,280	0 0	0 1,280	0 1,280	1,280 2,560	1,280 2,560	0 320	80 640	160 1,280	640 5,120	640 5,120
	$OX_{19}(504)$	0 640	0 640	640 2,560	1,280 2,560	0 320	0 640	0 1,280	0 1,280	320 1,280	640 1,280	0 160	0 640	0 640	640 2,560	1,280 2,560	0 320	80 640	160 1,280	640 2,560	640 5,120
326	$OX_{19}(1)Z$	0 640	160 1,280	1,280 2,560	1,280 2,560	0 0	0 160	0 320	0 640	160 640	640 2,560	0 640	320 1,280	640 1,280	640 2,560	1,280 5,120	0 640	80 2,560	80 2,560	1,280 5,120	1,280 5,120
	$OX_{19}(504)$	0 640	320 1,280	1,280 2,560	1,280 5,120	0 320	0 640	0 640	0 1,280	160 1,280	640 2,560	0 320	320 1,280	320 1,280	640 2,560	1,280 5,120	0 640	160 2,560	640 2,560	1,280 5,120	1,280 5,120
335	$OX_{19}(1)Z$	0 1,280	0 2,560	1,280 2,560	2,560 5,120	0 640	0 1,280	0 1,280	0 1,280	640 2,560	1,280 5,120	0 1,280	0 2,560	0 2,560	1,280 5,120	1,280 5,120	0 1,280	320 2,560	640 2,560	1,280 5,120	1,280 5,120
	$OX_{19}(504)$	0 1,280	0 2,560	1,280 5,120	2,560 10,240	0 1,280	0 1,280	0 1,280	0 1,280	640 2,560	1,280 5,120	0 1,280	0 2,560	0 2,560	1,280 5,120	1,280 5,120	0 1,280	640 2,560	1,280 2,560	1,280 2,560	2,560 5,120
341	$OX_{19}(1)Z$	0 160	0 320	320 1,280	640 1,280	0 20	0 80	0 160	0 160	160 320	320 1,280	0 160	0 320	0 320	320 640	320 1,280	0 640	0 640	80 640	160 1,280	160 2,560
	$OX_{19}(504)$	0 160	0 160	320 640	640 1,280	0 80	0 160	0 320	0 320	160 320	320 1,280	0 80	0 320	0 320	320 640	320 1,280	0 320	80 320	160 320	320 1,280	320 2,560

0=Negative in a final serum dilution of 1:20.
----=Not tested.
The upper figures represent the dilution of serum in which there was 100 percent agglutination; the lower give the highest serum dilution in which there was definite agglutination.

1. Our standard method consists of adding 0.5 cc of a 500 parts per million (silica standard) suspension of living organism to 0.5 cc of the several serum dilutions, then incubating at 37° C. for 2 hours and finally placing in the electric refrigerator for approximately 48 hours. In this study, readings were recorded at 1, 2, 24, and 48 hours. These tests were the controls.

2. In the second method the bacterial suspensions and sera were mixed as in the standard method and placed in the water bath at 55° C. with the mixtures half submerged. By this method, convection currents keep the organisms in slow movement. Readings were made at 10-, 20-, 30-, and 60-minute intervals and as usual following refrigeration.

3. The third method consisted of adding the bacterial suspension to the diluted sera, followed immediately by rapid shaking by hand for 2 minutes and slow shaking for 1 minute, after which time the first reading was made. Additional readings were made following incubation and refrigeration as for controls.

4. The bacterial suspensions and serum dilutions were used in five times the concentration of the standard method. Following rapid shaking for 3 minutes, the volume of each tube was made up to the total of 1 cc with saline and read immediately. Additional readings were made after 1 and 2 hours at 37° C. and after 24 and 48 hours' refrigeration.

Results.—Although 55° C. appeared to accelerate the reaction with certain sera, the final titers were, as a whole, lower than by any of the other methods. This result was to be expected in the light of what is known concerning the thermolability of O agglutinins.

Following shaking for 3 minutes, 7 of the 10 sera showed as high a titer as, or higher than, the 1-hour reading by the standard method. Following subsequent 1-hour incubation at 37° C., all the shaken sera showed as high or a higher titer. After 2 hours' incubation, 6 sera showed a 100 percent agglutination in 4 or more serum dilutions, while in the control test (standard method) only 1 of these same sera showed 100 percent agglutination in any dilution at the same reading.

