The Health and Nutritional Status of Alaskan Eskimos

A Survey of the Interdepartmental Committee on Nutrition for National Defense—1958

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THE SUCCESS of the adaptation of the Eskimo to a uniquely limited and precarious food supply in a harsh environment has been a challenging question to physiologists for over a century. Arctic explorers have often discussed this problem; some have taken controversial positions based on their estimates either of the merits of the Eskimo dietary regimen or the status of the natives' health. The present study was undertaken to investigate this question and to consider the necessity of remedial action. The work was carried out in cooperation with the Arctic Health Research Center of the Department of Health, Education and Welfare, the Alaska Command of the U. S. Armed Forces and the Alaska National Guard.

Members of the Arctic Health Research Center with the support of the Indian Health Service have been conducting systematic studies of the dietary habits of the Eskimo and their hematologic disorders. The work described here was designed to evaluate the nutritional status of the Eskimo people by carrying out physical appraisals and biochemical measurements of specific nutrients in blood and urine. These data were then to be evaluated along with the dietary evaluations and food analyses made available by continuing studies of the Arctic Health Research Center. Additional measurements of consumption of food in the mess halls were made among the native members of the Armed Forces.

THE CULTURAL BACKGROUND

The Eskimos, Indians and Aleuts of Alaska* vary widely in their cultural traditions and present day mode of living. At the time of the white man's arrival, the Eskimos occupied all the northern and western coasts of Alaska, and lived on the southern coast as far east as Prince William Sound and on Kodiak Island. The Alaskan Eskimos were divided culturally into a Northern group (the Thule culture) and a Southern group (the Old Bering culture) with the dividing line situated on Norton Sound in

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* Since the present study was performed and much of this report was written before or during the emergence of Alaska as the Forty-ninth state, there may be descriptions herein or references to agencies or procedures which have been superseded by new organizational arrangements.

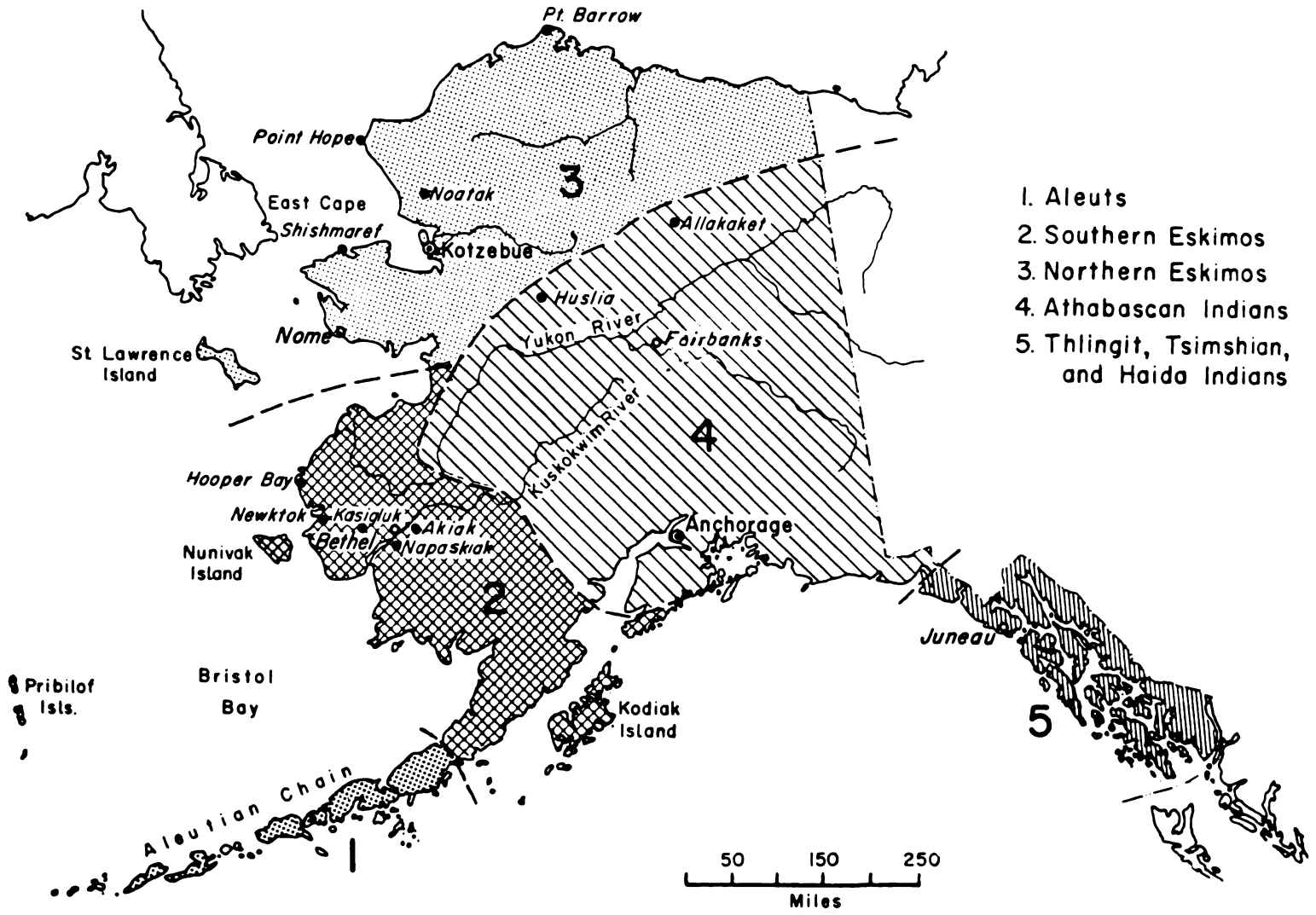

FIG. 1. Principal ethnographic divisions of Alaska, and the villages studied.

TABLE I
Eskimos, Indians and Aleuts in Alaska in 1950*

Cultural Groups	Population	Median Age (yr.)
Eskimos	15,882	17.7
Athabascan Indians	6,783	..
Aleuts	3,892	17.9

* U. S. Census of Population, 1950, vol. II, Parts 51–53.[1]

the vicinity of Unalakleet. Northern Eskimos still speak the same language as the Siberian, Canadian and Greenland Eskimos, whereas the language of Southern Eskimos is quite different. The Aleuts originally occupied the western half of the Alaska Peninsula and the Aleutian Islands. Thlingit Indians lived in southeast Alaska, while Athabascan Indians occupied the interior regions of the territory. Figure 1 shows these regions while Table I gives the numbers of these cultural groups in 1950.

The Eskimos, like the American Indians, are of Mongoloid ethnic origin. Eskimo skulls are narrow and oblong with a definite sagittal ridge. The lower jaws and maxillary bones are highly developed and prominent. The skin, hair, epicanthal folds and lumbar pigment testify to their Mongoloid origin. In contrast to the Negro, the Eskimos have narrow noses. As in the American Indian, blood group type O predominates among the Eskimos.

The present study was concerned primarily with two groups of Eskimos, defined by geographic areas, and to a lesser extent with Athabascan Indians and Aleuts. In order to understand the situation of these people today, it is important to review the primitive conditions under which they once lived, since all of them are now in transition from that primitive way of life. This transition began in the eighteenth century for the Aleuts with their introduction to the Russian explorers and traders who followed Vitus Bering into the Aleutian Chain territory. For the Indians and Eskimos the transition began later and at different times for different groups. The coastal Eskimos who lived on marine mammals were exposed to the white whalers and explorers of the eighteenth and nineteenth centuries, while some of the inland Eskimo and Indian villages have had important contact with white culture only during the past sixty years. The extent of acculturation is thus variable.

Eskimos have managed by a number of ingenious methods to maintain their numbers and to carry on a marginal existence under exceptionally adverse conditions. In order to survive in the Arctic, they have had to utilize every available resource. The primary consideration for the location of an Eskimo or Indian village in Alaska was the available food, fuel and water supply. The population balance in such an economy was important since overpopulation meant hunger and sometimes starvation. When the population became too large for the available food supply, or if the food supply became scarce because of persistently unfavorable weather conditions or some other accident of nature, family groups would break away and try to find a more favorable place to establish themselves.

There were three general types of Eskimo diets under the conditions of the primitive culture.[2] On the northern and northwestern coast of Alaska, Eskimos were primarily dependent on sea mammals (seal, walrus and whale) for food. Farther south, the chief dependence was on fish, while smaller numbers of interior Eskimos lived on land mammals (primarily caribou). In none of these areas was there total dependence on any one type of food. Use of fish was universal, while shellfish, birds, birds' eggs, small mammals (including hares, porcupine, rabbits, muskrats, mink and beaver), berries, roots and green plants were eaten when available. In retrospect these diets would seem to have had certain things in common. All of them were probably high in protein, moderate to high in fat content, and contained little carbohydrate. They were seasonally low in ascorbic acid and, on occasion, must have been deficient in calories. Such diets, however, had no known nutritional advantages or disadvantages except that they are generally believed responsible for the fact that Eskimo teeth were very nearly free of caries. The Eskimo did not

TABLE II
Mean Income per Capita

Village	Mean Income per Capita (Dollars)	Income from Welfare (%)
Napaskiak	173	28
Akiak	475	32
Kasigluk	138	35
Hooper Bay	137	30

usually have a choice of foods from which to make a selection. Instead, his problem was the fundamental one of assuring a continuity of food and to this problem he devoted his energy, intelligence and ingenuity.

It is important to recognize that Alaskan Eskimos are not nomadic people. They live in one or a few permanent homesites or campsites. Most of the sod houses have now been replaced by small frame or log structures. Often these frame houses are poorly insulated and therefore more difficult to heat adequately in winter than were the primitive sod houses. They are usually crowded.

Eskimos today live on a combination of foods obtained from traditional sources and foods brought from local grocery stores. The latter foods are for the most part cereals and sugars. Some of the factors which presently affect the food habits of Eskimos are these:

Eskimos live at a low economic level. In a study made in 1955,[3] the estimated annual per capita cash income in twenty-three Eskimo villages ranged from $69 to $475. Unless the Eskimo lives in one of the larger towns and has some education, he has little or no opportunity for a job with a steady income. The cash income for a village comes from a variety of sources. Fishing for profit provides income for many families in the Bristol Bay area and at the mouth of the Yukon. While such fishing may require considerable capital for a boat, the profits are large if the fishing is good. The trend in recent years has been toward smaller catches of salmon. Some men from villages in the Kuskokwim area obtain employment in the canneries on Bristol Bay. The pay is high, averaging $600 for the month or six weeks while the cannery operates. Trapping provides part of the income of most villages. Fur prices are now low, however, and only mink, muskrat and beaver are profitable enough to encourage the effort involved in trapping. Twenty mink, 700 muskrat, or twenty beaver would represent a good year's catch for one man but, generally speaking, fewer than this are obtained. During the 1957–1958 season, average market prices for mink were $30, muskrat $0.25 and beaver $25.

Service in the National Guard produces an appreciable proportion of the total income in the villages. In addition, a few Eskimos work on river barges in the summer or as storekeepers or janitors. Crafts, such as ivory carving, basket weaving and the making of souvenirs, provide some income for Eskimos. A major source of income in all villages is the territorial or state welfare. A large number of Eskimos are eligible for various forms of public assistance including Old Age Assistance and Aid-to-Dependent-Children. Welfare payments amount to between one-fifth and one-third of the cash income in most communities. In four of the villages included in the present survey, mean per capita income in 1955[3] was estimated as shown in Table II.

The population in Alaska is sparse and the communities are small. In 1950 about 80 per cent of the 287 places named in the census had fewer than 199 persons.[1] This smallness was probably originally related to the availability of food in the surrounding area. The creation of schools, stores, churches and postoffices in some villages has tended to attract native families and to enlarge the villages, whereas many small villages listed in 1950 are no longer in existence.

Eskimos seemed to accept Christianity readily and today every village has at least one church. This is an important part of the social life. Denomination of the churches is shown in Table III for the villages included in the present study.

Schools have been in existence in Alaska for many years, but there was never enough money to provide one for each of the smaller villages, and until the past ten years there was little opportunity for a high school education except in towns with a permanent white population.

