Community Isoniazid Prophylaxis Program in an Underdeveloped Area of Alaska

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ALASKA is a land of contrast. Not only are there great variations in climate, topography, and ecology, but in its economy as well. While some facets of its technology and economy are highly developed, there are areas which must be considered economically underdeveloped. One of the least developed regions is the Bethel area of southwestern Alaska, where approximately 11,000 persons live in some 50 villages scattered throughout a treeless tundra of 98,116 square miles. Most inhabitants are Eskimos or Athabascan Indians, whose subsistence economy is based on hunting and fishing. Economic difficulties are chronic, and a question posed in the report of the 1890 census is pertinent today—"What can these people do to support themselves in a more decent and comfortable mode of life?" (*1*).

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Ideal conditions for the spread of tuberculosis are created by a gregarious population living in small, crowded dwellings with inadequate ventilation and minimal sanitary facilities (*2*). Given these circumstances, it is not surprising that Alaska experienced one of the worst tuberculosis epidemics ever recorded (*3*). To combat it, a committee headed by the former Surgeon General of the Public Health Service, Dr. Thomas Parran, was convened in 1953 to study the situation and outline emergency measures (*4*). The tuberculosis control workers of the Alaska Department of Health and Welfare and the Public Health Service must be credited with effectively implementing these measures. Hospital facilities were increased so that one bed was available for every 30 Aleuts, Eskimos, and Indians in Alaska, and field programs provided casefinding and outpatient chemotherapy for every village. Credit must also be given to the population since cooperation of all segments with the tuberculosis program was consistently good. Following the emergency efforts, the epidemic declined sharply. Nevertheless, tuberculosis is still a major health problem in underdeveloped areas of the State. In 1963, the rate of newly reported active cases among Aleuts, Eskimos, and Indians was 578 per 100,000, contrasted with only 29 for the United States as a whole (*5*).

Studies initiated in the area served by the Public Health Service Hospital at Bethel clearly

showed that by 1963 most of the tuberculosis that was developing was among adults who had been previously infected. These studies also established that isoniazid prophylaxis had a substantial effect in preventing tuberculosis among infected persons and that a communitywide approach to control could be used in Alaska (*6, 7*). During a controlled trial of prophylaxis in 1958–60, half of the households in each selected study village received isoniazid and half received a placebo. Since the group which received isoniazid experienced a lower rate of tuberculosis than the placebo group, we felt an increasing obligation to offer isoniazid to persons who had taken placebo in the controlled trial. A communitywide isoniazid prophylaxis demonstration was therefore initiated in 1963 to reduce further the incidence of tuberculosis; to meet an obligation to those persons who had previously taken placebo; and to evaluate procedures for communitywide prophylaxis. The demonstration was aimed at the application and refinement of methods worked out in earlier programs. We also gave consideration to evolving simple methods of administering medication that would require minimal professional personnel.

Study Population

During the demonstration year, 8,583 persons lived in the 26 participating villages (fig. 1) and the two boarding schools. This total is an increase of 1,702, or 24.7 percent, over the population included in the 1958–60 controlled trial in the same communities. All the villages in the previous trial were included in the 1963–64 program except two. These two were not included because there was no place for the nurse to stay during visits. (Villages not participating in either program were smaller, less accessible, or only campsites.)

Table 1 shows the distribution of the population in the 1963–64 demonstration by ethnic age groups. Half the population was under the age of 15 years at the start of the program; the birth rate during the study year was 43.4 per 1,000. Slightly more than 90 percent of the population was Eskimo. Of the other ethnic groups, 71 percent lived in Bethel, the administrative center of the demonstration area.

Bethel, as well as being the administrative center, was also the largest community in the area, with 1,652 residents in 1963. The other communities in the area ranged in size from 30 to 550 persons; most of them had between 200 and 300 residents in 1963. Excluding Bethel, the villages have similar physical and social characteristics. Each village is governed by an elected council and has a school, a post office, at least one church, a general store, and a unit of the National Guard.