In the majority of the tests with the concentration method the readings at the end of the 3-minute shaking period were as high as, or higher than, at the end of the first-hour period by the standard method. At the end of the first-hour period the concentration method showed 100 percent agglutination in 2 or more tubes in all sera tested, while there was one by the standard method. The reaction is definitely accelerated by this method and with all sera but 2 the final titers were increased with one or both of the test antigens.

The final readings were relatively comparable by all methods except the second.

Thermolability of agglutinins.—Studies on the thermolability of agglutinins were continued. Forty-three sera were tested after heating at 55° C. and 62° C. for a half hour. As a rule there was a definite reduction in agglutinin titer following heating at 55° C. and a much more marked reduction following heating at 62° C. In certain instances the latter treatment reduced the agglutinin titer to nil. This is in complete agreement with studies on typhus sera.

Formalinized suspensions.—In our former report we made the statement, based on the theory that formalin affects neither the O agglutinogen nor the O agglutinin, that formalinized suspensions would have the same practical advantage as alcoholized suspensions when working with O strains. However, of 22 sera tested with formalinized suspensions of OX_{19} (504) and OX_{19} (2)Z, 17, or approximately 77 percent, showed a lower titer with the former (3 were equal and 2 were slightly higher), while all the sera showed a definitely lower titer with the latter. The suspensions had been preserved with 0.2 to 0.3 percent formalin and diluted 1:15 or 1:20 when used. We have not yet employed the longer incubation period at higher temperatures as used by Gardner and Stubington (1932) and recently recommended by Felix (*loc. cit.*).

DISCUSSION AND CONCLUSIONS

The main value of the results of this series of agglutination tests is the information which they furnish concerning the number of samples which should be tested from a given case and the period after onset when the samples should be taken.

In our previous paper it was suggested that at least 2 samples should be taken, 1 between the tenth and fifteenth days, the other a week or 10 days later. In the light of our further experience it is now felt that there should be three samples, the first taken early in the course of the disease or as soon as spotted fever is suspected, the second during the period from the tenth day to cessation of fever, and the third about the end of the first week of convalescence. Though it is evident from the tables that only a relatively small percentage of sera taken during the first 9 days are of diagnostic significance, the results, nevertheless, are of great value for subsequent comparison with the titer of the later samples in order to determine whether a definite rise in agglutinin content has occurred. This is particularly important in the type of case (of rather frequent occurrence) in which the high point of the agglutinin titer is too low to be of significance unless such a rise can be shown, and also in such cases as give an unexpected high titer with one or more of the test antigens early in the disease. There are other cases in which a consequential rise in

titer does not take place until during early convalescence, and in some cases the highest titer is present during this period. Hence, the desirability of the third sample, although this could be dispensed with in many instances in a locality where laboratories are close at hand.

When using H variants of *proteus* X_{19} there were marked differences in titers obtained with the several strains. Certain H variants were agglutinated only in very low titer, although all of our strains have been treated in a similar manner for approximately the same period of time. There were also slight differences in the agglutinability of O variants. However, the O variant of any individual strain appears to retain the same degree of sensitiveness over a long period.

Although OXK and OX_2 strains are more frequently agglutinated by spotted fever sera than by "normal" sera, the resultant titers, in the present series of tests, are, with a few exceptions, so low as to be of no importance in diagnosis. However, since our comparative studies of Rocky Mountain spotted fever and Sao Paulo typhus have shown identical serologic and immunologic reactions except with respect to OXK and OX_2 agglutinins, it is felt that a further study of these agglutinins in relation to these two diseases is desirable. Especially is this true in view of the fact that the OXK and OX_2 types are of apparent value in the study of the relationships of typhus-like diseases.

Heating sera at 55° C. for one-half hour definitely reduce the agglutinating properties, while heating at 62° C. for the same period completely destroyed the agglutinins in certain of the sera tested.

With the technique which we have used, fresh, unpreserved suspensions are definitely superior to formalinized suspensions as test antigens.

The use of concentrated reagents for the presumptive test may be of value.