TABLE III

Alaska: Characterization of the Villages in the Study, and the Size of the Samples Examined, 1958

Village	Type	Population	No. of Persons Examined	Churches	School	Store or Distance to Nearest Store	Distance to Hospital (miles)
Allakaket	Indian	120	75	Episcopalian	State	Co-op.	150
Akiak	Southern Eskimo	187	76	Moravian	Bureau of Indian Affairs	1 Trader plus Co-op.	20
Hooper Bay	Southern Eskimo	435	96	Roman Catholic Swedish Covenant	Bureau of Indian Affairs	2 Traders plus Co-op.	155
Huslia	Indian	145	90	Episcopalian	State	Trader	135
Kasigluk	Southern Eskimo	180	94	Russian Orthodox, Moravian	Bureau of Indian Affairs	None (4 miles)	35
Napaskiak	Southern Eskimo	137	81	Russian Orthodox	Bureau of Indian Affairs	None (1 mile)	6
Newktok	Southern Eskimo	118	59	Roman Catholic	Bureau of Indian Affairs Instructional Aid	3 Traders	115
Noatak	Northern Eskimo	400	69	Friends	Bureau of Indian Affairs	Co-op.	50
Point Hope	Northern Eskimo	315	88	Episcopalian	Bureau of Indian Affairs	Co-op.	150
Shishmaref	Northern Eskimo	200	77	Lutheran	Bureau of Indian Affairs	Co-op.	110
Totals		2,237	805				

Village schools are operated by the State (formerly called Territorial Schools) or by the Bureau of Indian Affairs. In recent years the latter agency has started a special type of school (The Instructional Aid School) in certain villages. In these schools the village furnishes the building, and a teacher is provided by the Bureau of Indian Affairs. Such teachers are often not fully qualified.

HEALTH FACILITIES

All Bureau of Indian Affairs schools, except some Instructional Aid Schools, all National Guard Units, and some traders and missionaries have two-way radio communication. Each village where two-way radios are located has the opportunity of communication daily with the Alaska Native Health Service hospitals. Advice is given from the latter to the operator of the radio, usually the teacher, on medical problems in the village. A notable difference is usually found in health conditions between those villages with and those without radio communication. Each teacher has a stock of drugs including antibiotics; however, except for penicillin, almost no parenteral medication is possible.

A general description of the ecologic and social factors which bear upon the health problems in western Alaska has been outlined in the report of a survey carried out in 1953–1954 by the Graduate School of Public Health of the University of Pittsburgh.[4] The Department of the Interior, which was then responsible for the health problems and programs in the native population of Alaska, invited the faculty of the School of Public Health of the University of Pittsburgh to survey the situation and make suggestions for improvement. In the summers of 1953 and 1954 such a survey was carried out by medical specialists in anthropology, nursing care, medical social services, tuberculosis control, hospital and medical care, sanitation, laboratory services and mental health. Members of the party traveled through the major areas of Alaska. The observations were

TABLE IV
1958 Budget for Alaska

Activity	Amount
Hospital operations	$ 8,702,000
Contract patient care	694,000
Field health	784,000
Management services	122,000
Total	$10,302,000

generally more concerned with the health organizations and demographic and environmental conditions than with clinical problems. The study was made at a critical time, because in July 1955 the responsibility for the health problems of the natives of Alaska was transferred by Public Law 568 from the Bureau of Indian Affairs of the Department of the Interior to the Department of Health, Education and Welfare. The Pittsburgh report thus reflects the conditions of an older system.

When Secretary Seward purchased Alaska in 1867, the contract with the Czar stipulated, "The uncivilized tribes will be subject to such laws and regulations as the United States may from time to time adopt in regard to aboriginal tribes of that country." Health services and regulations were almost nonexistent until 1914 when a medical program was established in the Bureau of Education which was then the only governmental agency directly concerned with the natives. In 1916 this Bureau established a migratory medical boat on the Yukon, but during the first summer the physician, Dr. J. W. Houston, fell overboard and was drowned. Small health surveys indicated that tuberculosis, syphilis and "trachoma" were common but there is now reason to doubt that trachoma did exist.

The first hospital for natives was built in Juneau in 1916. In 1931, when the Office of Indian Affairs assumed responsibility, there were five Alaska Native Health Service hospitals for the Alaskan Indians and Eskimos with six doctors and fifteen nurses for the entire population. There are now five general hospitals under the U. S. Public Health Service. These are located at Point Barrow, Bethel, Kanakanak, Kotzebue and Tanana. There are, in addition, two medical centers, one at Anchorage and another at Mt. Edgecumbe in southeastern Alaska near Sitka. Some specialized care, as for tuberculosis and mental disease, is obtained by contract in hospitals both in and outside Alaska. The 1958 budget of the Division of Indian Health, Public Health Service, for Alaska is shown in Table IV.

The territorial "self-help" with medical problems may be said to have begun in 1945 when the Alaska Department of Health was reorganized. The collection of demographic data in Alaska has been the responsibility of the Alaska Department of Health, although the several U. S. Commissioners throughout the state actually record the data which are in turn furnished for native areas by the resident teachers.

The Alaska Bureau of Vital Statistics was formed in 1949. The assignment of ages among adults is apt to be uncertain and the registration of births, deaths, and especially causes of death, are likely to be in error. The proportion of all death certificates signed by physicians is in the order of 65 per cent; the proportion of deaths caused by tuberculosis signed by physicians is much lower, often no more than 35 per cent. A disproportionately large number of the causes of death is assigned to senility and ill defined causes.

In 1950 the infant mortality for Alaskan natives was 101 per thousand live births (deaths occurring in infants under one year of age). This rate is about that of the U. S. in 1900 and is three times that recorded for the U. S. in 1950. The Alaskan white population has an infant mortality rate of 24 per thousand, although it must be recognized that few Alaskan whites live in the environmental extremes typical of the native population. The principal cause of death among Alaskan natives in 1950 was tuberculosis, which caused about one-third of all deaths and was thirty times more frequent in natives than in Alaskan whites. Accidents were the second important cause of death among the natives, and infectious disease of the respiratory system (excluding tuberculosis) were the third most important. The concerted efforts of Federal and State health

agencies have markedly diminished the tuberculosis problems of the natives since 1950.[5] This change is shown in Figure 2.

In 1956 the four leading causes of death in these people were accidents, influenza and pneumonia, heart disease and tuberculosis, in that order. The infant death rate among these races has dropped appreciably since 1945.

The birth rates of racial groups in Alaska in 1956[6] are White, 32 per 1,000 population; and Eskimos, Indians, Aleuts, 52 per 1,000 population.

The burden of disease in Alaska in 1950 and today bears a remarkable resemblance to that recorded for the United States in 1900. The opportunity for the application of modern medical skills and knowledge is obvious. "Native Alaska" could be made an almost ideal laboratory workshop for teaching, research and service.

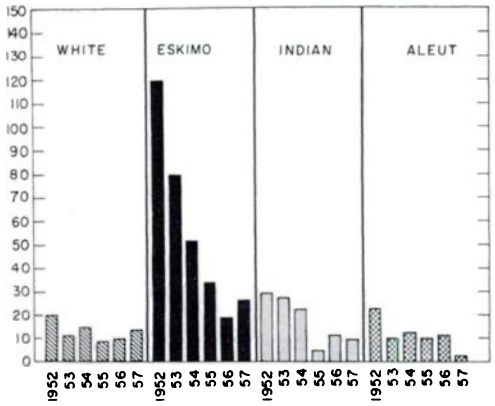

FIG. 2. Tuberculosis mortality for Alaska by race 1952–1957.

METHODS

General Plan of Study

A large proportion of the able-bodied Eskimo men are members of two battalions of the National Guard Reserve Unit which is brought to Camp Denali (at Fort Richardson near Anchorage) each year for a two week training period. In good weather when the widely scattered villages are accessible the men are often away on sealing expeditions or tending traplines, so the period of National Guard duty offered a unique opportunity to study these Eskimo men. This was also an economical way of assembling data on people from many widely separated villages. It was fortuitous that the Guard Training period occurred in late winter when native food supplies might be expected to be diminished and limited, thus placing the nutritional status of the people at a low ebb.

Battalion 2 is comprised of men from southwestern Alaska, including the Aleutian chain and the Bering Sea islands, except St. Lawrence and King Islands. Bethel in the Kuskokwim valley may be considered as its center. The men come from as far south as Dillingham, from west to Unalaska and the Pribilofs, and from the north to Hooper Bay and the lower Yukon. They include two distinct ethnic groups, the Eskimos (both inland and coastal) and the Aleuts, who are few in number (Fig. 1). These men were examined during three days at Camp Denali. Upon completion of the study on members of Battalion 2 the examiners were divided into two groups. One team proceeded to Bethel and in the following ten days studied the civilian population in five villages in that area. A second team went to Kotzebue where studies were completed in five villages of that region. Upon completion of these field studies the two parties again returned to Camp Denali and examined the members of Battalion 1 of the Eskimo Guardsmen. These men were assembled from the northern villages of Alaska extending from Barter Island near the Canadian border to Nome and Unalakleet on the Bering Sea. Men from St. Lawrence and King Islands were among the group as well as from the Athabascan Indian village of Fort Yukon in the interior.

Sampling Methods

It appears that minimal medical screening is carried out in the villages when the National Guard groups are assembled for annual duty at Anchorage. It is likely that known tuberculosis and obvious crippling or chronic disease are causes for rejection, but the men are generally sworn in and assembled in Anchorage before application of the usual medical standards for military acceptance.[7] The frequency and severity of grossly visible defects strongly suggested that these battalions were composed of able-bodied volunteer subjects. In Battalion 2, four cases of active pulmonary tuberculosis were diagnosed on the basis of symptoms and roentgenograms among the 350 men present.

The noneffective rates at Camp Denali among the Eskimo National Guardsmen were not made available. Since the survey examination facility was also the battalion dispensary, it was observed that from eight to thirty men appeared for sick call each morning from a battalion strength of about 400. During

the work with each battalion small epidemics of what seemed to be a contagious respiratory disease occurred a few days after the men arrived in camp. This was variously called "flu," "pneumonia" and "measles" by the orderlies. The medical facilities available to these men were the same as those for all U. S. military personnel in Alaska. These facilities and the local mess and sanitary facilities would not be expected to have any lasting effect on health status, however, since the men are in camp for only fourteen days.

The population counts for the villages and the numbers given clinical examinations in this survey were shown in Table III. The sampling within the villages was carried out with the help of the resident teacher, who selected one or two adolescent boys as runners. They were instructed to bring into the schoolroom entire families, including all ages. The selection of families and their order of appearance was not controlled. All persons two years old and over were appraised clinically. Blood and urine samples were obtained from all persons six years of age and over, until fifty blood samples had been obtained in each village. At the end of the day the villagers were advised to bring forward the people who were sick or those with medical complaints who had not been seen previously. These persons were not included in the nutritional appraisal. The invitation invariably produced an assorted clinic. No assessment was made of the number who deliberately stayed away from the nutritional appraisals.

Bethel is the principal trading center of a large area of southwestern Alaska which includes most of the lower Yukon and Kuskokwim River areas. The town is on the Kuskokwim River at the head of deep water navigation. It is the air terminal for the only outside contact of the area during eight months of the year. The population is a mixed white and Eskimo people. An electric service, high school and many other small town facilities are available.

In winter the main occupation of many Eskimos in this area is trapping for mink, beaver and muskrat. In summer many find temporary work in canneries on Bristol Bay, and on some occasions almost the entire able-bodied population is transported to these canneries for a period of six weeks or more. Those who remain behind in the villages spend their time fishing, catching herring, smelt, pike, whitefish and salmon for their own use. The larger fish are filleted and air-dried for the winter cache, to be consumed by both dogs and man. The tundra is dotted with small ponds and sloughs which are a source of whitefish, ling cod, blackfish and needlefish. These fish are often eaten raw, and are thus a source of tapeworm infestation.

The Kotzebue phase of the present study centered among the northern or Arctic Eskimos for present purposes are considered to be in ethnic area 3 (see Fig. 1). The Kotzebue study also included observations in two Indian villages in the mountains of the middle Yukon region lying in area 4.

The Eskimos north of Norton Sound (Nome) are much more sparsely distributed. The principal activity of the males is hunting, and seal, walrus and several species of whale are the chief game. The Eskimos along the Arctic coast find the whale kill highly variable since it depends strictly upon weather and hunting conditions. Polar bear have always been important not only as a source of food for man and dogs, but also as a source of income from the sale of skins. St. Lawrence Island has an abundant supply of walrus in the spring which is a good source of both meat and ivory. The people of St. Lawrence Island, Diomede Island and King Island are well known for their fine ivory carving, which provides them with an important part of their cash income. The materials they make are taken to Nome in the summer and marketed.

Each Eskimo school child receives a hot lunch and a therapeutic multivitamin tablet every school day.* The lunch program has been in effect in the Bureau of Indian Affairs School Program for about eight years. Vitamin administration is a more recent addition. The children in schools in Allakakret and Huslia, Indian villages of the Kotzebue Area, do not receive school lunches or vitamin supplements.

Biochemical Methods

During the first three or four days of their encampment fasting blood and six hour urine specimens, were collected from the men in the two Eskimo battalions of the Alaska National Guard.