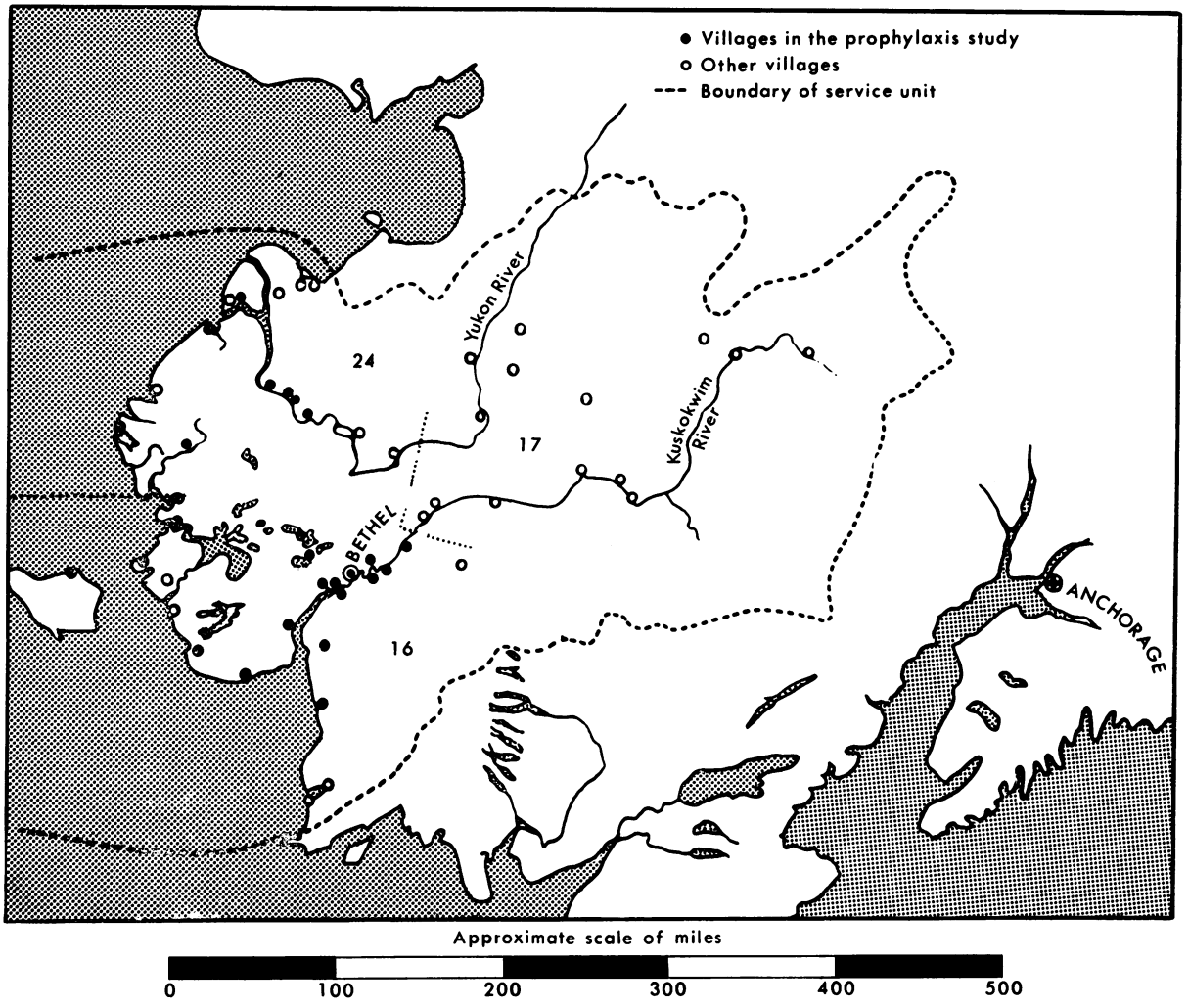
Although in the past the school teachers functioned also as health workers, now local medical aides, trained and supervised by the area hospital, look after the daily medical needs of the population, reporting to and consulting with the hospital physician on a daily radio schedule (*8*). The villages also have "chemotherapy aides" to supervise outpatient treatment of tuberculous patients. These aides are under the periodic supervision of public health nurses em-

Table 1. Characteristics of study population by age and ethnic group, Bethel area of Alaska, 1963–64

Age (years)	Total	Eskimo	Eskimo-white	White	Other
Total	8, 583	7, 845	111	573	54
Born during study year	364	345	5	13	1
0–14 [1]	4, 066	3, 779	68	199	29
15–34	2, 342	2, 116	24	177	16
35–54	1, 355	1, 204	11	134	6
55 and over	438	397	3	37	1
Unknown	18	4	0	13	1

[1] Includes children who were under 1 year during period of study, as well as those who became 1 year old before end of study year.

Figure 1. Villages in the Bethel area of Alaska participating in the tuberculosis prophylaxis demonstration of 1963–64



ployed by the Arctic Health Research Laboratory, which has its field headquarters at the Public Health Service hospital in Bethel (*9*).

Methods

The prophylaxis demonstration, initiated in the fall of 1963, was supported by three agencies of the Public Health Service, with assistance from the Alaska Department of Health and Welfare. The Service's Tuberculosis Program provided consultation and major financial support; the Arctic Health Research Laboratory was responsible for the design, fieldwork, and analysis of the demonstration; and the Division of Indian Health provided local medical guidance through its hospital at Bethel. The Alaska Department of Health and Welfare conducted the initial X-ray surveys and made available its tuberculosis register.