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COURT DECISION ON PUBLIC HEALTH

City held without power to enact health ordinance after creation of county health department.—(Mississippi Supreme Court, Division B; *City of Jackson* v. *Ferguson et al.*, 150 So. 531; decided Oct. 30, 1933.) Pursuant to statutory authority Hinds County created and put into operation a department of health. The city of Jackson, located within the county, passed an ordinance, after the county health department had been established, creating the office of food inspector and regulating the inspection of milk and milk products. Certain milk producers sought an injunction against the city to prohibit the enforcement of the ordinance as to them and all others similarly situated. The lower court granted the injunction prayed for and the city appealed to the supreme court.

The appellees relied upon the following portion of section 4926 of the Code of 1930:

* * * When any county or counties create a health department hereunder, then all other local or municipal or county public-health agencies and departments are thereby automatically abolished and said county and district health department shall have full control over all health matters in said county and counties, including all municipalities therein, but subject to the supervision, direction, and jurisdiction of the State board of health: *Provided, however,* That the proper authorities of any municipality in the State of Mississippi are hereby authorized in their discretion to make an appropriation for the support of such county or district health department from the general funds of such municipality.

The city's contention was that section 4926 should be considered as in pari materia with the several general statutes giving power to municipalities to enact ordinances and to prescribe regulations for the preservation of the health of the inhabitants thereof. It was argued that, when the section was so considered, the city was vested with concurrent jurisdiction in such matters where the county had established a health department. The supreme court, however, did not accept this view but affirmed the decree of the lower court, saying:

* * * It will be noted, however, that the quoted sentence taken from section 4926 is a particular provision applicable to particular situations, and, under familiar rules, controls over general statutes governing general situations. The quoted language is expressly, and in plain terms, that, when a county has created a health department, the action of the county shall have the effect automatically to abolish all other local or municipal health agencies within that county. We cannot grasp the conception that a particular municipal agency can have any jurisdiction, or power, or existence, concurrent or otherwise, when it has been or is abolished. The contention of the city, if sustained, would not be to read section 4926 as in pari materia with the other general statutes mentioned, but would be to repeal that particular section in part by judicial construction, and, this accomplished, to allow the other general statutes to come into effect in contravention of the plain and mandatory words of the particular statute thus partially repeated [repealed?]. This, of course, the courts are without the authority to do.

DEATHS DURING WEEK ENDED FEBRUARY 10, 1934

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

	Week ended Feb. 10, 1934	Corresponding week, 1933
Data from 86 large cities of the United States:		
Total deaths	8,792	8,465
Deaths per 1,000 population, annual basis	12.2	11.8
Deaths under 1 year of age	569	593
Deaths under 1 year of age per 1,000 estimated live births	53	[1] 51
Deaths per 1,000 population, annual basis, first 6 weeks of year	12.5	12.7
Data from industrial insurance companies:		
Policies in force	67,489,817	69,070,242
Number of death claims	13,811	15,399
Death claims per 1,000 policies in force, annual rate	10.7	11.6
Death claims per 1,000 policies, first 6 weeks of year, annual rate	11.0	11.8

[1] Data for 81 cities.

PREVALENCE OF DISEASE

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

UNITED STATES

CURRENT WEEKLY STATE REPORTS

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

Reports for Weeks Ended February 17, 1934, and February 18, 1933

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Feb. 17, 1934, and Feb. 18, 1933

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Feb. 17, 1934	Week ended Feb. 18, 1933	Week ended Feb. 17, 1934	Week ended Feb. 18, 1933	Week ended Feb. 17, 1934	Week ended Feb. 18, 1933	Week ended Feb. 17, 1934	Week ended Feb. 18, 1933
New England States:								
Maine	2	1	3	56	4	3	0	1
New Hampshire	----	1	----	8	174	1	0	0
Vermont	1	2	----	----	45	4	0	0
Massachusetts	7	22	----	19	2,386	265	3	0
Rhode Island	3	5	----	4	2	3	0	0
Connecticut	3	3	3	38	39	159	0	0
Middle Atlantic States:								
New York	47	67	[1] 23	[1] 41	804	1,993	4	4
New Jersey	20	22	24	91	382	818	1	2
Pennsylvania	45	99	----	----	1,056	866	3	10
East North Central States:								
Ohio	42	59	131	208	436	455	2	2
Indiana	29	37	57	55	450	25	0	3
Illinois	38	46	40	72	512	270	6	14
Michigan	15	21	3	6	44	820	2	1
Wisconsin	10	3	98	227	1,164	286	2	0
West North Central States:								
Minnesota	9	2	3	1	229	1,387	1	1
Iowa [2]	7	16	13	----	78	3	2	2
Missouri	59	30	288	25	1,778	37	3	2
North Dakota	7	5	----	228	46	80	1	0
South Dakota	1	9	----	1	159	21	1	1
Nebraska	4	14	22	1	109	28	0	1
Kansas	27	6	10	13	121	331	3	0
South Atlantic States:								
Delaware	2	12	2	5	143	2	0	0
Maryland [2] [3]	8	14	45	117	342	4	0	2
District of Columbia	5	10	5	3	413	5	0	0
Virginia	25	18	----	----	725	444	1	1
West Virginia	13	18	33	271	18	552	0	0
North Carolina [2]	25	15	75	332	3,040	555	2	3
South Carolina	7	8	841	1,824	496	56	0	0
Georgia [2]	24	11	229	491	1,515	14	0	1
Florida	2	3	2	61	123	10	0	1