In the studies of the National Guardsmen the blood samples were collected in two Vacutainer® tubes, a 20 ml. size for whole clotted blood and a 10 ml. oxalated tube containing 20 mg. of oxalate mixture per tube for the hematocrit and hemoglobin analyses. The oxalated blood specimens were

* Contents of multivitamin tablet: Vitamin A. 5,000 U.S.P. units; vitamin D, 500 U.S.P. units, thiamine mononitrate, 3 mg.; riboflavin, 3 mg.; pyridoxine hydrochloride, 0.5 mg.; vitamin B_{12}, 2 μg.; folic acid, 100 μg.; niacinamide, 25 mg.; calcium pantothenate, 5 mg.; ascorbic acid, 50 mg.; vitamin E, 5 I.U.; calcium carbonate, 250 mg.; ferrous sulfate, 234 mg.; potassium iodide, 0.15 mg.; potassium sulfate, 5 mg.; copper sulfate, 6 mg.; magnesium oxide, 6 mg.; zinc sulfate, 1.5 mg.

analyzed for hemoglobin, hematocrit, serum protein* and ascorbic acid. Serum from the whole blood sample was frozen for subsequent lipid analyses. The six hour urine volumes were recorded and a 60 ml. aliquot was acidified with 0.1 ml. of concentrated hydrochloric acid and frozen. The frozen serum and urine specimens were packed in dry ice and shipped to the U. S. Army Medical Research and Nutrition Laboratory in Denver, where they usually arrived within twenty hours, still in a frozen state. There the serum was analyzed for vitamin A, carotene, total cholesterol, phospholipids and total fatty acids, and the urine was analyzed for thiamine, riboflavin, N′-methylnicotinamide and creatinine.

In the village studies a 60 ml. aliquot of a "random" sample of urine was acidified and frozen for vitamin assay. The blood samples were allowed to stand for twenty to twenty-five minutes; the clot was freed with a wooden applicator, centrifuged and the serum separated. An aliquot was pipetted into metaphosphoric acid for the estimation of ascorbic acid. The remainder of the serum was frozen for further assays. Whenever time permitted, hemoglobin and serum protein determinations were performed in the field.†

Hemoglobin and serum protein determinations were performed by the copper sulfate specific gravity method of Phillips and Van Slyke[8] with the gravities being recorded to the nearest 0.0005 unit. The hematocrit was determined using a Wintrobe tube and centrifuging the blood at 3,000 r.p.m. for thirty minutes. Ascorbic acid in the serum was determined by the spectrophotometric 2,4-dinitrophenylhydrazine method of Roe and Kuether[9] with the modifications of Schaffert and Kingsley.[10] The protein in the serum was precipitated with metaphosphoric acid for the vitamin C analysis and the filtrate was usually analyzed within twenty-four to forty-eight hours. Serum carotene and vitamin A were estimated by a modified Carr-Price reaction on a petroleum ether extract (Dann and Evelyn,[11] Lewis et al.[12] and Kaser and Stekol.[13] Cholesterol was determined by a modified Schoenheimer and Sperry method.[14] Total fatty acids were determined using a modified Smith and Kik[15] procedure, and phospholipids were determined by the method of Youngburg and Youngburg,[16] measuring the lipid in terms of phosphorus.

Thiamine was determined in the urine by the thiochrome fluorometric procedure of Hennessey and Cerecedo[17] and Mickelsen et al.[18] Riboflavin was measured by the fluorometric procedure of Conner and Straub[19] and N′-methylnicotinamide was estimated fluorometrically by the method of Huff et al.[20] Creatinine was measured by a modified Jaffe (alkaline picrate) reaction, using the method of Folin and Wu[21] modified by Peters.[22]

Dental Methods

The dental examinations of the men in the National Guard were carried out by a single dentist. The men were seated in a portable dental chair under a standard, color-corrected examination light. Dental mouth mirrors and explorers were employed. Observations were dictated in code to an experienced recorder, who entered the data for each man upon an individual examination card separate from that used for the rest of the clinical observations and originally designed in the National Institute of Dental Research for use in field studies of fluoride-caries relations (Appendix III). The exact age of the examinee and the village from which he came were unknown to the observer at the time of examination. The dental examinations of the people in the villages were recorded by the examining physician in a cursory fashion and without uniform lighting or special tools. The methods and observations of the earlier surveys of the ICNND were used. The dental examinations of the Eskimo men in the National Guard will be reported separately in more detail.

Dietary Methods (National Guard)

The food consumption of the Eskimo Guardsmen was measured under Army garrison conditions. A three day measurement was made for each battalion of men. The food was prepared by regular Army personnel using the Quartermaster menu as a guide. The survey team personnel collected five representative servings of each item served at each meal, and composites were made for each meal by procedures that have been described.[23] These meal samples were then combined for the three days. Plate wastage was determined by scraping plates, removing the inedible portion and compositing the residue. Aliquots of both the meal and plate wastage composites were analyzed for protein, fat, moisture and ash (carbohydrate being calculated by difference). Data on food consumed outside the mess halls were obtained by a written questionnaire supplied to each man.

Dietary Methods (Villages)

A quantity of dietary data had been previously collected by Dr. Christine Heller of the Alaska

* Total protein was determined on serum in the field and on plasma in the laboratory in Anchorage.

† In the Bethel Area, the samples were returned to the laboratory for analysis.

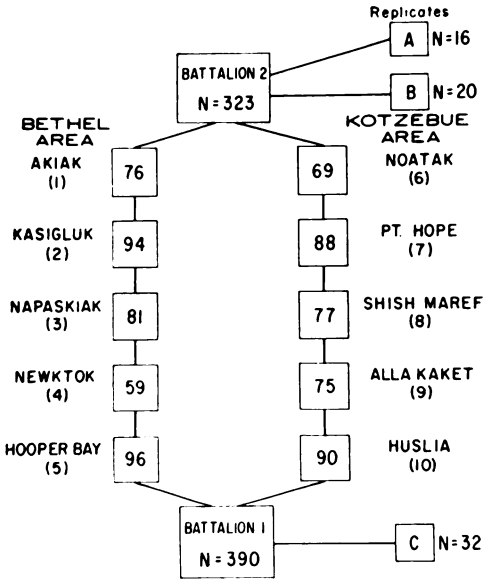

FIG. 3. Plan of the study with numbers examined.

Health Research Center in seven of the ten villages which were visited by the nutrition survey team. These data were collected by personal interview with the nutritionist, by intake records written by the family and, to a limited extent, by the weighing of the daily food intake by either the nutritionist or the Eskimo and Indian women after instruction by the nutritionist.

The nutritionist instructed the Eskimos and Indians in the use of the home record. Meats, fish and bread were recorded by measuring the length, width and depth of the food item. For simplification of calculation these measurements were reduced to the nearest 0.5 cubic inch. Items such as evaporated milk, syrup, sugar and seal oil were measured and recorded by the teaspoon, tablespoon or in cups. Quantities of soups and cereals were recorded by cups. Vegetables, such as potatoes and onions, were classified as small, medium or large. In many instances the Eskimo and Indian women prepared a recipe of unusual homemade items. Calculation of the quantity of the food item consumed was then made with the ingredients and apportioned to average servings (Appendix I).

The collection of these food records was begun in the fall of 1956. Analysis of the data was delayed until the chemical analyses were available for the unusual food items.

The dietary records represent data for a seven day period. In a few of the villages it was possible to obtain records for only three or four days. An attempt was made to obtain written seven day intake records for each of the four seasons of the year, but because of the movement of the people to their various seasonal camps and to their summer work, this was not always possible. Rodahl,[24] then at the Arctic Aeromedical Laboratory in Fairbanks, has published data on sixty-nine Alaskan foods but only for protein, fat, carbohydrate and cholesterol content. A program to determine the nutrient content of many more Alaskan foods continues. The food samples were collected by personnel of the Alaska Health Research Center, frozen and shipped to the Army Medical Research and Nutrition Laboratory in Denver for analysis. Analyses have been completed on seventy-five Alaskan foods for protein, fat, moisture, ash, calcium, vitamin A, thiamine, riboflavin and ascorbic acid (Appendix II).

Clinical Calibration Studies

The general plan of the examinations of the several groups is shown schematically in Figure 3. In all locations two physicians of the Alaska Native Health Service carried out measurements of pulse rate, blood pressure and skinfold thickness, auscultatory observation of the heart, palpation of the abdomen and tests of tendon reflexes, and elicited the histories af diarrhea and tuberculosis. At Fort Richardson these two Alaska Native Health Service physicians took subjects at random for examination. Since they did not sign the data cards, examiner differences cannot be evaluated. In the villages one physician was with each party and performed all these measurements, except the skinfold measurements on the subjects in the Bethel area, which were carried out by the biochemist's assistant.

Calibration of the nutritional appraisals was attempted by the two clinicians at several preliminary conferences. The clinician here designated "examiner 2" had recently completed an extensive clinical experiment intended to reveal and correct examiner differences in the application of the present methods. A preliminary clinical calibration was carried out by examining a group of sixteen available Eskimo Guardsmen on two successive days under the procedural conditions that were later used for all the Eskimo National Guardsmen. Each examiner filled out a data card for every man who came through the line on a random basis, but on the second day each man was assigned to the examiner he had not seen on the previous day. No consultations on findings between examiners were undertaken until the end of the second day. These data, handicapped by small numbers and especially by low prevalence of the attributes considered, seem to

TABLE V

Eskimo Men, Alaska National Guard, 1958

*Clinical Calibration Studies**

Data	(1) Preliminary Trials (N = 16)				(2) Battalion 2 (N = 20)				(3) Battalion 1 (N = 32)				(4) Total Duplicates (N = 68)			
Examiner No. 1	−	+	−	+	−	+	−	+	−	+	−	+	−	+	−	+
Classification No. 2	−	−	+	+	−	−	+	+	−	−	+	+	−	−	+	+
Attribute																
General appearance†	13	3	—	—	16	4	—	—	26	6	—	—	55	13	—	—
Thyroid enlarged	16	—	—	—	19	—	1	—	26	1	4	1	61	1	5	1
Submaxillary enlarged	16	—	—	—	18	1	1	—	29	—	3	—	63	1	4	—
Nasolabial seborrhea	16	—	—	—	17	—	2	1	32	—	—	—	65	—	2	1
Other seborrhea	16	—	—	—	20	—	—	—	28	—	4	—	64	—	4	—
Erythema—head	14	1	—	1	13	4	—	3	28	2	—	2	55	7	—	6
Pigmentation—head	14	2	—	—	20	—	—	—	28	3		1	62	5	—	1
Thickened conjunctivas	15	1	—	—	16	4	—	—	21	6	1	4	52	11	1	4
Pingueculae	—	2	4	10	—	2	—	18	9	4	4	15	9	8	8	43
Bitot's spots	15	—	1	—	19	—	1	—	32	—	—	—	66	—	2	—
Conjunctival injection	16	—	—	—	19	1	—	—	26	4	2	—	61	5	2	—
Angular scars	14	1	1	—	17	—	3	—	32	—	—	—	63	1	4	—
Cheilosis	16	—	—	—	19	—	1	—	32	—	—	—	67	—	1	—
Filiform atrophy, slight	16	—	—	—	16	—	4	—	30	—	2	—	62	—	6	—
Glossal furrows	16	—	—	—	15	4	—	1	23	5	2	2	54	9	2	3
Red gums	16	—	—	—	11	—	7	2	30	—	1	1	57	—	8	3
Swollen gums	16	—	—	—	13	—	6	1	29	—	3	—	58	—	9	1
Gum recession	6	2	1	7	3	1	12	4	19	1	8	4	28	42	1	15
Unfilled caries	7	3	—	6	14	2	—	4	12	3	6	11	33	8	6	21
Worn teeth	1	8	1	6	2	3	1	14	16	5	2	9	19	16	4	29
Follicular hyperkeratosis	15	—	1	—	15	—	5	—	28	—	4	—	58	—	10	—
Xerosis	16	—	—	—	19	1	—	—	28	3	1	—	63	4	1	—
Acne	15	1	—	—	18	1	—	1	25	2	2	3	58	4	2	4

NOTE: Plus or minus indicate examiner classification of subject for a particular attribute.

* The forty-three items recorded for the detailed examination which were used exclusively in the Alaska Survey have been abridged here to include only the twenty-three items which showed sufficient prevalence of a sign to allow comparison of observers.

† Positive means less than "good general appearance."

indicate the examiners were in general agreement except for the prevalence of pingueculae, recession of gums, caries and worn teeth (Table v).