The demonstration staff held preliminary meetings with all agencies concerned with health and sent explanatory letters to the village councils and teachers in the demonstration communities to explain the nature and purpose of the demonstration. A basic record system was developed, and the census for each participating community was brought up to date, as well as the current tuberculosis status of each individual. A household card was used for fieldwork because contacts in the field were made on a household basis. Since analysis and subsequent followup were on an individual basis, a

card for each village resident was the primary record in the central office.

Isoniazid was to be taken in a single dose daily for 1 year. Infants under 18 months of age were given 50 mg., children between 18 months and 7 years 100 mg., children between 7 and 16 years 200 mg., and persons 16 years of age and over 300 mg. daily. (Dosage was by the average weight for the age group.) Infants were not started on prophylaxis until they were 2 months old because of the difficulty in administering solid medication before that age. Persons with convulsive disorders were excluded because of the theoretical possibility that isoniazid might increase the tendency toward seizures. The largest number of persons excluded were those under treatment for tuberculosis; these persons became eligible for prophylaxis when their prescribed course of therapy was completed; they continued prophylaxis until the end of the demonstration year.

Isoniazid was supplied in scored 100-mg. tablets and delivered to the villages in sealed metal drums. Opened drums were kept in locked wooden boxes to minimize the risk of accidental poisoning should small children gain access to large amounts of isoniazid. Each family received an unbreakable plastic bottle of tablets sufficient for about 4 weeks. Limiting the amount of drug in the home provided an additional safeguard against accidental poisoning.

The staff of the Arctic Health Research Laboratory supervised the demonstration and supplied statistical services. A field unit in Bethel was responsible for implementation of the demonstration. Personnel of this unit included a nursing supervisor, three public health nurses, and a clerk. The nursing supervisor had been in charge of the field staff during the earlier trial of isoniazid prophylaxis. The other nurses were newly recruited and required considerable orientation to the aims of the demonstration and the culture and economy of the villages. The nurses needed also to be prepared to travel from village to village by light aircraft, boat, or dogsled. The supervisor took direct responsibility for the program in Bethel and in two other villages; each of the other three nurses was assigned eight or nine communities, located so as to minimize air travel.

The demonstration nurses and X-ray technicians from the State health department conducted X-ray surveys before the demonstration began. The purpose of the surveys was to establish the tuberculosis status of the population and to identify the persons with active cases so that they could be given standard combined drug therapy rather than the single-drug regimen for prophylaxis. Children were tested with 5 TU of PPD–S before the demonstration to ascertain the prevalence of infection. Seventy-two percent of the population over 4 years of age were given chest X-rays and 85 percent of those under 16 years were given tuberculin tests.

Because of distances between villages and delays due to weather, the study was initiated village by village between October 1963 and May 1964. On the initial visit, the nurse explained the purpose of the demonstration to the village council and sought the council's acceptance, which was freely given in every instance. She also requested help of the council in selecting a local resident to take charge of the demonstration and fill a position called "recorder" for administrative reasons. The recorder took charge of the supply of isoniazid and distributed it in relatively small amounts to each household as needed. He also answered questions and encouraged participation. The recorders were paid for keeping records of the medication dispensed to each household and of the comments household members made indicating regularity of medication-taking and possible side effects. Each recorder was given an emergency kit and also instructions for treating children who might accidentally take an overdose of isoniazid. The kit contained a small supply of barbiturates to alleviate convulsions, as well as syrup of ipecac to induce vomiting.

Following selection and instruction of the recorder, the nurse and a local interpreter (usually the interpreter was the recorder) explained the demonstration in both English and Eskimo at a general village meeting. A movie on tuberculosis or colored slides from the 1958–60 study were useful introductions. A tape recording made by the principal investigator of the previous trial was played to report the results of that study and to give reasons for now offering prophylaxis to the entire village.

Medication was dispensed the next day by the nurse and the recorder. An adult member of

each household was invited to a central point and given a bottle of isoniazid labeled with the names of all household members and with the daily dose for each one. The nurse suggested that each day's medication be taken at one time by all household members, so that if one forgot, the others might remind him. A sheet of simple instructions was given to each family. A household calendar with a square for every day of the year was provided. The people were instructed to check a square each day that the family took its medication. Use of a single check for the entire family, however, proved confusing. Monthly calendars were later issued with a line for each household member and a space to be checked when each person took the day's medication.