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Feb. 17, 1934, and Feb. 18, 1933—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Feb. 17, 1934	Week ended Feb. 18, 1933	Week ended Feb. 17, 1934	Week ended Feb. 18, 1933	Week ended Feb. 17, 1934	Week ended Feb. 18, 1933	Week ended Feb. 17, 1934	Week ended Feb. 18, 1933
East South Central States:								
Kentucky	25	10	67	118	265	----	1	1
Tennessee	16	15	183	168	904	52	1	3
Alabama [3]	16	13	186	192	525	13	1	1
Mississippi [3]	8	1	----	----	----	----	0	1
West South Central States:								
Arkansas	4	5	67	113	765	4	2	1
Louisiana	16	16	11	51	113	27	1	2
Oklahoma [4]	15	16	121	228	449	20	6	5
Texas [3]	197	54	1,076	252	1,816	679	3	1
Mountain States:								
Montana [5]	2	----	49	93	16	154	0	0
Idaho	----	3	----	1	19	90	0	0
Wyoming	----	----	----	2	56	10	0	1
Colorado	7	6	----	68	63	3	0	1
New Mexico	3	7	9	11	105	4	0	0
Arizona	6	2	15	12	24	----	2	1
Utah [3]	----	3	----	----	815	3	0	1
Pacific States:								
Washington	6	8	3	1	268	6	0	1
Oregon	4	1	49	94	49	111	0	0
California	50	52	39	129	1,340	449	3	3
Total	862	791	3,825	5,731	24,425	11,122	57	75

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Feb. 17, 1934	Week ended Feb. 18, 1933	Week ended Feb. 17, 1934	Week ended Feb. 18, 1933	Week ended Feb. 17, 1934	Week ended Feb. 18, 1933	Week ended Feb. 17, 1934	Week ended Feb. 18, 1933
New England States:								
Maine	0	0	24	20	0	0	3	1
New Hampshire	0	0	33	44	0	0	0	0
Vermont	0	0	17	12	0	0	1	0
Massachusetts	0	1	251	390	0	0	3	3
Rhode Island	0	0	12	40	0	0	0	0
Connecticut	0	0	50	97	0	1	0	0
Middle Atlantic States:								
New York	1	1	694	738	0	0	4	5
New Jersey	1	0	221	314	0	0	4	1
Pennsylvania	2	0	740	856	0	0	13	10
East North Central States:								
Ohio	0	0	753	746	0	6	8	2
Indiana	0	2	291	133	1	1	6	1
Illinois	1	0	621	435	5	11	2	6
Michigan	1	1	517	528	4	0	3	6
Wisconsin	0	0	231	98	33	3	4	1
West North Central States:								
Minnesota	0	0	59	77	2	1	0	3
Iowa [3]	0	0	78	81	3	25	1	0
Missouri	1	0	212	50	7	1	10	2
North Dakota	0	0	31	11	1	0	0	0
South Dakota	0	0	18	21	1	2	1	2
Nebraska	0	0	23	24	6	1	2	0
Kansas	0	0	115	78	4	2	2	1
South Atlantic States:								
Delaware	0	0	10	5	0	0	0	0
Maryland [3] [5]	0	0	87	81	0	0	4	1
District of Columbia	1	0	14	11	0	0	0	0
Virginia	0	0	74	36	0	0	5	3
West Virginia	1	0	84	25	0	0	2	7
North Carolina [3]	1	0	51	29	0	0	2	3
South Carolina	0	0	10	2	0	0	6	3
Georgia [3]	0	0	0	9	0	0	5	9
Florida	0	0	1	7	0	0	2	6

