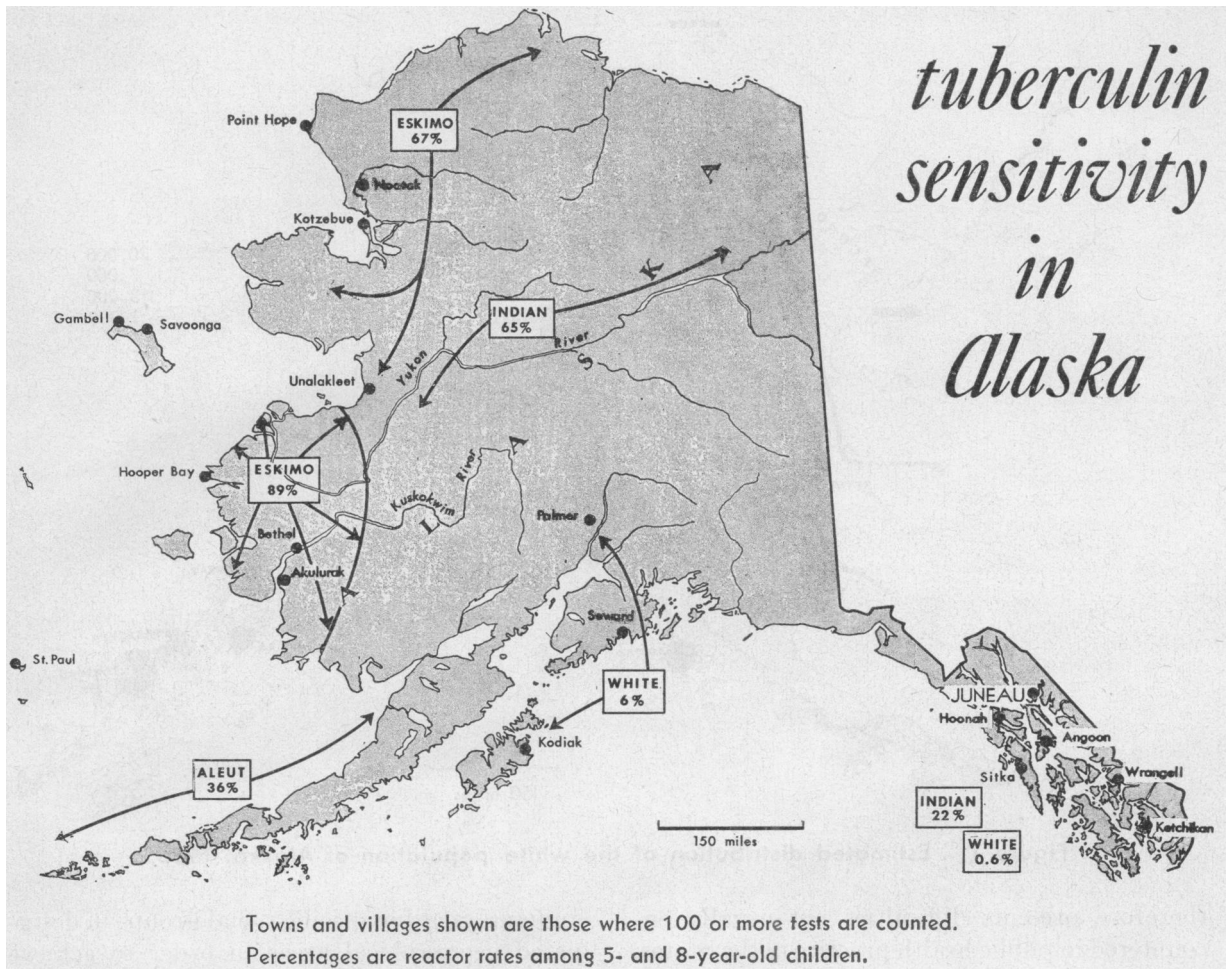


tuberculin sensitivity in Alaska



By EDWARD S. WEISS, M.P.H.