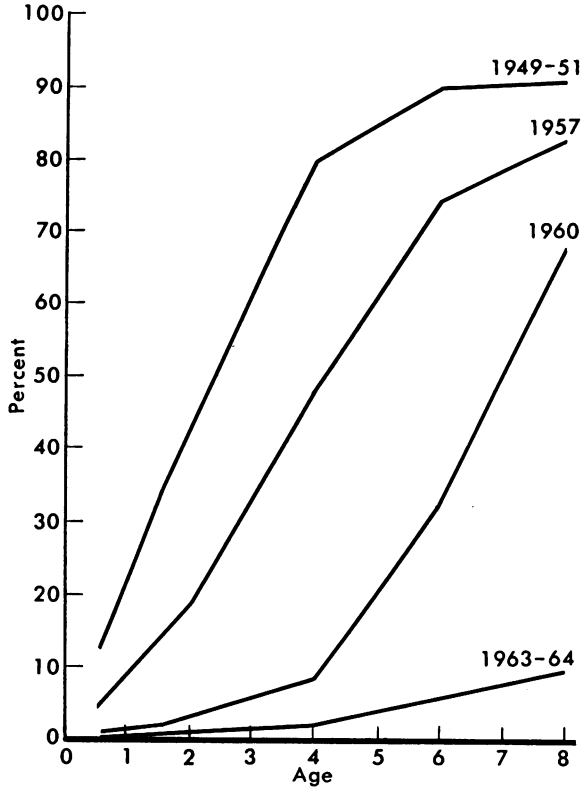
Children reaching 2 months of age during the program, persons whose tuberculosis treatment had been discontinued, and persons moving into the village were started on medication by the recorder. Because these late starters discontinued medication when the village program ended, they did not receive isoniazid for a full year.

Although a nurse was to visit each village at least once every 3 months, weather and transportation difficulties caused the average interval to be 4 months. On these visits, the nurse met with the recorder to review recordkeeping and provide consultation and encouragement. She urged persons who had stopped medication to start again. If the reason for stopping was minor side effects, the nurse recommended a reduced dosage with gradual return to the full

Table 2. Frequency of 6 mm. or more of induration to 5 TU PPD–S among children of study villages except Bethel, by age groups, 1963–64

Age groups (years)	Total tested	Reactors	
		Number	Percent
Totals	2,841	579	20.4
Under 1	20		
1–2	464	1	.2
3–4	429	7	1.6
5–6	429	24	5.6
7–8	425	40	9.4
9–10	377	81	21.5
11–12	363	187	51.5
13–14	334	239	71.6

Figure 2. Prevalence of tuberculin sensitivity among Eskimo children 0–9 years from the Yukon-Kuskokwim Delta of Alaska in four successive surveys



amount. She repeatedly stressed the importance of keeping medication bottles away from small children. Arrangements were made for adequate supplies of isoniazid to be given to residents leaving the village for summer cannery work and to families going to summer fish camps. On all the nurse's visits, she tried to maintain participation. She used home visits and group health education sessions to persuade people to stay in the program. Movies and lectures were set up for village meetings, groups of mothers, and school children. In several villages, poster contests bolstered interest.

At the end of the year of medication, an adult in each household was asked to estimate the participation of each member of his household by the number of months the medication had been taken and the frequency. Since all remaining isoniazid was collected and returned to Bethel at the close of the demonstration, the amount

taken by the entire village could be estimated by substracting the amount returned from the amount supplied. The isoniazid taken by each participant was estimated from the household calendars, the quarterly records kept by the recorders, and the personal histories. The personal histories of medication taken over the demonstration period, although certainly not the most accurate source of information, were the only index for individuals which was available for the entire population. The quarterly records were useful in confirming the personal histories—in spite of some lapses in recordkeeping by both families and recorders.

Results

The prevalence of tuberculin reactors in the population of the Bethel area has decreased markedly in recent years. Frequency distributions of induration to 5 TU of PPD–S are still clearly bimodal; therefore almost no reactions are reflected in indurations of 2 to 4 mm. in diameter. A positive reaction may thus reasonably be defined as 6 mm. or more of induration. The results of tuberculin tests of children in 1963–64 (table 2) are compared in figure 2 with results of those done previously in the Bethel area (*3*, *10*). Tests done in Bethel itself have been excluded because its lower rates have always seemed atypical. The results for the rest of the area clearly show that the high prevalence of tuberculin reactors among older children is a legacy from previous years and that current infection rates are much lower. Using the experience of children under 3 years of age as an indicator of the current average annual infection rates, we estimated these rates to be 25 percent for the period 1949–51, 8 percent for 1957, 1 percent for 1960, and less than 1 percent for 1963–64. Clearly, nonreactors now experience a low risk of acquiring tuberculous infection, and their risk of developing tuberculous disease must therefore be even lower.