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Feb. 17, 1934, and Feb. 18, 1933—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Feb. 17, 1934	Week ended Feb. 18, 1933	Week ended Feb. 17, 1934	Week ended Feb. 18, 1933	Week ended Feb. 17, 1934	Week ended Feb. 18, 1933	Week ended Feb. 17, 1934	Week ended Feb. 18, 1933
East South Central States:								
Kentucky	0	2	79	30	1	0	2	6
Tennessee	0	1	64	30	0	1	2	4
Alabama [3]	1	0	20	21	2	3	2	0
Mississippi [3]	0	0	11	8	0	4	1	2
West South Central States:								
Arkansas	0	0	10	4	22	3	2	3
Louisiana	0	0	26	2	7	2	11	6
Oklahoma [4]	0	1	27	24	8	4	5	1
Texas [3]	0	0	179	55	53	8	39	14
Mountain States:								
Montana [5]	0	0	12	31	0	2	0	0
Idaho	0	0	10	3	1	5	0	0
Wyoming	0	0	6	11	1	0	0	0
Colorado	0	0	56	25	14	0	0	1
New Mexico	0	0	34	12	0	0	2	0
Arizona	0	0	22	14	0	0	0	3
Utah [3]	0	0	10	9	2	0	0	0
Pacific States:								
Washington	0	0	45	39	3	5	1	3
Oregon	0	0	38	30	1	6	1	1
California	3	1	247	208	4	33	5	4
Total	14	10	6,218	5,504	186	130	166	124

[1] New York City only.
[2] Week ended earlier than Saturday.
[3] Typhus fever, week ended Feb. 17, 1934, 29 cases, as follows: Maryland, 1; North Carolina, 1; Georgia, 5 Alabama, 15; Texas, 7.
[4] Exclusive of Oklahoma City and Tulsa.
[5] Rocky Mountain spotted fever, week ended Feb. 17, 1934, Montana, 1 case.

SUMMARY OF MONTHLY REPORTS FROM STATES

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

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
January 1934										
Indiana	10	193	332		1,432		1	1,000	14	6
Iowa	4	54	51		219		0	388	25	5
Massachusetts	6	74		5	6,069		2	1,028	0	5
Michigan	3	65	14	4	174		6	1,738	1	10
Minnesota	1	61	5		513		5	287	12	15
New Jersey	5	99	121		771		2	814	0	22
New Mexico	1	39	16	2	477	1	1	208	1	26
New York	9	269		10	2,737		6	2,981	0	25

January 1934

Anthrax:	Cases
Massachusetts	1
New York	1
Chicken pox:	
Indiana	907
Iowa	498
Massachusetts	1,649
Michigan	1,599
Minnesota	887
New Jersey	2,141
New Mexico	115
New York	3,982
Conjunctivitis:	
Iowa	1
New Mexico	3

Dysentery:	Cases
Iowa	1
Massachusetts (amoebic)	1
Massachusetts (bacillary)	1
Michigan	9
Minnesota (amoebic)	19
Minnesota (bacillary)	22
New Jersey	10
New Mexico	2
New York (amoebic)	21
New York (bacillary)	14
Food poisoning:	
New Mexico	4

German measles:	Cases
Iowa	109
Massachusetts	47
Michigan	54
New Jersey	25
New Mexico	3
New York	81
Impetigo contagiosa:	
Iowa	4
Lethargic encephalitis:	
Iowa	2
Massachusetts	7
Michigan	8
New Jersey	2
New York	9

Milk sickness:	Cases
New Mexico	7
Mumps:	
Indiana	131
Iowa	208
Massachusetts	651
Michigan	612
New Jersey	304
New Mexico	36
Ophthalmia neonatorum:	
Massachusetts	123
New Jersey	3
New Mexico	1
New York	3
Paratyphoid fever:	
Minnesota	1
New York	1
Psittacosis:	
New York	1
Puerperal septicemia:	
New Mexico	2
Rabies in animals:	
Indiana	29
Massachusetts	9

Rabies in animals—Con.	Cases
New Jersey	19
New York	[1] 2
Septic sore throat:	
Massachusetts	16
Michigan	91
New York	28
Tetanus:	
Massachusetts	2
Michigan	1
New Jersey	1
New York	5
Trachoma:	
Massachusetts	12
Minnesota	3
Trichinosis:	
Iowa	1
Massachusetts	1
New Jersey	3
New York	23
Tularaemia:	
Iowa	1
Michigan	1
Minnesota	3