ALTHOUGH it is generally recognized that tuberculosis constitutes one of the most serious health problems in Alaska, few specific data are available for measuring its extent. The commissioner of health for Alaska has quoted a 1950 tuberculosis death rate among the Eskimos, Indians, and Aleuts of 600 per 100,000 population and a prevalence of active tuberculosis of 25 percent in some villages (1). In comparison, the estimated tuberculosis death

rate in the continental United States in 1950 was about 23 per 100,000 population (2).

Prerequisite to a reasonable interpretation of these figures for Alaska, however, is some knowledge of the number and distribution of the people. The 1950 civilian population, based on Bureau of the Census figures (3) was about 108,000: Eskimos, Indians, and Aleuts numbered 34,000; other civilians, mostly whites, 74,000. The white population is concentrated in a few comparatively large cities, but the Eskimo, Indian, and Aleut population is scattered throughout the Territory in many small villages (figs. 1 and 2). Evaluation of the magnitude of the tuberculosis problem

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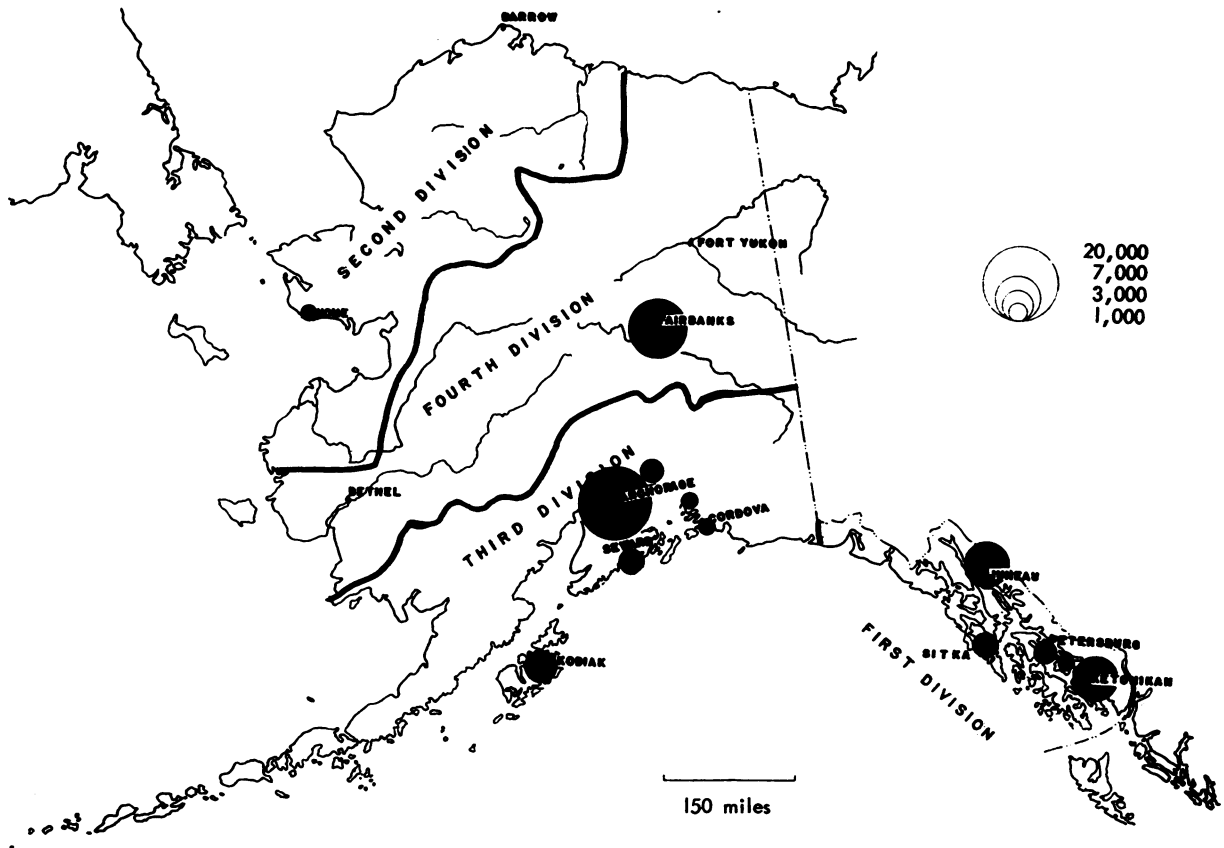


Figure 1. Estimated distribution of the white population of Alaska, 1950.

therefore presents difficulties not usually encountered in public health practice in the States.