The tuberculosis status of the study population upon entrance to the demonstration is contrasted in table 3 with the status of persons from the same communities at the beginning of the 1958–60 controlled trial. In both studies, those whose tuberculosis status was classified as unknown were almost entirely children too young to be X-rayed or persons who were nontuberculous on previous examinations, but who had not been examined during the year preceding the study. The number of persons with tuberculosis increased only slightly in the 5-year period between the studies, while the number without known tuberculosis increased markedly. This result is almost certainly not an artifact of casefinding, because all casefinding measures have been intensified in recent years. A dramatic decrease occurred in the numbers and proportions of persons under treatment for tuberculosis, again in the face of an expanded control program. Although the current figure for the demonstration villages of 2 percent of the population under treatment for tuberculosis appears small in comparison with figures for previous years, it still represents a remarkably high proportion by national standards.

Success of mass chemoprophylaxis depends not only on the effectiveness of the medication but also on the willingness of each person to take it. Of the 8,583 residents in these communities, 6,501 started to take isoniazid when the program was initiated in their villages and 331 started later in the medication year—a total participation rate of just under 80 percent.

Participation	*Number*	*Percent*
Total population	8, 583	100. 0
Initial participants	6, 501	75. 7
Late participants	331	3. 9
Nonparticipants	1, 751	20. 4

Over half of the nonparticipants were from Bethel. Many who had started late or did not start at all had valid reasons for not participating initially (table 4). A very small proportion of the population (0.9 percent) flatly refused to participate. Some who agreed to start never did so, the reason most often given being, "I forgot." Persons directly or indirectly refusing to participate comprised 13.7 percent of the total population; 78.5 percent of them were from Bethel.

Unfortunately, not all participants continued to take isoniazid throughout the year. A quarter of them stopped prematurely, and about one-sixth stopped for a while but started again. The reasons for both actions are shown in table 5. Many persons who complained of side effects, as well as many of those who gave no reason, are believed to have used this means to avoid direct

Table 3. Tuberculosis status of residents of study villages at beginning of 1963–64 demonstration and of 1958–60 controlled trial

Status	Demonstration		Controlled trial	
	Number	Percent	Number	Percent
Total participants	8, 583	100. 0	6, 881	100. 0
Known tuberculosis	3, 385	39. 5	3, 045	44. 3
Under treatment	181	2. 1	696	10. 1
Previous treatment	1, 622	18. 9	958	13. 9
No treatment recommended	1, 582	18. 5	1, 391	20. 2
No known tuberculosis	5, 198	60. 5	3, 836	55. 7
Nontuberculous	3, 183	37. 2	2, 418	35. 1
Unknown	2, 015	23. 3	1, 418	20. 6

refusal. Nearly a third of the lapses were accounted for by persons who did not take isoniazid with them when they left for fish camp or other summer employment. Another third did not state a reason, or said they "forgot," and again this lapse came mostly during the busy fishing season. Fear of complications was rarely given as a reason for stopping isoniazid during this demonstration, in contrast to the frequent mention of this reason during the previous trial. At that time large numbers of villagers stopped because of rumors that enemy agents were distributing the medication. If similar rumors existed during the 1963–64 demonstration, they were not openly expressed.

The categories of symptoms given as reasons for discontinuing isoniazid are shown in table 6. Dizziness (which might in some instances be nausea imperfectly expressed in English) and gastrointestinal symptoms (usually nausea or diarrhea) were the most common complaints. In the 1958–60 controlled trial, these categories were the only ones which were mentioned more frequently by persons taking isoniazid than by those taking placebo (*6*). In 1963–64, all side effects cleared up quickly when isoniazid was discontinued. Although it was often difficult for

Table 4. Reasons for late participation and nonparticipation in 1963–64 demonstration

Reasons	Late participation			Nonparticipation		
	Number	Percent	Percent of study population	Number	Percent	Percent of study population
Total	331	100. 0	3. 9	1, 751	100. 0	20. 4
Tuberculosis treatment	24	7. 3	. 3	105	6. 0	1. 2
Other medical reason	2	. 6	----------	38	2. 2	. 4
Came late to village	152	45. 9	1. 8	232	13. 2	2. 7
Too young	74	22. 4	. 9	203	11. 6	2. 4
Refused	3	. 9	----------	79	4. 5	. 9
Not stated	76	22. 9	. 9	1, 094	62. 5	12. 8

Table 5. Reasons for temporary lapses in medication or for discontinuing medication prematurely, 1963–64 demonstration

Reasons	Temporary lapses			Premature stops		
	Number	Percent	Percent of participants	Number	Percent	Percent of participants
Total	1, 146	100. 0	16. 7	1, 771	100. 0	25. 9
Moved or left temporarily	376	32. 8	5. 5	543	30. 7	8. 0
Died	--------	--------	----------	20	1. 1	. 3
Illness	42	3. 7	. 6	72	4. 1	1. 1
Side effects	297	25. 9	4. 3	426	24. 0	6. 2
Fear of complications	43	3. 7	. 6	17	1. 0	. 2
Village ran out of pills	--------	--------	----------	63	3. 5	. 9
Other or no reason stated	388	33. 9	5. 7	630	35. 6	9. 2

families in their crowded cabins to keep their supply of isoniazid out of reach of children, no instances of accidental poisoning occurred during this demonstration.