Tularaemia—Con.	Cases
New Jersey	1
New York	2
Undulant fever:	
Iowa	7
Massachusetts	1
Michigan	6
Minnesota	10
New Jersey	1
New York	25
Vincent's infection:	
Iowa	7
Michigan	19
New York	[1] 137
Whooping cough:	
Indiana	182
Iowa	148
Massachusetts	1,759
Michigan	895
Minnesota	216
New Jersey	752
New Mexico	83
New York	1,893

[1] Exclusive of New York City.

WEEKLY REPORTS FROM CITIES

City reports for week ended Feb. 10, 1934

[This table summarizes the reports received regularly from a selected list of 121 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table. Weekly reports are received from about 700 cities, from which the data are tabulated and filed for reference]

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Maine:											
Portland	0	------	0	0	7	2	0	0	0	7	23
New Hampshire:											
Concord	0	------	1	20	1	1	0	1	0	1	12
Nashua	0	------	0	0	0	2	0	0	0	0	--------
Vermont:											
Barre	0	0	0	0	0	0	0	0	0	0	4
Burlington	0	------	0	0	0	3	0	0	0	4	17
Massachusetts:											
Boston	0	------	1	299	38	52	0	15	0	46	252
Fall River	1	------	1	0	3	2	0	0	0	9	35
Springfield	0	------	0	1	1	8	0	0	0	20	36
Worcester	0	------	1	60	4	10	0	5	0	9	45
Rhode Island:											
Pawtucket	0	------	0	0	0	0	0	0	0	0	24
Providence	1	------	0	1	10	9	0	2	0	21	70
Connecticut:											
Bridgeport	1	1	0	1	4	13	0	2	0	0	35
Hartford	3	------	1	2	7	14	0	0	0	1	26
New Haven	0	------	1	0	3	5	0	2	0	2	47
New York:											
Buffalo	0	------	1	281	6	23	0	7	0	20	140
New York	25	30	13	19	159	270	0	94	4	88	1,550
Rochester	0	------	0	0	5	27	0	1	0	3	73
Syracuse	0	------	0	1	6	3	0	3	0	36	52
New Jersey:											
Camden	1	1	0	28	6	3	0	1	0	1	--------
Newark	0	4	0	3	13	14	0	8	3	25	104
Trenton	0	1	0	10	7	14	0	1	0	11	47
Pennsylvania:											
Philadelphia	7	3	2	917	58	90	0	29	1	36	535
Pittsburgh	4	5	3	35	30	32	0	7	0	29	178
Reading	1	------	0	6	2	2	0	2	0	11	38
Scranton	1	------	0	1	0	7	0	0	0	4	--------
Ohio:											
Cincinnati	9	1	2	292	8	27	0	6	0	13	142
Cleveland	1	45	2	17	26	101	0	14	0	78	201
Columbus	3	1	1	4	8	40	0	4	0	11	85
Toledo	0	1	0	72	4	56	0	3	0	46	72
Indiana:											
Fort Wayne	6	------	0	0	4	20	0	0	0	0	22
Indianapolis	1	------	0	161	16	12	0	2	0	32	--------
South Bend	0	------	0	0	2	4	0	1	0	3	16
Terre Haute	0	------	0	38	2	0	0	0	0	0	26