The second set or reproducibility data (column 2 of Table v) was obtained with twenty Eskimo Guardsmen who were sent back through the line by one or the other of the examiners during the first series of clinical examinations at Camp Denali. These duplicates were not taken at random and were largely influenced by the work load, the duplicates being sent back when the load was light. The second examiner was always aware that this was a duplicate examination, since he was required to fill out a special card. Under these working conditions the examiner variation was larger, and if one arbitrarily assumes that a divergent classification by the examiners of more than 15 per cent of the men for any finding disqualifies that class of observations, one must disqualify skin erythema, thickened conjunctivas, slight filiform atrophy, glossal furrows, three kinds of gum lesions, worn teeth and follicular hyperkeratosis. The erythema and conjunctival and glossal changes would seem inconsequential in this population, but the follicular hyperkeratosis is an important area of dyscalibration. It will be shown later that this particular examiner difference is partially accounted for by an assignment of lesions to follicular hyperkeratosis by examiner 2 whereas examiner 1 assigned similar conditions to xerosis.

A similar estimate of examiner difference was carried out with the men in Battalion 1 after the survey parties returned from the village surveys (column 3 in Table v). The extent of the differences between examiners is both large and important.

TABLE VI

Eskimo Men, Alaska National Guard, 1958

*Summary of Calibration Studies for the Clinical Examinations**

Trial	No. of Observations	Examiner's Reaction							
		Agree (No.)	Positive (%)	Disagree					
				No. 1 +		No. 2 +		Agree (No.)	Negative (%)
				No.	%	%	%		
Trial 1	368	30	8.2	24	6.5	9	2.4	289	78.6
Battalion 2	460	49	10.7	28	6.1	44	9.6	319	69.5
Battalion 1	736	53	7.2	45	6.1	49	6.7	557	75.6
Totals	1,564	132	8.4	97	6.2	102	6.5	1,165	74.5

Conclusion: In 1,564 observations recorded in duplicate after independent evaluation by examiner 1 and examiner 2 both agree positive findings in 8 per cent, both agree negative findings in 75 per cent, disagree in 13 per cent, with examiner 1 positive in 6.2 per cent, and examiner 2 positive in 6.5 per cent.

* Using the twenty-three items shown in Table v.

If the average difference between examiners in per cent of subjects in which they disagree for all items is obtained for Battalion 2 and Battalion 1, the averages are respectively 16.6 N-25 and 14.0 N-25. There is no clear indication of a trend of examiner difference. For the total duplicate examinations (sixty-eight in all, column 4, Table v), the examiners exceed 15 per cent divergence for thickened conjunctivas and pingueculae, glossal furrows, gum atrophy and recession, unfilled caries, worn teeth and dental malposition. The divergence on follicular hyperkeratosis is just at 15 per cent, but one examiner identified all of these (N-10) whereas the other examiner diagnosed four subjects with xerosis, not indicated by the first. These data are further condensed in Table VI. The secular consistency of the examiners is notable.

These clinical calibration studies were made on 5 per cent of the subjects studied at Camp Denali. This approach will always be limited by the scarcity of clinical material showing a range of manifestations for many of the important clinical signs. The problem then is one of measuring the ability of examiners to fix their criteria for recognition of threshold levels of clinical signs. It appears that a more rigorous set of definitions should be used. It is also necessary that more extensive estimates of observer differences be made. The present data suggest that perhaps 10 per cent of all the clinical appraisals should have been replicates, and this process should have been arranged to measure self-duplication as well as interexaminer duplication.

RESULTS

Clinical Findings (National Guard)

The general impression of physical appearance obtained from casual observation of the two battalions was that these men were active, rugged, deeply tanned and well conditioned. They were short in stature, with "Oriental" faces, short limbs and long trunks, and they generally had a mesomorphic body type. The men in Battalion 1 who came from northwestern Alaska seemed somewhat taller, were more frequently obese and more commonly had lighter eyes, hair and skin than the men in Battalion 2. The men in Battalion 1 were also more at ease, better acquainted with English, and their behavior was more like that of American troops. The height-weight measurements bear out some of these observations. A summary of the height, weight, skinfold and blood pressure measurements is shown in Table VII.

The relationship of weight to age is shown in Table VIII. The small gains in weight with age are in contrast to the usual findings in white males in the United States. As noted the men from northwestern Alaska (Battalion 1) were a little taller than those in Battalion 2, but no important trends were demonstrated.

TABLE VII

Eskimo Men, Alaska National Guard, 1958, by Battalion Origin,* Age, Height, Weight, Weight Status, Skinfold Thickness and Blood Pressure

Data	Battalion 2	Battalion 1	Total
No. of men examined	323	390	713
No. of men examined by region of origin			
Aleuts	38	...	38
Southern Eskimos	285	24	309
Northern Eskimos	...	345	345
Athabascan Indians	...	21	21
Villages represented	26	29	55
Age			
Mean (yr.)	30.8	28.1	29.3
Percentage distribution			
17–19 years	6.5	10.8	8.8
20–29 years	45.2	54.3	50.2
30–39 years	33.7	27.2	30.2
40–54 years	14.6	7.7	10.8
Height (in.)			
Mean ± deviation error	64.5 ± 0.1	66.2 ± 0.1	65.4 ± 0.1
Standard deviation	2.3	2.2	2.4
Weight (lb.)			
Mean ± standard error	141.7 ± 0.9	149.2 ± 0.8	145.8 ± 0.6
Standard deviation	15.9	16.0	16.4
Per cent of standard weight† (observed weight) × 100 (standard weight)			
Mean ± standard error	103.6 ± 0.4	105.7 ± 0.5	104.8 ± 0.3
Standard deviation	8.0	9.2	8.7
Percentage distribution			
80–89%	3.4	3.6	3.5
90–99%	27.9	21.5	24.4
100–109%	51.1	43.6	47.0
110–119%	14.9	27.2	21.6
≥120%	2.8	4.1	3.5
Arm skinfold thickness			
Median (mm.)	5.9	6.9	6.3
Percentage distribution			
2–4 mm.	24.0	24.0	24.0
5–9 mm.	62.5	43.9	52.3
10–14 mm.	10.7	26.6	19.5
>15 mm.	2.8	5.5	4.2
Scapula skinfold thickness			
Median (mm.)	7.8	9.7	8.5
Percentage distribution			
2–4 mm.	2.8	1.0	1.8
5–19 mm.	73.5	47.3	59.1
10–14 mm.	15.8	36.7	27.3
≥15 mm.	7.9	15.0	11.8
Systolic blood pressure (mm. Hg)			
Mean ± standard error	125.4 ± 0.8	120.9 ± 0.7	122.9 ± 0.6
Standard deviation	15.1	14.8	15.0
Diastolic blood pressure (mm. Hg)			
Mean ± standard error	72.4 ± 0.7	69.7 ± 0.5	70.9 ± 0.4
Standard deviation	12.2	10.5	11.3
Per cent with blood pressure ≥140/90 mm. Hg‡	5.9	1.5	3.5
Per cent with blood pressure ≥ 140/90 mm. Hg§	2.5	0.5	1.4

* See Figure 1 for regions.
† U. S. Medico-Actuarial Tables[25] are used as an arbitrary standard.
‡ Systolic pressure at least 140 and diastolic pressure at least 90 mm. Hg.
§ Systolic pressure above 140 and diastolic pressure above 90 mm. Hg.

In particular, there is no evidence that Eskimo men are taller as their race becomes acculturated. These data also indicate that obesity is rare. It should be remembered in using the U. S. Medico-Actuarial Tables of Standard Weight[25] that an appreciable increase in weight with age is incorporated in the "standard weight." The fall of per cent "standard weight" with age shown in Table XVIII (page 44) is thus largely an artifact due to the use of these U. S. reference tables. The per cent distribution of men exceeding the calculated "standard weight" was shown in Table VII. The physical appearance of these men suggests that the per cent "standard weight" in excess of 100 is often an artifact due to excessive

TABLE VIII

Eskimo Men, Alaska National Guard, 1958, by Battalion and Age

Height, Weight, Weight Status, Skinfold Thickness and Blood Pressure

Determination	Age Group (yr.)			
	17–19	20–39	40–54	Total
Battalion 2				
No. examined	21	255	47	323
Height (in.)*	65.5 ± 0.4	64.5 ± 0.1	63.8 ± 0.3	64.5 ± 0.1
Weight (lb.)*	140.0 ± 3.0	141.0 ± 1.0	144.0 ± 2.0	142.0 ± 1.0
Per cent of standard weight	108.0 ± 2.0	104.0 ± 1.0	102.0 ± 1.0	104.0 ± 1.0
Median skinfold thickness (mm.)				
Arm	6.3	5.9	5.4	5.9
Scapula	8.3	7.7	7.6	7.8
Blood pressure (mm. Hg)				
Systolic	125.0 ± 4.0	126.0 ± 1.0	122.0 ± 2.0	125.0 ± 1.0
Diastolic	73.0 ± 2.0	73.0 ± 1.0	72.0 ± 2.0	67.0 ± 1.0
Per cent with blood pressure ≥ 140/90 mm. Hg	0.0	6.3	6.4	5.9
Battalion 1				
No. examined	42	318	30	390
Height (in.)*	65.8 ± 0.3	66.2 ± 0.1	65.8 ± 0.4	66.2 ± 0.1
Weight (lb.)*	140.0 ± 2.0	150.0 ± 3.0	150.0 ± 3.0	149.0 ± 1.0
Per cent of standard weight	107.0 ± 1.0	106.0 ± 1.0	100.0 ± 1.0	106.0 ± 1.0
Median skinfold thickness (mm.)				
Arm	8.9	6.7	7.1	6.9
Scapula	10.7	9.5	8.8	9.7
Blood pressure (mm. Hg)				
Systolic	119.0 ± 2.0	121.0 ± 1.0	120.0 ± 3.0	121.0 ± 1.0
Diastolic	67.0 ± 2.0	70.0 ± 1.0	74.0 ± 1.0	70.0 ± 1.0
Per cent with blood pressure ≥ 140/90 mm. Hg	0.0	1.9	0.0	1.5

* Mean ± standard error.

bone and muscle mass; that is, the consequence of high activity rather than of fat deposits. Body composition data on these people are not available, but this may have some relevance to the physiologic problem of adaptation to a cold environment.

The mean systolic blood pressures are remarkably constant with age (Table VIII). Furthermore, the number of men with systolic pressure of 160 mm. Hg or over comprises a very small percentage (8 men, 1.1 per cent) of the entire group examined. In neither group was there a significant number of men with diastolic pressures over 90 mm. Hg and there were only five men with diastolic pressures over 100. Since these were casual blood pressure measurements taken under moderately stressful conditions they may be presumed to be high estimates. They suggest that hypertensive heart disease is not an important problem among these men. Rodahl has also made this observation.[26] This fact is of particular interest because of the high protein diet which these men consume. It is of some interest that when systolic blood pressure is considered for each battalion by inch of height a definite trend is observed for higher mean pressure with increasing height. Grouping and comparing heights reveals mean differences as shown in Table IX. Diastolic pressures reveal a similar trend. It may be concluded that the observed blood pressure readings reveal little or no signs

TABLE IX
Eskimo Men, Alaska National Guard, 1958, by Battalion and Height
Blood Pressure (Mean ± Standard Error)

Battalion	Height (in.)		
	59–63	64–67	68–73
Systolic Blood Pressure (mm. Hg)			
2	122.3 ± 1.4	127.1 ± 1.1	127.8 ± 3.0
1	117.6 ± 2.1	119.7 ± 0.9	125.1 ± 1.5
Diastolic Blood Pressure (mm. Hg)			
2	70.7 ± 1.0	73.0 ± 1.0	75.2 ± 1.9
1	67.4 ± 1.6	69.9 ± 0.6	70.5 ± 1.1

of high blood pressure as an indicator of cardiovascular disease and that the minor fluctuations of blood pressure observed are reasonably related to small differences of arm thickness. The absence of hypertension among the Eskimos may be of some importance in relation to the problem of causation of hypertensive heart disease in white cultures.

Summary of selected clinical findings for the Eskimo Guardsmen is presented by battalion and age in Table X and by ethnographic origin in Table XI. The significant findings are as follows:

No important prevalence of goiter was observed in the men of Battalion 2 but an average prevalence of 10 per cent was seen in Battalion 1. These were, without exception, small goiters which were judged to be enlarged either with nodules or symmetrically. A 9.9 per cent incidence of goiter was found among northern Eskimos, and 14.3 per cent of the Athabascan Indians had enlarged thyroid glands. No instance of thyrotoxicosis was seen.