In assessing individual and village participation, the number of months that a person took isoniazid and the regularity with which he took it were combined to form a medication index, in which 100 percent signified that a person took isoniazid every day for 12 months. This index is admittedly crude and subjective because it is based on the family histories of medication-taking. It appeared to correlate reasonably well, however, with other more objective indexes. For the entire population, the median medication index was 51.2 percent. This index reflects the 1,751 persons (20.4 percent of the population) who took no medication at all and the 1,048 persons (12.2 percent of the population) who had an index for medication-taking of 90 percent or better. In the 1958–60 trial, there was a suggestion that 60 percent of the recommended annual dosage might be as effective as the full amount. The proportion of the total population taking this amount or more in the 1963–64 demonstration was 33.6 percent; the proportions for ethnic, sex, and age subgroups are shown in table 7. Eskimos took medication better than non-Eskimos. There were relatively small differences between the indexes for males and females, while younger persons had higher scores than older persons.

When the villages were ranked according to the proportion of their populations with medication indexes of 60 percent or better, we found that the coastal villages tended to rank appreciably higher than the villages along the Yukon or Kuskokwim. This result did not appear to be related to the nurse assigned to supervise the program.

Villages farthest away from Bethel tended to rank higher than those nearby.

No correlation of the degree of medication-taking could be found with the number of visits the nurse made in the course of the program. The interval between her initial and second visit was somewhat longer in the villages that took isoniazid best. This trend is probably associated with distance from Bethel, as weather conditions often made it more difficult to get to the coastal villages than to those farther inland. The observed trend might also have been associated with a tendency of the nurses to return sooner to villages where there were difficulties than to those where things appeared to be running smoothly.

In about a quarter of the villages isoniazid was dispensed only when families came to request it, while in another quarter the recorder delivered it on a regular schedule without waiting for the household to request replenishment. We found no indication that either method was associated with the village's rank for medication-taking. The method of issuing medication varied with the characteristics of the recorder and the local situation. Some recorders were relatively aggressive and had status in the village, making a rigid distribution schedule possible; the shyness of others made a permissive pattern inevitable. There was only a slight and inconclusive positive association between the number of group meetings on tuberculosis and the village's participation in the demonstration program.

Table 6. Persons discontinuing medication because of symptoms they attributed to isoniazid, 1963–64 demonstration

Symptom	Number	Percent	Percent of participants
Total	426	100.0	6.2
Gastrointestinal	73	17.1	1.1
Dermatological	36	8.5	.5
Cardiac	50	11.7	.7
Dizziness	126	29.6	1.8
Other neurological	25	5.9	.4
"Felt sick"	51	12.0	.7
Miscellaneous	65	15.2	1.0

Table 7. Percent of population taking 60 percent or more of recommended medication, by ethnic group, sex, and age group, 1963–64 demonstration

Age group (years)	Eskimo		Non-Eskimo [1]	
	Male	Female	Male	Female
0–14	42.5	43.0	29.4	25.2
15–34	21.3	30.0	22.6	26.1
35–54	30.3	37.5	27.3	33.8
55 and over	33.8	30.9	12.5	17.6

[1] Includes persons classified as Eskimo-white.

Characteristics of the recorders were also examined for association with medication-taking in the villages. Several recorders resigned and were replaced by new persons. This variable did not appear to be related to the degree of village participation. Some recorders were members of the village council, others were village medical aides, and most had some position of responsibility. Their position in the village, however, did not appear to be associated with their success in getting their fellow villagers to participate. Nor did education, ability to speak English, or shyness, as reported by the nurses, appear important. On the other hand, some characteristics did appear to be associated with the rank of the village on the scale of medication-taking. The recorders in the villages of highest rank were more likely to be men, younger, and unmarried.

The villages in the 1963–64 demonstration could also be ranked with respect to their participation in the earlier controlled trial. A comparison of the two rankings showed a rank order correlation coefficient of only 0.28. Nearly half the villages had almost the same rank in both programs, while several showed dramatic differences. Both the tendency toward similar ranking and for extreme differences appeared greater than might be expected by chance alone. Three villages had marked changes in ranking. One was second highest in participation in the earlier program but only 24th in the 1963–64 demonstration. In this village, administrative difficulties led to medication not being available much of the time. Two other villages that did relatively well in the 1963–64 program were hit hard during the earlier trial by rumors that the medication was harmful.