City reports for week ended Feb. 10, 1934—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Illinois:											
Chicago	7	5	9	54	76	252	0	38	1	173	747
Springfield	1	1	0	11	4	4	0	1	0	0	29
Michigan:											
Detroit	9	3	5	6	26	121	0	10	0	118	278
Flint	0	------	0	10	7	86	0	3	0	15	33
Grand Rapids	0	------	0	1	2	16	0	0	0	2	24
Wisconsin:											
Kenosha	0	------	0	0	0	23	1	0	0	0	9
Madison	[1] 1	------	------	1	------	4	0	------	0	22	10
Milwaukee	2	------	0	5	3	59	0	3	0	114	94
Racine	0	------	0	3	0	11	1	0	0	2	8
Superior	0	------	2	0	1	0	0	0	0	0	11
Minnesota:											
Duluth	0	------	0	0	3	0	0	0	1	0	23
Minneapolis	1	------	0	5	11	31	0	2	0	23	119
St. Paul	0	------	0	0	11	6	0	3	1	8	83
Iowa:											
Des Moines	5	------	------	4	------	20	0	------	0	0	31
Sioux City	0	------	------	2	------	0	0	------	0	1	------
Waterloo	0	------	------	0	------	0	0	------	0	1	------
Missouri:											
Kansas City	3	2	0	4	12	26	0	1	0	6	114
St. Joseph	1	------	1	5	0	2	0	2	0	0	25
St. Louis	22	------	1	698	10	38	0	10	1	51	217
North Dakota:											
Fargo	0	------	2	88	0	0	0	0	0	6	5
Grand Forks	0	------	0	1	0	0	0	0	0	3	------
South Dakota:											
Aberdeen	0	------	0	0	0	0	0	0	0	0	0
Nebraska:											
Omaha	0	------	2	82	7	3	1	0	0	7	58
Kansas:											
Topeka	0	------	0	1	4	0	0	0	0	2	9
Wichita	2	------	0	2	3	8	0	1	0	1	23
Delaware:											
Wilmington	1	------	0	28	2	1	0	4	0	2	32
Maryland:											
Baltimore	3	10	3	126	32	26	0	12	0	163	228
Cumberland	1	------	0	0	1	2	0	0	0	2	15
Frederick	0	------	0	0	0	3	0	0	0	0	4
District of Columbia:											
Washington	6	4	3	324	20	19	0	10	0	16	156
Virginia:											
Lynchburg	2	------	0	1	2	2	0	0	0	5	10
Richmond	1	2	2	4	5	7	0	4	0	3	63
Roanoke	1	------	1	0	6	3	0	1	0	0	21
West Virginia:											
Charleston	0	1	0	0	2	0	0	1	0	0	14
Huntington	1	------	0	0	0	12	0	0	0	0	------
Wheeling	0	------	0	0	0	5	0	1	0	7	10
North Carolina:											
Raleigh	1	------	0	4	2	3	0	0	0	15	13
Wilmington	1	------	0	0	2	0	0	1	0	0	12
Winston-Salem	0	------	1	233	3	5	0	1	0	0	15
South Carolina:											
Charleston	0	30	2	------	3	2	0	1	2	3	29
Columbia	0	------	0	0	0	0	0	0	0	0	5
Greenville	0	------	0	1	0	1	0	1	0	4	14
Georgia:											
Atlanta	4	17	2	76	17	5	0	0	1	4	102
Brunswick	0	------	0	82	1	0	0	0	0	0	2
Savannah	0	60	0	85	1	0	0	2	0	0	33
Florida:											
Miami	0	1	0	3	0	2	0	3	0	1	29
Tampa	3	1	1	1	0	0	0	0	0	0	19
Kentucky:											
Ashland	0	------	------	0	------	0	0	------	0	0	------
Lexington	0	------	0	0	4	2	0	2	1	0	16
Louisville	11	2	0	1	9	33	0	1	0	19	71

[1] Nonresident.

City reports for week ended Feb. 10, 1934—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Tennessee:											
Memphis	2	------	1	183	11	15	0	6	0	8	97
Nashville	0	------	1	128	6	0	4	1	0	7	47
Alabama:											
Birmingham	7	2	6	11	11	6	0	7	0	1	80
Mobile	1	------	0	2	3	2	0	3	0	0	32
Montgomery	0	------	--------	6	-------	1	0	-------	0	1	--------
Arkansas:											
Fort Smith	0	------	0	48	-------	1	0	-------	0	2	--------
Little Rock	0	------	0	115	2	1	0	1	0	0	3
Louisiana:											
New Orleans	20	10	7	24	18	14	0	11	0	0	188
Shreveport	1	------	0	2	4	2	0	1	0	5	36
Oklahoma:											
Tulsa	0	------	--------	43	-------	0	0	-------	0	1	--------
Texas:											
Dallas	13	2	2	0	8	7	1	2	0	3	63
Fort Worth	5	------	0	0	5	8	0	0	1	3	33
Galveston	0	------	0	0	3	3	0	0	1	0	17
Houston	6	------	1	1	9	4	0	2	2	0	59
San Antonio	2	------	5	4	6	15	0	2	1	0	58
Montana:											
Billings	0	------	0	0	0	0	0	0	0	0	5
Great Falls	0	------	0	0	0	0	0	0	0	5	8
Helena	0	------	0	1	0	0	0	0	0	0	6
Missoula	0	------	0	0	0	0	0	0	0	0	4
Idaho:											
Boise	0	------	0	0	1	0	0	1	0	2	6
Colorado:											
Denver	2	29	1	5	8	13	1	3	0	63	65
Pueblo	0	------	0	1	2	4	0	0	0	4	10
New Mexico:											
Albuquerque	1	------	0	0	2	1	0	7	0	3	11
Utah:											
Salt Lake City	0	------	2	589	0	7	0	1	0	15	26
Nevada:											
Reno	0	------	0	0	0	0	0	0	0	0	3
Washington:											
Spokane	0	------	--------	208	-------	1	5	-------	0	7	30
Tacoma	0	------	0	17	3	0	0	0	0	17	23
Oregon:											
Portland	0	------	1	4	6	14	2	2	0	10	81
Salem	0	3	0	0	0	0	0	0	0	11	--------
California:											
Los Angeles	25	19	0	38	23	69	1	20	2	68	324
Sacramento	0	------	0	0	1	2	0	1	0	0	28
San Francisco	0	2	1	25	9	14	0	6	3	16	149