The 90-percent increase in the white civilian population of Alaska between 1939 and 1950 was largely due to the entry of employable adults and their children into the Anchorage and Fairbanks areas. Since many of these newer residents, as well as some of the older ones, return to the States for medical care, especially when extended hospitalization is involved, tuberculosis mortality statistics are of little value with respect to this group.

Rejecting mortality statistics as an index of prevalence leaves two practical measures: mass X-ray survey results and tuberculin sensitivity data. Although records of both are available, the latter provide greater coverage numerically and geographically. They are a byproduct of an extensive BCG program of the Alaska Department of Health. Since age-specific tuberculin sensitivity rates are among the most useful measures of the prevalence of infection, the results of tuberculin tests have been tabulated

and analyzed for specific racial groups in designated geographical areas in order to achieve a preliminary definition of the tuberculosis problem.

Materials and Methods

In September 1948, the Alaska Department of Health began its BCG program. By the spring of 1951, when the program was interrupted for administrative reasons, about 30,000 tuberculin tests had been performed on civilian persons of all ages throughout the Territory.

In general, groups which were predominantly Eskimo, Indian, or Aleut were tested with a dose of 0.00002 mg. (1 tuberculin unit) of PPD-S; those which were predominantly white, with 0.0002 mg. (10 tuberculin units) of the same product. However, the Aleuts whose records were selected for this study received a dose of 0.0002 mg. of the tuberculin.

Results of the tests were recorded only as negative or positive. The reaction was classi-