Table 8. Medication index in 1958–60 controlled trial and in 1963–64 demonstration for persons eligible to participate fully in both programs

Medication index in 1958–60 trial (percent) [1]	Medication index in 1963–64 demonstration (percent) [1]			
	Total	0–29	30–59	60 and over
Total	3,535	834	1,179	1,522
0–29	313	148	86	79
30–59	679	190	261	228
60 and over	2,543	496	832	1,215

[1] 100 percent would signify that a person had taken isoniazid every day for 12 months.

A comparison of individual medication-taking in the trial of 1958–60 and in the 1963–64 demonstration is possible for persons who participated in both programs. The comparison shown in table 8 is for persons who were eligible for full participation in both programs. One-third of these persons had a medication index of 60 percent or better in both. Participation was better in the earlier program. Estimates based on the total medication consumption for all villages also showed that about 70 percent of the recommended medication was taken in 1958–60, while only about 55 percent was taken in the 1963–64 demonstration.

Even so, the second program increased considerably the proportion of the total population which has now received a reasonable amount of medication. About 2,400 persons took less than 60 percent of the recommended dosage in the earlier trial. Most of these persons, however, had not been available or eligible at the start of that program. Of these 2,400 persons, more than 1,200 have, as a result of both programs, now received a dose of medication equivalent to 60 percent or more of the recommended prophylactic dosage.

Since the demonstration program began, new cases or reactivations have occurred in 32 persons, all of whom had positive bacteriological tests. Only one case occurred among the persons participating in the 1963–64 demonstration who took 60 percent or more of their medication; 22 occurred among persons who took less than 30 percent of the recommended dosage. In the absence of controls, this result is not conclusive evidence of the effectiveness of isoniazid prophylaxis. The result indicates, however, that new tuberculosis case rates were high among persons who took little or no isoniazid and low among those who took the medication regularly.

Discussion

Comparison of two similar programs of isoniazid prophylaxis conducted in the same communities approximately 5 years apart offers material for speculation about differences in participation. In the 1963–64 demonstration, fewer persons participated than in the 1958–60

trial and those who did were less likely to take the recommended amount of medication. Nevertheless, the two programs combined succeeded in inducing a sizable proportion of the population to take what appears to be an effective dose of isoniazid for preventing the development of active tuberculosis (*7*).

To a considerable extent, the decreased participation in the demonstration program compared with the earlier trial resulted from the failure of the program in the town of Bethel. Only a small proportion of the residents came for examination and volunteered to take isoniazid. In retrospect, the program in such a town, which is too large and variegated for information to spread by word of mouth, should have been conducted door to door. There appears to be no other way to contact the entire population effectively. Bethel's constantly shifting population also made followup difficult. But even in the other villages, participation was not as successful in the second program, even though we could then state definitely that the first trial had shown isoniazid to be effective in preventing tuberculosis. Perhaps the decreased participation resulted primarily from the marked change in the attitude toward tuberculosis in recent years. In 1958, the frequent deaths, disabling effects, and prolonged hospitalizations stemming from the epidemic of 1953 were still vivid in the minds of the people. Today the disease is not regarded as a threat to life, and treatment entails only a few months of hospitalization. Going to the hospital for tuberculosis treatment, commonly termed "the rest" by villagers, may even come as a welcome reprieve from the hardships and monotony of village life (*11*). The threat of tuberculosis has ceased to be strong motivation for community action.

Changes in community structure also made the study area less ideal for supervision. Though the population continued to be receptive to the visits of professional health workers, there was some evidence of resistance to regimentation, particularly when instructions were relayed by the recorder. The authority afforded the teachers who had acted as medical aides in the past had apparently not yet been transferred by the community to the village medical aides and other local health assistants.

Shipping isoniazid to the villages in bulk containers and placing it under the care of nonprofessional persons apparently cheapened the medication and the program in the eyes of many villagers. In the earlier trial, medication was specifically labeled for each family and given to them personally by the nurse. Individual family packaging of the year's supply at some central office might have been worth the extra time and expense. Use of a standard bottle size also created difficulties. A month's supply might not fill the bottle, and it was difficult to explain why some households had their bottles filled while others did not. If all bottles were completely filled, it then became difficult to ask households to return regularly for refills before the bottle was empty.

In both programs persons who took medication well had similar characteristics. Preschool and school children did best and the older adult tended to do poorly. There was little difference between the sexes with regard to taking medication, except in the age group 15 to 34 years, in which females did better than males, probably because males in this age group were often away from home for hunting, fishing, or outside employment.