State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths	
New York:			
New York	4	2	1
Rochester	0	0	1
New Jersey:			
Newark	1	0	0
Pennsylvania:			
Reading	1	0	0
Ohio:			
Cleveland	0	1	0
Indiana:			
Indianapolis	1	0	1
Illinois:			
Chicago	5	1	0
Michigan:			
Detroit	1	0	0
Iowa:			
Des Moines	1	0	0
Missouri:			
Kansas City	1	1	0
Kansas:			
Topeka	0	1	0
District of Columbia:			
Washington	1	0	0
Colorado:			
Denver	1	0	1
California:			
Los Angeles	1	0	0
San Francisco	0	0	1

Pellagra.—Cases: Philadelphia, 2; Washington, 1; Lynchburg, 1; Charleston, S.C., 3; Savannah, 3; Tampa, 1; Dallas, 1; San Francisco, 1.

Lethargic encephalitis.—Cases: Cleveland, 1; St. Joseph, 1; St. Louis, 1; Atlanta, 1; Louisville, 1; Birmingham, 1; San Francisco, 1.

Typhus fever.—Cases: Savannah, 2; Montgomery, 2; New Orleans, 1.

FOREIGN AND INSULAR

CANADA

Quebec Province—Communicable diseases—Two weeks ended February 10, 1934.—The Bureau of Health of the Province of Quebec, Canada, reports cases of certain communicable diseases for the 2 weeks ended February 10, 1934, as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	1	Measles	224
Chicken pox	224	Puerperal septicemia	1
Diphtheria	28	Scarlet fever	121
Dysentery	1	Tuberculosis	139
Erysipelas	8	Typhoid fever	40
German measles	6	Undulant fever	1
Influenza	1	Whooping cough	312

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

(NOTE.—A table giving current information of the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS for Feb. 23, 1934, pp. 276-288. A similar cumulative table will appear in the PUBLIC HEALTH REPORTS to be issued Mar. 30, 1934, and thereafter, at least for the time being, in the issue published on the last Friday of each month.)

Cholera

Philippine Islands.—During the week ended February 17, 1934, cholera was reported in the Philippine Islands as follows: Bohol Province—Balilihan, 4 cases, 2 deaths; Calape, 7 cases, 6 deaths; Clarin, 22 cases, 14 deaths; Corella, 1 case, 1 death; Cortes, 4 cases, 3 deaths; Inabanga, 5 cases, 3 deaths; Loon, 7 cases, 3 deaths; Tagbilaran, 3 cases; Talibon, 3 cases, 2 deaths; Tubigon, 10 cases, 7 deaths. Occidental Negros Province—Calatraba, 2 cases, 4 deaths; Oroquieta, 1 case, 1 death; San Carlos, 2 cases, 1 death. Oriental Negros Province—Ayuquitan, 8 cases, 6 deaths; Bais, 3 cases, 2 deaths; Tanjay, 16 cases, 11 deaths.

Smallpox

China—Manchuria.—A report dated February 10, 1934, states that an epidemic of smallpox had occurred in Mukden, Manchuria. One hundred and forty cases with 17 deaths had been reported in the railway concession from January 1 to February 9, 1934.

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