Erythema of the exposed parts was common, but this could be adequately explained by the known degree of exposure to sun, cold and wind. It was noted particularly among the Eskimos (Table XI). The late cutaneous results of cold injury which the men describe collectively as "ice" resemble x-ray injury, with cicatrization, depilation and dilatation of venules. Excessive pigmentation of exposed parts was also common in the older men and was sometimes dramatic about the face. Over the trunk and especially the back it assumed a mottled effect with an irregular deposition of pigment. This change strongly resembled the *erythema ab igne* more often seen about the shins in some U. S. rural populations. In these people this sign, restricted to males, is probably related to the "kashim" or sweat bath procedure.

Thickening of the conjunctivas in the palpebral fissures, occurred commonly in the men and was difficult to judge. In general, it was diagnosed as present if lateral orbital pressure, through the lid, would cause definite folds to appear. Similarly, pingueculae of one or both palpebral fissures were both common and extensive. These sometimes protruded between the closed lids medially and were dry and lichenified on the surface. Although over half the men showed these ocular lesions, it seemed they could be reasonably attributed to environmental irritation rather than to nutritional causes. An age analysis (Table X) conforms with this interpretation, the prevalence increasing regularly with age. The incidence was greatest among Eskimos from southern Alaska.

The Bitot's spots seen were rare in the early examinations and are, in retrospect, only suggestive of vitamin A deficiency. However, other corroborative evidence will be discussed with the data from the villages.

Conjunctival injection was noted in 11.9 per cent of men seventeen to nineteen years of age in Battalion 1 (Table X), and in 26.7 per cent northern Eskimos, and 19 per cent of Athabascan Indians. This is attributed to environmental trauma rather than nutritional deficiency.

Corneal scarring represents an important cause of morbidity among the Eskimos. No signs of trachoma were seen in the present studies. Neither was there evidence of "snow blindness," although there were several young people in the villages who had active phlyctenular keratoconjunctivitis with typical photophobia. In the present study the frequency of corneal scars was somewhat greater among

TABLE X
Eskimo Men, Alaska National Guard, 1958, by Battalion and Age
*Per Cent Prevalence of Selected Clinical Findings**

Data	Battalion 2				Battalion 1				Grand Total
	Age (yr.)				Age (yr.)				
	17–19	20–39	40–54	Total	17–19	20–39	40–54	Total	
No. examined	21	255	47	323	42	318	30	390	713
Suspected disease									
Tuberculosis	4.8	2.4	4.3	2.8	4.8	2.8	0.0	2.8	2.8
General appearance									
Good	90.5	92.9	95.8	93.2	83.3	91.5	90.0	90.5	91.7
Fair	9.5	6.7	2.1	6.2	14.3	8.5	10.0	9.2	7.9
Poor	0.0	0.4	2.1	0.6	2.4	0.0	0.0	0.3	0.4
Glands enlarged									
Thyroid	0.0	0.8	2.1	0.9	9.5	9.7	16.7	10.3	6.0
Submaxillary	0.0	2.7	2.1	2.5	0.0	3.5	10.0	3.6	3.1
Skin (face and neck)									
Nasolabial seborrhea	4.8	3.1	0.0	2.8	4.8	0.9	0.0	1.3	2.0
Erythema, face and neck	9.5	13.7	14.9	13.6	2.4	12.3	10.0	11.0	12.2
Pigmentation, face and neck	4.8	2.7	4.3	3.1	2.4	6.3	3.3	5.6	4.5
Eyes									
Thickened conjunctivas	0.0	6.3	6.4	5.9	11.9	26.4	40.0	25.9	16.8
Pingueculae	38.1	69.4	91.5	70.5	23.8	61.0	76.7	58.2	63.8
Conjunctival injection	0.0	2.4	2.1	2.2	11.9	5.7	6.7	6.4	4.5
Corneal scarring	0.0	8.6	8.5	8.0	7.1	2.5	6.7	3.3	5.5
Tongue									
Filiform atrophy, slight	0.0	7.8	6.4	7.1	14.3	9.7	6.7	10.0	8.7
Filiform atrophy, moderate	0.0	1.6	2.1	1.5	0.0	2.8	6.7	2.8	2.2
Furrows	0.0	3.5	8.5	4.0	9.5	10.4	6.7	10.0	7.3
Serrations and swellings	0.0	7.5	10.6	7.4	0.0	6.3	3.3	5.4	6.3
Red, tip or lateral margins	0.0	1.6	2.1	1.5	4.8	5.0	0.0	4.6	3.2
Geographic tongue	4.8	0.4	0.0	0.6	2.4	1.9	0.0	1.8	1.3
Gums									
Red or swollen gums	0.0	17.3	29.8	18.0	7.1	10.4	0.0	9.2	13.2
Atrophy or recession		54.9	66.0	53.9	14.3	33.6	50.0	32.8	42.4
Teeth									
No carious teeth	36.8	64.6	75.0	63.9	14.3	26.7	46.7	26.9	41.2
Caries, filled or unfilled (1 or 2)	15.8	13.8	11.1	13.5	19.0	23.3	30.0	23.3	19.6
Caries, filled or unfilled (3 or more)	47.4	19.0	5.6	19.3	66.7	45.9	20.0	46.2	35.7
Edentulous	0.0	2.6	8.3	3.3	0.0	4.1	3.3	3.6	3.5
Worn	15.8	48.7	91.7	52.5	2.4	31.8	80.0	32.3	40.1
Skin (general)									
Follicular hyperkeratosis	9.5	8.6	2.1	7.7	7.1	4.7	3.3	4.9	6.2
Xerosis	0.0	0.8	0.0	0.6	7.1	8.2	6.7	7.9	4.6
Acneform eruption	9.5	3.5	0.0	3.4	11.9	6.6	6.7	7.2	5.5

* No findings of staring hair, enlarged parotids, xerophthalmia, magenta tongue, "scorbutic-type" gums, crackled skin, pellagrous lesions, splenomegalia, ascites or calf tenderness. Findings of one case each of glossitis, perifolliculosis and depigmentation of hair also omitted.

the men in Battalion 2 from the less acculturated area of southwestern Alaska than in those in Battalion 1 (Tables X and XI). However, both groups had significant numbers of men with such scars. Casual observation suggested an age gradient, the lesions being more common in older men than in young men. An analysis of the prevalence of this stigma by age and

TABLE XI

Eskimo Men, Alaska National Guard, 1958, by Region of Origin

Age, Height, Weight, Weight Status, Blood Pressure and Selected Clinical Findings

Data	Ethnographic Region of Origin				
	Aleuts	Southern Eskimo	Northern Eskimo	Athabascan Indians	Total
No. examined	38	309	345	21	713
Villages represented	2	26	26	1	55
Age (yr.)	29.9	29.9	27.8	28.5	29.3
Height (in.)*	65.3 ± 0.5	64.4 ± 0.1	66.3 ± 0.1	66.6 ± 0.5	65.4
Weight (lb.)*	146.0 ± 4.0	141.0 ± 1.0	150.0 ± 1.0	146.0 ± 4.0	146.0
Per cent of standard weight*	105.0 ± 2.0	103.0 ± 1.0	106.0 ± 1.0	102.0 ± 2.0	105.0
Blood pressure (mm. Hg)*					
Systolic	135.0 ± 3.0	124.0 ± 1.0	121.0 ± 1.0	128.0 ± 3.0	123.0
Diastolic	77.0 ± 2.0	72.0 ± 1.0	70.0 ± 1.0	68.0 ± 2.0	71.0
	(*as per cent prevalance*)				
Suspected disease					
Tuberculosis	0.0	3.6	2.6	0.0	2.8
Glands, enlarged					
Thyroid	0.0	1.9	9.9	14.3	6.0
Submaxillary	0.0	2.9	3.5	4.8	3.1
Skin					
Nasolabial seborrhea	2.6	2.6	1.4	0.0	2.0
Erythema, face, neck	0.0	15.5	11.0	4.8	12.2
Pigmentation, face, neck	0.0	4.5	4.6	9.5	4.5
Eyes					
Thickened conjunctivas	2.6	7.4	26.7	19.0	16.8
Pingueculae	23.7	77.3	57.4	42.9	63.8
Conjunctival injection	2.6	3.2	4.9	19.0	4.5
Corneal scarring	5.3	8.7	2.9	0.0	5.5
Filiform atrophy, slight	5.3	7.1	11.0	0.0	8.7
Filiform atrophy, moderate	5.3	1.0	3.2	0.0	2.2
Tongue					
Furrows	0.0	6.1	9.0	9.5	7.3
Serrations and swellings	2.6	8.1	5.5	0.0	6.3
Red, tip or lateral margins	2.6	1.6	4.9	0.0	3.2
Geographic tongue	0.0	1.0	1.4	4.8	1.3
Gums					
Red or swollen	7.9	18.4	9.6	4.8	13.2
Atrophy or recession	36.8	55.7	32.8	14.3	42.4
Teeth					
No caries	21.1	68.7	24.9	42.9	41.2
Caries, filled or unfilled (1 or 2)	13.2	14.8	22.6	33.3	19.6
Caries, filled or unfilled (3 or more)	44.7	16.1	48.7	23.8	35.7
Edentulous	21.1	0.4	3.8	0.0	3.5
Worn	21.1	59.1	29.9	33.3	40.1
Skin (general)					
Follicular hyperkeratosis	5.3	7.4	5.2	4.8	6.2
Xerosis	0.0	2.3	7.2	4.8	4.6
Acneform eruption	5.3	3.2	6.7	19.0	5.5

* Mean ± standard error.

battalion is shown in Table x. These questions will be considered again with the village data.

Angular scars were rarely seen in members of Battalion 2 and none were observed in those of Battalion 1. Slight filiform atrophy of the tongue was occasionally reported. Moderate atrophy, being more consistent, is better considered. About 2 per cent of the men showed

TABLE XII

Eskimo Men, Alaska National Guard, 1958

Comparison of Dental Caries and Periodontal Status of 713 Eskimo Guardsmen with 1,400 White Male Residents of Birmingham and Baltimore

Age (yr.)	No. Examined, Alaska	Mean Numbers of Decayed, Missing and Filled Permanent Teeth per Man		Mean Periodontal Scores*	
		Baltimore, Birmingham	Alaska	Baltimore, Birmingham	Alaska
15–19	63	11.3	10.2	0.43	0.40
20–29	359	12.9	9.5	0.66	0.69
30–39	214	13.3	7.7	0.82	1.39
40–49	68	15.8	6.3	1.25	1.44
50–59	9	19.5	9.8	1.73	1.06

* The periodontal score for each subject is the average for the teeth present in the mouth. The criteria for scoring are given in Appendix III.

TABLE XIII

Eskimo Men, Alaska National Guard, Ft. Richardson, 1958

Food Consumption from the Mess Hall Alone, Average per Man per Day

Date	No.	Calories	Protein (gm.)	Fat (gm.)	Carbohydrate (gm.)
Battalion 2					
March 3..	161	4,045	161	175	458
March 4..	160	4,084	145	179	474
March 5..	181	3,895	180	173	405
Mean..	167	4,003	163	175	444
Battalion 1					
March 24.	197	3,287	143	128	392
March 25.	219	3,739	147	169	406
March 26.	225	3,783	132	151	475
Mean	214	3,616	141	150	426

this lesion to the latter degree. A moderate degree of filiform atrophy was found in 5.3 per cent of the Aleuts and 3.2 per cent of northern Eskimos. The finding is of interest because of the tendency of Eskimos to show a normocytic anemia of unknown cause.[27] No true glossitis was seen. The other glossal changes are considered unimportant; the glossal serrations may possibly reflect a thick muscular tongue, developed by vigorous eating habits.

The dental findings revealed a great range of dental disease. Carious teeth and periodontal disease were very common. The extent and prevalence of worn teeth suggests the utility of sound teeth in this culture. The distinct trend of increase of unsound teeth in the younger age groups suggests that some cultural change had caused dental disease to increase in the last fifty years. Furthermore, in Table XI there are well marked differences in prevalence of carious teeth by region of origin. Only 21 per cent of the Aleut men were free of caries whereas 69 per cent of the Kuskokwim Eskimos were free of caries. The behavior of periodontal disease is also determined by area but in a different pattern than for caries.

For the entire group of Alaskan males the lifetime caries experience was generally lower, and diseases of the periodontal tissues generally were more prevalent and severe than in approximately 1,400 white males examined in Baltimore[28] and in Birmingham[29] in the United States. The caries experience in these two latter groups is considered to be moderate, and periodontal conditions possibly typical, for U. S. white males in general. These specific data were selected as a basis for comparison because the same criteria and methods were used as in Alaska, and because the Alaska examiner participated in all three studies. Comparative findings are shown in Table XII.