The ranking of villages with respect to medication-taking was generally similar in both programs, and the few marked discrepancies had obvious explanations. Village attitudes toward such programs appear to persist over several years and are relatively unaffected by different methods of health education, techniques of distributing medication, and the characteristics of the supervising nurses. No correlation could be found between a village's rank in medication-taking and the proportion of persons in it who had been X-rayed in the survey preceding the demonstration. Cooperation in one type of program does not necessarily carry over to related health programs. Although the agreeable nature of the villagers usually insures a good initial response to a new program, it does not guarantee prolonged participation. This initial reaction may mislead health workers implementing long-term programs, particularly newcomers to the area.

As the tuberculosis epidemic recedes in the underdeveloped areas of Alaska, the need for total communitywide prophylaxis programs diminishes. Already the majority of school chil-

dren are uninfected, and the agencies responsible for tuberculosis control are limiting prophylaxis to tuberculin reactors and household associates of persons with active cases. In spite of this change in emphasis, however, there are opportunities for nonprofessionals to assist in isoniazid prophylaxis and other community health activities, and a number of suggestions emerge from the analysis of the 1963–64 demonstration.

The professional worker in charge of community health programs should realize that patterns of acceptance and participation may vary from village to village. He should therefore first endeavor to acquire considerable background information concerning the individual characteristics of each village. Observations of anthropologists and health educators may offer clues as to village patterns and suggest approaches for successful program implementation (*12–14*). Professional personnel should spend sufficient time in each village to become acquainted with its power structure, attitudes of the people toward health, and the facilities for dealing with health problems. The professional worker should select the nonprofessional personnel to be employed locally with the advice and consent of the village council. All too often selection by the council may be based on need rather than ability. Young persons with few family responsibilities appear to be the most effective workers.

The nurse should make a followup visit shortly after her initial visit. Although no correlation was found between the rank of the village in medication-taking and the interval between the nurse's first and second visit, it was clear that the nurse's return to the village in a few weeks could have prevented many mistakes and misunderstandings regarding techniques and recordkeeping. During followup visits, professional personnel should seek to motivate the local worker and lend prestige to his position.

As the epidemic diseases of the past give way to chronic diseases, motivating people to avail themselves of public health facilities becomes more and more important. Even though the comparison of the two control programs suggests that a public health nurse dealing directly with a family is more effective than a nurse dealing with the family through an intermediate lay worker, it is doubtful that there will ever be enough nurses or other professional personnel to make use of the direct approach practical. Moreover, since professional personnel often do not reside permanently in the area they are serving, it is the local worker who can best bridge the cultural gap between the professional worker and the population and provide continuity for long range programs (*14*). Even with the difficulties encountered in this demonstration, a sizable proportion of the population was motivated to take daily medication for a long period of time with little professional supervision and stimulation. With further training and experience local nonprofessional workers will become increasingly effective, thereby broadening the scope of community health activities (*15*).

Summary

A controlled trial of isoniazid prophylaxis for tuberculosis was conducted in 1958–60 in the service area of the Public Health Service hospital at Bethel, Alaska. Five years later, three agencies of the Public Health Service, aided by the Alaska Department of Health and Welfare, carried out a demonstration program in the same area. In the 1963–64 program, isoniazid was offered to all eligible persons in 26 villages and in two boarding schools. The recommended dose of isoniazid was approximately 5 mg. per kilogram of body weight, to be taken in a single dose each day for 1 year. Heavy reliance was placed on local personnel to distribute the medication and to motivate the people to participate. Only minimal supervision was available from itinerant public health nurses.

Approximately 80 percent of the population participated to some extent in the program. Children were most likely to take the medication as recommended; older adults tended to do poorly. Participation was poor in Bethel, a town of 1,652 persons and the administrative headquarters of the area. Participation was much better in the smaller villages and was best in the more remote areas. Most villages ranked similarly in the degree of participation in the controlled trial and in the demonstration. Subsequent observation indicates that new tuberculosis case rates have been high among persons

who took little or no isoniazid and low among those who took the medication regularly.

Methods of distributing medication within the village, the frequency of visits by the public health nurses, and the methods used for health education did not demonstrably affect the village rankings for participation. Only one apparent characteristic of the local resident who distributed the medication—freedom from domestic responsibilities—was positively associated with a village's participation. Although a number of difficulties arose because of the delegation of authority to the villagers, the program demonstrated that a large proportion of the population could be motivated to take daily medication for a long period with minimal professional supervision. The demonstration thus indicates the responsibilities nonprofessional local workers might assume in future health programs.

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Education Note

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Additional information and applications are available from the School of Public Administration, University of Southern California, University Park, Los Angeles 90007.