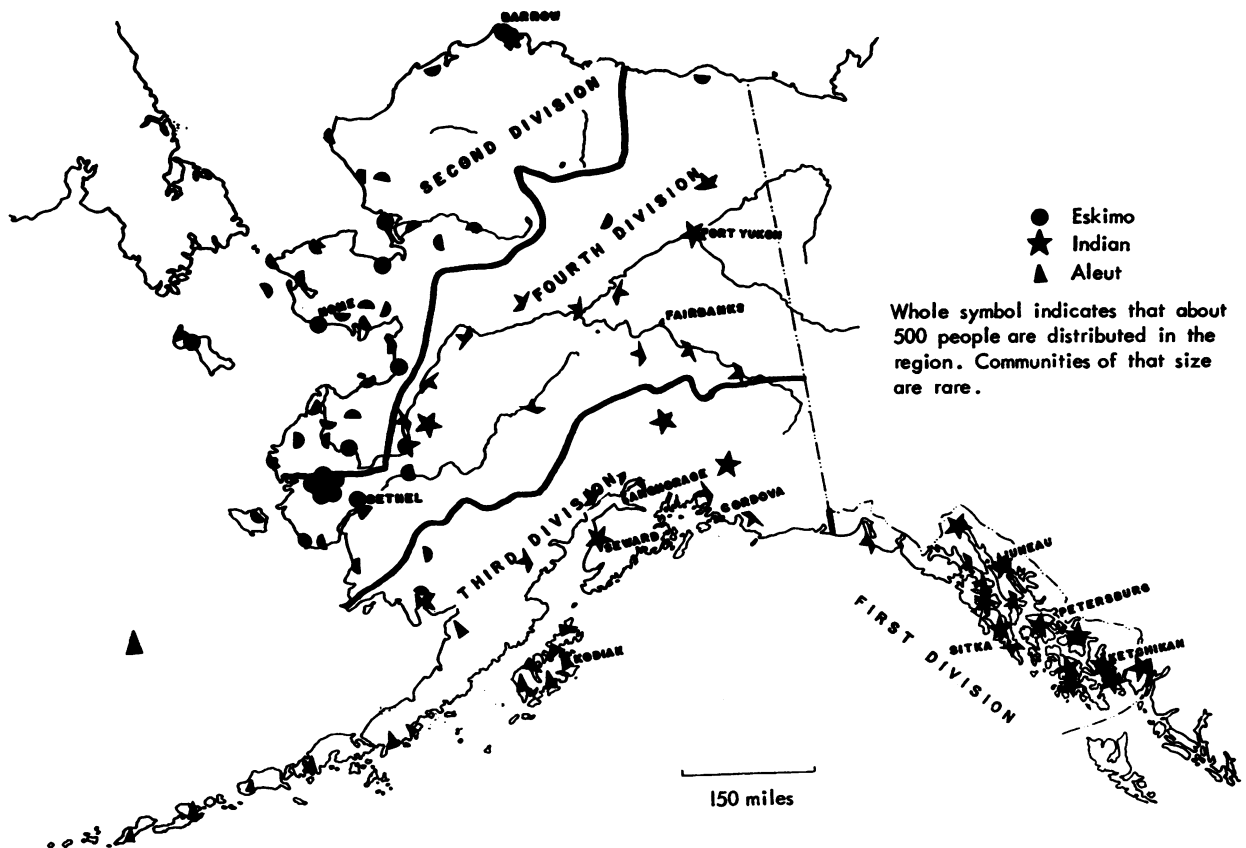


Figure 2. Estimated distribution of Eskimo, Indian, and Aleut population of Alaska, 1950.

fied positive if the area of induration measured 8 mm. or more in diameter 48 hours after injection of the tuberculin.

The records of 6,504 children through age 14 years who were tested on the first visit of the BCG team to their respective communities were selected for tabulation and analysis. The age limit of 14 years was set when preliminary examination of the data disclosed that almost all native adults and older children were reactors. Over half of the original group of records was eliminated on this basis. The availability of two sets of data based on different tuberculin doses and the existence of less than 20 records for small isolated communities were other reasons for eliminating records.

Although combination of tests with different doses was avoided, no further distinction was made between the results of tests with the 0.0002 mg. and the 0.00002 mg. doses. Furcolow and his colleagues (4) showed that although there was a marked increase in the number of reactors among tuberculous children as the PPD dose

was increased from 0.000001 mg. (0.05 tuberculin unit) to 0.00001 mg. (0.5 tuberculin unit), the latter dose brought the S-shaped dose-response curve so near its upper asymptote that the next increase to 0.0001 mg. (5 tuberculin units) elicited few additional reactors. They further showed that the greatest increments in reactors among apparently nontuberculous children were in the tenfold steps above 0.0001 mg.

The difference in the two doses used in the Alaskan program, therefore, cannot account for more than a negligible portion of the differences in sensitivity rates.

Results

The age-specific tuberculin sensitivity rates for each of seven groups, homogeneous with respect to race, area, dose, and pattern of response, and the observations from which they were computed are presented in the table.

A number of alternative ways of summarizing these data for comparative purposes are

Tuberculin sensitivity, by age, race, and area, Alaska, 1948-51

Age (in years)	Eskimo		Indian		Aleut	White	
	Yukon and Kuskokwim Deltas	Northwest coast and Seward Peninsula	Interior	Southeast (panhandle)	Aleutian Islands to Kodiak	South central	Southeast (panhandle)
Percent positive							
Under 1.....	12.8	4.1	19.0	4.9	2.5	0	0
1 to 2.....	41.8	19.1	25.0	9.6	11.1	.8	0
3 to 4.....	76.6	40.6	30.2	13.7	25.0	0	.8
5 to 6.....	86.9	62.0	52.0	23.4	25.4	4.5	.6
7 to 8.....	91.0	72.6	79.2	21.4	45.1	7.0	.5
9 to 10.....	88.9	80.1	81.8	49.6	52.6	8.2	2.0
11 to 12.....	95.5	83.0	81.2	46.0	60.0	6.1	6.4
13 to 14.....	94.7	88.1	92.9	52.1	83.9	13.9	10.5
Number tested							
All ages.....	1,262	1,500	201	702	582	1,274	983
Under 1.....	109	147	21	41	40	80	26
1 to 2.....	196	237	36	83	81	132	84
3 to 4.....	184	229	43	80	84	165	132
5 to 6.....	183	216	25	111	71	178	169
7 to 8.....	177	164	24	112	91	214	194
9 to 10.....	152	176	22	117	78	184	148
11 to 12.....	110	171	16	87	75	163	125
13 to 14.....	151	160	14	71	62	158	105

available. For example, the annual infection rate required to establish the observed levels of sensitivity or the age at which 50 percent of the children had attained sensitivity to the antigen might be used. In preference to these more elegant parameters, a simple expression of the proportion of reactors in the middle age groups, 5 through 8 years old, was selected.