Dietary Findings (National Guard)

The summary of food consumption for the two battalions is shown in Table XIII. The average values are, as might be expected, not unusual. The weather during both measurements was mild, never being subzero, and the wind was not excessive. However, both groups were in training status with night maneuvers and were active physically. In Table XIV the plate wastage is shown by battalion, day and nutrient. It is of interest that about half the total calories for plate waste are accounted for by fat. Table XV presents the food consumed from sources outside the mess and the total

TABLE XIV
Eskimo Men, Alaska National Guard, Ft. Richardson, 1958
Plate Waste, Average per Man per Day

Date	Calories	Protein (gm.)	Fat (gm.)	Carbohydrate (gm.)
Battalion 2				
March 3	259	10.1	14.2	22.6
March 4	212	4.9	10.2	25.1
March 5	166	7.7	9.2	13.1
Mean	210	7.6	11.1	20.0
Battalion 1				
March 24	133	4.0	7.0	13.5
March 25	163	6.7	9.1	13.5
March 26	189	6.5	10.0	18.3
Mean	163	5.8	8.8	15.2

TABLE XV
Eskimo Men, Alaska National Guard, Ft. Richardson, 1958
Food Consumption from All Sources, Average per Man per Day

Food Consumption	Calories	Protein (gm.)	Fat (gm.)	Carbohydrate (gm.)
Battalion 2				
Food in mess	4,003	163	175	444
Food outside mess*	652	13	46	60
Total from all sources	4,655	176	221	504
Per cent of calories		15	37	43
Battalion 1				
Food in mess	3,616	141	150	426
Food outside mess.	764	12	40	90
Total from all sources	4,380	153	190	516
Per cent of calories		14	36	47

* Food and beverages from PX and service clubs.

food consumption from all sources. Battalion 2 averaged 652 calories and Battalion 1 averaged 764 calories per man per day from sources outside the mess. The total food consumption from all sources averaged 4,665 and 4,380 calories per man per day for Battalion 2 and Battalion 1, respectively.

The protein intake averaged 153 to 175 gm. per man per day. These values are in agreement with surveys performed in Army training camps throughout the United States.[23] In the latter study, conducted at four basic and airborn training camps of men working in a temperate environment, food consumption averaged 4,227 calories per man per day when corrected for body weight changes. In another study by Welch et al.[30] of men bivouacking in a subarctic environment, the caloric intake was found to average 4,163 calories per man per day for a three week period. On the basis of these studies, the caloric requirement for military personnel in training activities may be considered to range between 4,100 and 4,300 calories per man per day. The present values for both of the National Guard Battalions in training were slightly higher than for other American troops in training. Since no body weight data were collected at the end of the survey, the food consumption data could not be corrected for such possible changes.

Clinical Findings (Villages)

A summary of the clinical findings in the villages is shown in Table XVI. The northern and southern areas are shown separately, but all ages and both sexes are combined. This summary emphasizes certain negative findings. There was no scurvy and no gross inanition, although in certain villages, especially Newktok, the people seemed, by their thinness, to be in a marginal status. It was noteable that while signs of tuberculosis, phlyctenular keratoconjunctivitis and the scars of wounds and infections were plentiful, there were few chronically disabled people of any age. There was, by American standards, a remarkable scarcity of aged or infirm people. The fate of the aged was not apparent.

TABLE XVI

Clinical Findings in Eskimo and Indian Villages* in Alaska, 1958

Per Cent Prevalence†

Data	Bethel Area (Examiner 1)						Kotzebue Area (Examiner 2)					
	Total	1	2	3	4	5	Total	6	7	8	9	10
No. examined	406	76	94	81	59	96	399	69	88	77	75	90
Suspected disease												
Tuberculosis	13.8	30.3	10.6	7.4	8.5	12.5	6.3	5.8	10.2	6.5	6.7	2.2
General appearance												
Good	80.5	82.9	87.2	79.0	66.1	82.3	99.2	98.6	100.0	98.7	98.7	100.0
Fair	16.0	17.1	9.6	14.8	25.4	16.7	0.8	1.4	0.0	1.3	1.3	0.0
Poor	3.4	0.0	3.2	6.2	8.5	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Staring hair	2.7	0.0	0.0	0.0	18.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Glands (enlarged)												
Thyroid	3.7	3.9	0.0	2.5	10.2	4.2	0.3	1.4	0.0	0.0	0.0	0.0
Submaxillary	0.2	0.0	1.1	0.0	0.0	0.0	4.0	5.8	6.8	3.9	1.3	2.2
Skin												
Nasolabial seborrhea	0.0	0.0	0.0	0.0	0.0	0.0	2.3	5.8	2.3	2.6	0.0	1.1
Other seborrhea	0.2	0.0	0.0	1.2	0.0	0.0	0.5	1.4	0.0	1.3	0.0	0.0
Erythema	23.2	14.5	25.5	7.4	61.0	17.7	15.0	11.6	21.6	33.8	5.3	3.3
Pigmentation	1.0	0.0	2.1	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eyes												
Thickened conjunctivas	11.8	7.9	6.4	16.0	13.6	15.6	8.5	7.2	5.7	10.4	8.0	11.0
Pingueculae	28.3	31.6	31.9	22.2	27.1	28.1	26.3	34.8	27.3	28.6	29.3	14.4
Bitot's spots	0.5	0.0	0.0	0.0	3.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Circumcorneal injection	0.2	0.0	0.0	0.0	0.0	1.0	0.3	0.0	1.1	0.0	0.0	0.0
Conjunctival injection	2.2	3.9	0.0	2.5	5.1	1.0	1.3	0.0	5.7	0.0	0.0	0.0
Blepharitis	1.2	0.0	0.0	0.0	8.5	0.0	0.5	0.0	2.3	0.0	0.0	0.0
Corneal scarring	14.3	21.1	12.8	11.1	20.3	9.4	6.3	8.7	5.7	5.2	4.0	7.8
Lips												
Angular scars	0.2	0.0	0.0	0.0	1.7	0.0	0.5	2.9	0.0	0.0	0.0	0.0
Cheilosis	0.2	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tongue												
Filiform atrophy, slight	8.6	9.2	6.4	9.9	13.6	6.2	6.3	7.2	4.5	2.6	12.0	5.6
Filiform atrophy, moderate	1.5	3.9	0.0	2.5	1.7	0.0	0.5	0.0	0.0	0.0	2.7	0.0
Papillary hypertrophy	0.2	0.0	0.0	0.0	0.0	1.0	1.3	1.4	2.3	1.3	0.0	1.1
Furrows	5.2	1.3	7.4	9.9	3.4	3.1	2.5	4.3	2.3	2.6	2.7	1.1
Fissures, erosions, ulcers	0.7	1.3	1.1	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Serrations or swelling	2.2	0.0	6.4	3.7	0.0	0.0	1.0	0.0	0.0	0.0	1.3	3.3
Red, tip, or lateral margin	2.7	3.9	4.3	4.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Geographic tongue	1.2	1.3	0.0	1.2	0.0	3.1	1.3	2.9	0.0	3.9	0.0	0.0
Gums												
Red or swollen	5.9	1.3	3.2	9.9	8.5	7.3	11.8	17.4	2.3	7.8	13.3	18.9
Atrophy or recession	8.4	9.2	8.5	16.0	1.7	5.2	21.1	23.2	19.2	27.3	17.3	18.9
Bleeding gums	0.0	0.0	0.0	0.0	0.0	0.0	1.3	1.4	0.0	0.0	0.0	4.4
Teeth												
Unfilled caries	40.1	30.3	60.6	48.1	23.7	31.2	43.1	31.9	40.9	58.4	34.7	47.8
Filled caries	11.1	17.1	9.6	13.6	0.0	12.5	20.3	46.4	23.9	11.7	9.3	13.3
No carious teeth	50.2	50.0	31.9	44.4	76.3	57.3	38.1	23.2	37.5	29.9	57.3	41.1
Caries (1 or 2)	7.6	13.2	7.4	6.2	3.4	7.3	22.8	24.6	18.2	28.6	21.3	22.2
Caries (3 or 4)	24.1	18.4	36.2	24.7	11.9	24.0	21.1	23.2	23.9	20.8	14.7	22.2
Caries (5 or more)	16.3	11.8	23.4	23.5	8.5	11.5	16.3	24.6	18.2	18.2	6.7	14.4
Edentulous	1.7	6.6	1.1	1.2	0.0	0.0	1.8	4.3	2.3	2.6	0.0	0.0
Worn	30.8	30.3	33.0	35.8	23.7	29.2	14.3	14.5	12.5	27.3	12.0	6.7
Fluorosis	0.2	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Malposition	7.1	2.6	1.1	12.3	6.8	12.5	0.3	0.0	0.0	1.3	0.0	0.0
Skin (general)												
Folicular hyperkeratosis	2.7	3.9	1.1	1.2	10.2	0.0	32.6	40.6	34.1	20.8	20.0	45.6
Xerosis	16.5	19.7	21.3	11.1	22.0	10.4	0.0	0.0	0.0	0.0	0.0	0.0
Acneform eruption	1.0	0.0	1.1	1.2	0.0	2.1	0.5	0.0	0.0	1.3	0.0	1.1
Thickened pressure points	0.7	1.3	2.1	0.0	0.0	0.0	0.3	0.0	0.0	1.3	0.0	0.0
Purpura or petechiae	0.5	0.0	1.1	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Hyperpigmentation	1.2	2.6	0.0	0.0	0.0	3.1	0.3	0.0	1.1	0.0	0.0	0.0
Hepatomegalia	1.2	0.0	0.0	2.5	5.1	0.0	Examination of abdomen and lower extremities omitted					
Loss of ankle jerk	0.7	1.3	0.0	1.2	1.7	0.0						

* Villages referred to by number: Southern Eskimos: 1, Akiak; 2, Kasigluk; 3, Napasiak; 4, Newktok; 5, Hooper Bay. Northern Eskimos: 6, Noatak; 7, Point Hope; 8, Shishmaref. Athabascan Indians: 9, Huslia; 10, Allakaket.

† No findings of enlarged parotids, xerophthalmia, magenta tongue, "scorbutic-type" gums, crackled skin, pellagrous lesions, splenomegalia, ascites, calf tenderness, angular atrophy. Not examined for scrotal dermatitis.

TABLE XVII

Selected Clinical Findings by Age and Sex, Eskimo and Indian Villages in Alaska, 1958

Per Cent Prevalence

Data	Bethel Area*						Kotzebue Area†					
	Age (yr.)				Sex		Age (yr.)				Sex	
	2–4	5–14	15–39	40+	Male	Female	2–4	5–14	15–39	40+	Male	Female
No. examined	45	174	107	80	169	237	46	188	105	60	192	207
Suspected disease												
Tuberculosis	2.2	5.2	18.7	32.5	13.0	14.3	0.0	3.7	10.5	11.7	4.2	8.2
General appearance												
Good	91.1	78.2	89.7	67.5	79.3	81.4	100.0	98.4	100.0	100.0	99.5	99.0
Fair	8.9	14.9	10.3	30.0	15.4	16.5	0.0	1.6	0.0	0.0	0.5	1.0
Poor	0.0	6.9	0.0	2.5	5.3	2.1	0.0	0.0	0.0	0.0	0.0	0.0
Glands												
Thyroid	0.0	1.7	7.5	5.0	1.8	5.1	0.0	0.0	1.0	0.0	0.5	0.0
Submaxillary	0.0	0.0	0.9	0.0	0.6	0.0	2.2	5.9	1.9	3.3	6.8	1.4
Skin												
Nasolabial seborrhea	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	5.7	1.7	2.1	2.4
Erythema	17.8	23.6	31.8	13.8	16.6	27.8	32.6	14.4	10.5	11.7	13.0	16.9
Pigmentation	0.0	1.1	0.0	2.5	1.2	0.8	0.0	0.0	0.0	0.0	0.0	0.0
Eyes												
Thickened conjunctivas	0.0	0.6	15.9	37.5	10.7	12.7	0.0	1.1	14.3	28.3	7.8	9.2
Pingueculae	0.0	1.7	48.6	75.0	29.0	27.8	0.0	0.0	52.4	83.3	25.5	27.1
Conjunctival injection	0.0	2.3	1.9	3.8	1.8	2.5	0.0	2.1	0.0	1.7	1.6	1.0
Corneal scarring	8.9	16.7	18.7	6.2	16.0	13.1	0.0	1.6	2.9	31.7	6.2	6.3
Tongue												
Filiform atrophy, slight	2.2	1.1	18.7	15.0	5.9	10.5	8.7	6.4	4.8	6.7	7.8	4.8
Filiform atrophy, moderate	0.0	0.0	1.9	5.0	0.0	2.5	0.0	0.5	1.0	0.0	0.5	0.5
Furrows	0.0	2.9	4.7	13.8	7.1	3.8	0.0	1.6	2.9	6.7	3.6	1.4
Serrations, swellings	0.0	0.0	3.7	6.2	3.6	1.3	0.0	0.0	1.0	5.0	0.5	1.4
Red, tip or lateral margins	0.0	0.0	3.7	8.8	3.0	2.5	0.0	0.0	0 0	0.0	0.0	0.0
Geographic tongue	4.4	1.1	0.0	1.2	2.4	0.4	2.2	0.5	1.9	1.7	1.6	1.0
Gums												
Red or swollen	0.0	1.7	9.3	13.8	4.7	6.8	0.0	5.9	15.2	33.3	12.0	11.6
Atrophy or recession	0.0	0.0	5.6	35.0	14.8	3.8	0.0	3.2	28.6	80.0	21.4	20.8
Teeth												
No caries	60.0	39.1	51.4	67.5	50.9	49.8	52.2	32.4	31.4	56.7	44.3	32.4
Caries (1 or 2)	8.9	5.7	9.3	8.8	9.5	6.3	8.7	26.1	24.8	18.3	22.4	23.2
Caries (3 or more)	31.1	55.2	37.4	17.5	38.4	41.8	37.1	41.5	40.0	20.0	32.3	42.0
Edentulous	0.0	0.0	1.9	6.2	1.2	2.1	0.0	0.0	3.8	5.0	1.0	2.4
Worn	0.0	1.7	48.6	87.5	28.4	32.5	0.0	0.5	10.5	75.0	14.6	14.0
Skin (general)												
Follicular hyperkeratosis	0.0	5.2	1.9	0.0	4.7	1.3	17.4	50.5	24.8	1.7	33.9	31.4
Xerosis	8.9	32.8	4.7	1.2	20.7	13.5	0.0	0.0	0.0	0.0	0.0	0.0
Acneform eruption	0.0	0.6	1.9	1.2	1.2	0.8	0.0	0.0	1.9	0.0	1.0	0.0

* Bethel Area includes Southern Eskimos from Akiak, Kasigluk, Napaskiak, Newktok and Hooper Bay.

† Kotzebue Area includes Northern Eskimos from Noatak, Point Hope and Shishmaref and the Athabascan Indian villages Husila and Allakaket.

Scars of cold injury were common. The teeth were worn and carious, being best among the least acculturated people. Signs of rheumatic heart disease were seen. Infectious disease was usually the most conspicuous ailment. Pediculosis was not uncommon. Despite the sparcity and lack of variety in the diet, evidence of gross deficiency diseases was rarely seen. The school lunch program and possibly the vitamin supplements (*vide supra*) to the basically meat diet seem to explain this observation in the Eskimo school children. Preschool children were generally well nourished. The mothers were often both thin and pale, especially those who had had recent pregnancies. Table XVII shows a summary of the prevalence of clinical findings in the villages by age, sex and area.

Incidence of thyroid enlargement was variable among the villages but when present was of small degree. Endemic goiter does not seem to be a serious problem. The facial erythema could be accounted for by exposure, as could the prevalent pingueculae. Bitot's spots were seen only in Newktok, the poorest, most primitive, and perhaps the least well situated village. Roughness of the skin was common, and the observers were not in agreement on

FIG. 4. Dental attrition in a thirty-two year old Eskimo woman.

their criteria for this finding and for follicular hyperkeratosis. The scarcity of water and soap no doubt accounts for much of the skin disturbances.

The incidence of caries as indicated by the total of filled and unfilled carious teeth is shown in Tables XVI and XVII. As predicted from the dentist's experience with the Eskimo National Guardsmen this defect was strongly related to the village location. The lowest prevalence was seen in Newktok, the most primitive and underfed village. The remarkable extent of dental attrition is illustrated in Figure 4. This was noted not only in adults but also in the deciduous teeth in children.

A striking difference in the relation of per cent "standard weight" to age for the two areas is shown in Table XVIII. The adults in the northern or Kotzebue study (villages 6 to 10) increase in "standard weight" with age in nearly the same manner as do white people. The southern Eskimos seem to decrease in "standard weight" with age which, allowing for the increase that is built into the "standard weight" ratio, means either no increase or a small decrease with age.

As with the men in the National Guard, the people in the northern villages are a little taller, but the rates of gain of height and weight with age among the children are not remarkable. A summary of heights and weights by sex and age for the five villages, in each area combined, is shown for reference purposes in Table XIX and in Figures 5 and 6. Data on Canadians in the same age groups are included

TABLE XVIII

Eskimos and Athabascan Indians in Alaska, 1958

Percentage of "Standard Weight" by Age and Sex*

Age (yr.)	Southern Eskimo†				Northern Eskimo‡				Athabascan Indian§			
	Male		Female		Male		Female		Male		Female	
	No.	Mean ± S.E.	No.	Mean ± S.E.	No.	Mean ± S.E.	No.	Mean ± S.E.	No.	Mean ± S.E.	No.	Mean ± S.E.
5–9	47	114 ± 1	53	110 ± 1	29	109 ± 1	24	106 ± 1	22	104 ± 1	29	104 ± 2
10–14	33	110 ± 1	40	109 ± 1	30	108 ± 1	21	105 ± 2	17	103 ± 2	16	98 ± 2
15–44	93	105 ± 1	70	106 ± 2	71	107 ± 1	52	114 ± 2	20	98 ± 1	21	106 ± 3
45+	31	100 ± 2	27	95 ± 2	17	107 ± 2	11	110 ± 8	11	99 ± 2	7	114 ± 6

NOTE: The women included here were not pregnant or lactating.

* U. S. Medico-Actuarial Tables used as an arbitrary standard for ages fifteen years and over. The tabular weights were adjusted for shoes and clothing by subtraction of 1 inch and 5 pounds for both males and females. The Alaskan heights were taken without shoes; men were stripped to the waist, and women had on indoor clothing. No readjustment was made for this clothing. Baldwin-Wood standards were used for children <15 years of age, with these standards as adjusted for indoor clothing.

† Southern Eskimos from five villages surveyed (Akiak, Kasigluk, Napaskiak, Newktok and Hooper Bay), including men from these villages in the National Guard.

‡ Northern Eskimos from three villages surveyed (Noatak, Point Hope and Shishmaref), including men from these villages in the National Guard.

§ Indians from two villages surveyed (Huslia and Allakaket).

TABLE XIX

Average Height and Weight of Eskimos and Athabascan Indians in Alaska, 1958, Compared to Canadian 1953 Survey

Age (yr.)	Southern Eskimo*						Northern Eskimo†						Athabascan Indians‡						Canadians§			
	Male			Female			Male			Female			Male			Female			Male		Female	
	No.	Height	Weight	No.	Height	Weight	No.	Height	Weight	No.	Height	Weight	No.	Height	Weight	No.	Height	Weight	Height	Weight	Height	Weight
2	5	34	32	8	33	31	5	36	36	2	36	32	3	35	31	2	36	31	35	30	34	28
3	9	37	36	8	37	36	6	39	39	5	37	36	4	38	37	3	38	35	37	32	36	31
4	8	39	40	7	39	40	4	40	40	5	41	41	3	41	38	4	40	39	39	37	39	36
5	9	42	45	13	40	40	8	43	44	7	42	42	3	42	41	5	44	45	42	40	42	41
6	6	44	48	12	43	47	4	47	59	5	45	48	7	45	47	8	44	45	45	46	44	44
7	9	45	52	9	45	49	8	48	57	4	46	50	2	46	51	4	48	52	47	50	47	49
8	10	48	60	7	46	51	5	50	63	4	48	55	7	48	56	4	48	53	49	57	49	57
9	13	49	63	12	48	60	4	54	71	4	52	65	3	51	66	8	51	64	51	63	51	62
10	5	51	67	9	51	65	6	53	72	4	56	81	2	53	70	5	53	61	54	70	53	69
11	3	53	75	7	52	70	7	57	86	5	57	90	5	55	75	3	54	68	55	77	55	77
12	6	54	73	5	56	85	5	58	96	4	58	92	1	56	78	3	58	89	57	84	58	92
13	11	55	83	7	58	99	5	58	90	2	59	82	5	59	91	4	58	94	59	94	60	102
14	8	58	97	12	59	105	8	63	115	5	60	101	4	59	93	1	59	105	62	108	61	107
15	2	60	98	6	58	104	2	65	132	3	59	101	2	59	94	1	59	108	65	119	62	112
16–17	7	62	115	12	60	123	2	62	117	2	60	109	2	63	113	2	61	118	67	136	63	120
18–19	8	65	138	3	60	109	2	67	149	6	62	134	3	64	125	...	...	...	68	144	63	124
20–24	21	64	139	5	58	122	16	67	150	8	62	135	3	65	130	3	60	115	68	154	63	124
25–34	32	64	143	23	59	118	32	67	157	18	62	139	6	66	143	12	61	127	68	164	63	128
35–44	23	64	145	21	60	129	17	66	158	15	62	154	4	65	135	3	60	137	68	167	62	135
45–54	14	64	141	14	60	121	12	66	161	8	62	146	5	66	149	4	62	160	67	164	62	144
55–64	9	63	136	8	59	123	2	65	162	1	62	182	4	67	147	1	58	125	66	161	61	147
65+	8	63	148	5	58	121	3	65	159	3	59	138	2	66	160	2	61	143	65	155	61	138

NOTE: Age in years to last birthday; height recorded to the nearest inch; weight recorded to nearest pound. Heights without shoes, and weights of males taken stripped to waist and females in indoor clothing. Pregnant and lactating women excluded.

* Southern Eskimos from five villages surveyed (Akiak, Kasigluk, Napaskiak, Newktok and Hooper Bay), including men from these villages in National Guard.

† Northern Eskimos from three villages surveyed (Noatak, Point Hope and Shishmaref), including men from these villages in National Guard.

‡ Indians from two villages surveyed (Huslia and Allakaket).

§ See Reference 31.

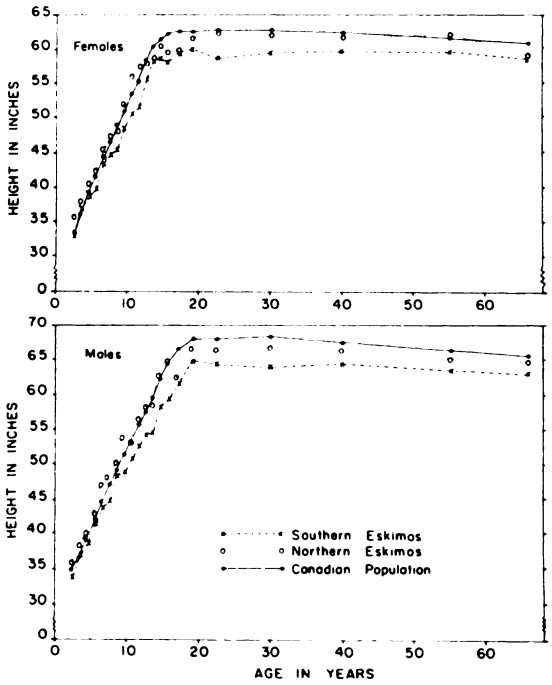

FIG. 5. Height by age and sex, Eskimo villages, 1958 compared with Canadian population.

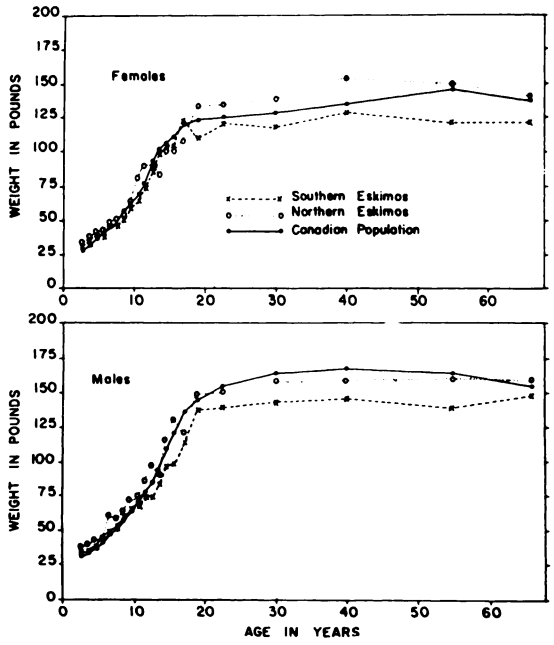

FIG. 6. Weight by age and sex, Eskimo villages, 1958 compared with Canadian population.

for comparison.[31] The data for the Athabascan Indians are omitted from the figures. They are shown in Table XIX.

Height growth was slowest in the southern Eskimos. It followed the Canadian population pattern closely until about six years of age, then dropped below it for the remainder of the growth. Weight growth in the southern Eskimos was faster than the Canadian pattern until eight to ten years of age, then lagged below it. Adult height of the southern Eskimos is about 3 inches shorter than that of the Canadian population in both men and women. The adult weight of southern Eskimo women is about 10 pounds below that of the Canadian population.