The proportions of reactors among children 5 to 8 years old in each of the seven groups, designated by race and area, are shown on the map on the title page. They range from an almost unbelievable high of 89 percent for Eskimos in the region of the Yukon and Kuskokwim Deltas to 0.6 percent for white children in the southeastern panhandle.

The Eskimo children of the northwest apparently are less exposed to infection than their southern kinsmen, for the sensitivity rate there is 67 percent, about the same as that found among the Indians of the interior (65 percent). Southeastern Indians appear to be in a compar-

atively favorable condition, with 22 percent of their 5- to 8-year-old children reacting to tuberculin.

The comparable rate among Aleuts is 36 percent, very high in comparison to the 6 percent and 0.6 percent observed among white children in the two designated areas but much lower than that for either group of Eskimos or the Indians of the interior.

Discussion

The variations in sensitivity among the seven specified Alaskan groups almost cover the range recorded for the rest of the world. No available report, not even that based on tests of "Chinese children of the poorest classes" (5), shows levels of sensitivity exceeding those observed among the delta Eskimos. On the other hand, few communities in the United States show levels lower than those recorded for the white children of the panhandle. Myers, for example,

states that there are now many schools in Minnesota in which no child reacts to tuberculin (6). That goal is within the grasp of one group of Alaskans, but at present completely out of the reach of many others.

The success of any control program attempting to deal with tuberculosis in Alaska or even with tuberculosis among the Eskimo, Indian, and Aleut population in Alaska will require an appropriate "area control" viewpoint. Different plans, procedures, and objectives may have to be used for various areas.

Summary and Conclusion

1. The records of tuberculin tests on 2,762 Eskimos, 903 Indians, 582 Aleuts, and 2,257 white children through age 14 years were selected from records of the Alaska BCG program.

2. The records were tabulated to show the age-specific sensitivity rates prevailing in selected population groups.

3. The rates observed for Eskimo, Indian, and Aleut children 5 to 8 years old ranged from 89 percent among a large group of Eskimos to 22 percent among Indians of the southeastern panhandle. The rate for another group of Eskimos and the Indians of the interior was approximately 65 percent.

4. Sensitivity rates of 0.6 and 6.0 (similar to those observed in cities of the United States)

were found among white children aged 5 to 8 years old.

Although conventional control measures are probably adequate for maintaining or reducing the low prevalence of tuberculosis among the white residents of the Territory and the Indians of the southeastern area, it is unlikely that they can succeed among the other groups in Alaska.

* * *

A list of the villages selected for this report, number and date of tests in each, and the dosage of tuberculin used may be obtained from the author.

REFERENCES

- (1) Albrecht, C. Earl: Public health in Alaska—United States frontier. *Am. J. Pub. Health* 42: 694-698 (1952).
- (2) U. S. National Office of Vital Statistics: Provisional vital statistics for January 1952 with data on cause of death for December 1951. *Monthly Vital Statist. Rep.* 1: 1-8 (Apr. 4, 1952).
- (3) U. S. Bureau of the Census: Population of Alaska. *Advance Reports, Series PC-11, No. 4, 1952.*
- (4) Furcolow, Michael L., Hewell, Barbara, Nelson, Waldo E., and Palmer, Carroll E.: Quantitative studies of the tuberculin reaction. I. Titration of tuberculin sensitivity and its relation to tuberculous infection. *Pub. Health Rep.* 56: 1082-1100 (1941).
- (5) McDougall, J. R.: *Tuberculosis.* Baltimore, Williams and Wilkins, 1949, p. 265.
- (6) Myers, J. A.: Immunity in tuberculosis. *J. A. M. A.* 146: 1492-1500 (1951).

Indexes for 1952

The index to *Public Health Reports* for 1952 (vol. 67) will be published as a separate and distributed to all subscribers with an early issue. In addition to author and subject entries for all material which appeared in the monthly issues, the index will contain data for Public Health Monographs as well as a cumulative listing of monograph titles published through December 1952.