Growth in both height and weight among the northern Eskimos closely followed that of the Canadian population throughout the growth period. Adult height is about 1 inch shorter than that of the Canadian population, for both men and women. Adult northern Eskimo women weigh about 10 pounds more than the Canadian population; adult northern Eskimo men weigh about 5 pounds less than the Canadian population.

The height curve for the Athabascan Indians falls close to that for the Canadian population. The weight curve for these people is close to that of the Canadian population until age ten, when it lags. Adult height of Athabascan Indians is similar to that of the northern Eskimos. Adult weight is least in young adults, rising strongly in older groups. However, with such small groups as these there is a

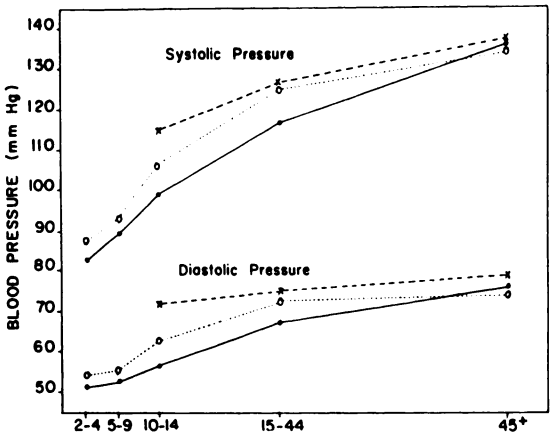

FIG. 7. Eskimo and Indian villages in Alaska, 1958 blood pressures and pulse rates, by age. X = Southern Eskimo; O = Northern Eskimo; ● Canadian population.

TABLE XX

Eskimos and Athabascan Indians in Alaska, 1958
"Obesity" in Adults by Age and Sex

Ethnographic Group*	15–44 years			45+ years		
	No. Examined	No. "Obese"†	Per Cent "Obese"	No. Examined	No. "Obese"†	Per Cent "Obese"
Males						
Southern Eskimo	93	3	3.2	31	1	3.2
Northern Eskimo	71	5	7.0	17	1	5.9
Athabascan Indian	20	0	0.0	11	0	0.0
Total	184	8	4.3	59	2	3.4
Females‡						
Southern Eskimo	70	11	15.7	27	0	0.0
Northern Eskimo	52	15	28.8	11	4	36.4
Athabascan Indian	11	2	9.5	7	3	42.9
Total	133	28	21.1	45	7	15.6

* See footnotes to Table XVIII.
† "Obesity" taken as ≥120 per cent of standard weight, using the U. S. Medico-Actuarial Tables in the manner described in footnote* to Table XVIII.
‡ The women included here were not pregnant and not lactating.

TABLE XXI

Eskimo and Indian Villages in Alaska, 1958
Blood Pressure (Mean ± S.E.) by Age, for Villages by Ethnographic Groups

Age (yr.)	Southern Eskimo*			Northern Eskimo†			Athabascan Indian‡		
	Blood Pressure (mm. Hg)			Blood Pressure (mm. Hg)			Blood Pressure (mm. Hg)		
	No.	Systolic	Diastolic	No.	Systolic	Diastolic	No.	Systolic	Diastolic
2–4	No measurements on children under 10 years of age			6	88 ± 3	54 ± 3	6	82 ± 3	52 ± 3
5–9				49	93 ± 2	56 ± 2	51	89 ± 2	53 ± 1
10–14	12	114 ± 3	72 ± 3	51	106 ± 2	63 ± 1	33	99 ± 2	57 ± 2
15–19	31	124 ± 2	75 ± 2	17	122 ± 3	72 ± 2	11	107 ± 5	67 ± 4
20–44	96	127 ± 1	75 ± 1	60	126 ± 3	74 ± 2	33	120 ± 3	68 ± 2
45–64	43	131 ± 3	78 ± 2	20	133 ± 5	74 ± 3	13	131 ± 8	72 ± 3
65+	13	155 ± 8	83 ± 3	6	142 ± 4	77 ± 3	4	155 ± 29	86 ± 13

* Southern Eskimos from five village surveyed (Akiak, Kasigluk, Napaskiak, Newktok and Hooper Bay).
† Northern Eskimos from three villages surveyed (Noatak, Point Hope and Shishmaref).
‡ Indians from two villages surveyed (Hislia and Allakaket).

possible differential age bias in the sampling.

Gross overweight was most prevalent in the northern Eskimo villages (Table XX), especially in the women, and also in the women of the Athabascan Indian villages, and in young, southern Eskimo women.

High blood pressure was no more common among the population in the villages than it

TABLE XXII

Total Serum Protein and Hematology by Village,* for Men, Women and Children†
Alaska, Nutrition Survey, March 1958

Data	Bethel Area						Kotzebue Area					
	Total	1	2	3	4	5	Total	6	7	8	9	10
No. of subjects												
Children	87	14	17	14	16	26	113	17	27	23	20	26
Women	65	16	14	11	7	17	76	18	15	19	13	11
Men	56	11	19	21	0	5	63	16	5	12	16	14
Total serum protein (gm./100 ml.)												
Children	7.67	7.63	7.83	7.66	7.47	7.71	7.06	6.97	6.91	7.23	7.05	7.14
Women	7.74	7.60	7.76	7.85	7.75	7.77	7.21	7.18	7.11	7.25	7.32	7.20
Men	7.53	7.36	7.67	7.54	...	7.31	7.03	7.13	7.16	7.03	7.00	6.89
Hemoglobin (gm./100 ml.)												
Children	12.6	12.5	12.5	12.5	12.6	12.8	12.2	12.0	12.5	12.1	12.3	12.2
Women	12.8	12.9	12.7	12.7	13.3	12.7	12.4	12.5	12.4	12.2	12.8	11.4
Men	13.7	14.1	13.3	14.0	...	13.2	13.3	13.3	12.8	13.4	13.3	13.7
Hematocrit (%)												
Children	40.1	38.9	40.8	40.2	40.5	39.9	41.3	40.2	41.3	40.8	43.0	41.2
Women	40.8	40.0	40.2	41.2	42.6	41.0	42.2	42.8	42.6	41.4	43.3	40.6
Men	44.0	43.0	43.6	45.2	...	42.4	45.5	46.1	44.4	44.6	45.2	46.6
Mean corpuscular hemoglobin concentration (%)												
Children	31.6	32.4	30.9	31.1	31.2	32.2	29.6	29.9	30.1	29.8	28.7	29.5
Women	31.7	32.2	31.7	30.9	31.2	31.9	29.3	29.5	29.1	29.6	29.8	28.1
Men	31.4	33.0	30.7	31.2	...	31.1	29.4	28.9	28.7	30.1	29.4	29.5

NOTE: Children are all persons age six through fourteen years. Individuals fifteen years or over are included as men or women. No pregnant or lactating women are included in this tabulation.

* Identification of villages: 1, Akiak; 2, Kasigluk; 3, Napaskiak; 4, Newktok; 5, Hooper Bay; 6, Noatak; 7, Point Hope; 8, Shishmaref; 9, Allakaket; 10, Huslia.

† For definitions of age groups see footnotes Table XXIII.

was among the men in the National Guard. The per cent of subjects exceeding stated levels of pressure are shown by area, age and blood pressure in Table XXI. Hypertension is conspicuous by its absence. The usual rise of blood pressure with age was noted, with a lesser rise of diastolic than of systolic pressure. These blood pressure findings confirm earlier observations among the Eskimos,[32] Figure 7.

Blood pressure and pulse data have not been presented by sex because there was no sex differences except in older people, in whom measurements for the women slightly exceeded those for the men.

Biochemical Findings

In all, blood and urine samples were obtained from 826 adult males, 145 adult females and 209 children for a total of 1,180 specimens. All subjects under the age of fifteen years were classified as children. The data in Table XXII summarize the results for serum protein, hemoglobin, hematocrit and packed cell volume in all the adult males, adult females and children. Appendix IV gives the ICNND suggested guide to interpretation of biochemical data.

The serum protein means tend to be high; the mean for the male adults was 7.03 gm. per 100 ml. for the northern villages, 7.53 gm. per 100 ml. for the southern villages, 7.12 gm. per 100 ml. for the Eskimo guardsmen of Battalion 1 from the north and 7.14 gm. per 100 ml. for the guardsmen from the south. In adult women the mean was 7.21 and 7.74 gm. per 100 ml., whereas the children had mean levels of 7.06 and 7.67 gm. per 100 ml. for the northern and southern villages, respectively.

The mean hemoglobin values for the adult males were 13.3 gm. per 100 ml. for the northern Eskimos, 13.7 gm. per 100 ml. for the southern Eskimos, 14.6 gm. per 100 ml. for Battalion 1 members from the north, and 14.3 gm. per 100 ml. for Battalion 2 members from the south. These data suggest some selection of the male groups as reflected in the higher levels among

TABLE XXIII
Serum Vitamin C, A and Carotene, by Village*
Alaska, Nutrition Survey, March 1958

Data	Bethel Area						Kotzebue Area					
	Total	1	2	3	4	5	Total	6	7	8	9	10
Serum vitamin C (mg./100 ml.)												
No.	222	44	49	48	30	51	208	43	40	45	45	35
Mean	0.39	0.49	0.27	0.53	0.35	0.33	0.47	0.46	0.34	0.63	0.40	0.52
Standard error	0.02	0.06	0.04	0.04	0.05	0.04	0.02	0.03	0.03	0.04	0 04	0.03
Standard deviation	0.32	0.37	0.28	0.27	0.28	0.30	0.23	0. 20	0.17	0.25	0.24	0.16
Per cent distribution												
<0.10	21.6	15.9	38.8	4.2	23.3	25.5	3.4	0.0	5.0	0.0	11.1	0.0
0.10–0.19	9.5	6.8	14.3	6.2	10.0	9.8	9.6	4.7	20.0	6.7	11.1	5.7
0.20–0.39	23.0	18.2	20.4	18.7	26.7	31.4	27.4	44.2	40.0	11.1	28.9	11.4
>0.40	45.9	59.1	26.5	70.8	40.0	33.3	59.6	51.2	35.0	82.2	48.9	82.9
Serum vitamin A (μg./100 ml.)												
No.	196	30	45	46	27	48	220	42	45	39	46	48
Mean	31	40	29	28	27	32	29	24	25	37	33	29
Standard error	1	4	2	2	2	3	1	2	1	2	2	2
Standard deviation	18	24	14	13	12	19	10	12	9	12	12	10
Per cent distribution.												
<10	3.1	3.3	2.2	0.0	3.7	6.2	1.8	2.4	2.2	2.6	2.2	0.0
10–19	24.5	20.0	24.4	23.9	33.3	22.9	19.1	35.7	33.3	7.7	8.7	10.4
20–49	57.1	40.0	66.7	71.7	44.4	52.1	71.8	54.8	60.0	76.9	80.4	85.4
>50	15.3	36.7	6.7	4.3	18.5	18.7	7.3	7.1	4.4	12.8	8.7	4.2
Serum carotene (μg./100 ml.)												
No.	198	31	46	46	27	48	225	44	45	41	47	48
Mean	57	47	65	49	57	63	56	38	44	101	49	53
Standard error	2	4	5	4	4	4	2	2	3	5	3	2
Standard deviation	28	21	34	26	27	25	31	12	21	34	23	16
Per cent distribution												
<20	2.5	6.4	0.0	4.3	3.7	0.0	1.8	2.3	2.2	0.0	4.2	0.0
20–39	28.3	41.9	26.1	41.3	14.8	16.7	37.3	54.5	55.6	2.4	44.7	27.1
40–99	61.6	51.6	54.3	50.0	77.8	77.1	50.7	43.2	40.0	46.3	51.1	70.8
>100	7.6	0.0	19.6	4.3	3.7	6.2	10.2	0.0	2.2	51.2	0.0	2.1

* For identity of villages see footnote Table XVI.

the men in the Alaska National Guard. In the adult women, the mean values were 12.4 gm. per 100 ml. for the northern villages and 12.8 gm. per 100 ml. for the southern villages. The women at Huslia had the lowest values, the mean being 11.4 gm. per 100 ml. (It should be noted that findings in only eight women from Huslia are included in the biochemical tests.) The children from the northern areas had a mean of 12.2 gm. per 100 ml., whereas the children from the south had a mean of 12.6 gm. per 100 ml.

The hematocrits were within the normal range for men, women and children. Men from the northern villages had mean average values of 45.5 per cent, the southern group 44.0 per cent, the Eskimo guardsmen from the north 47.0 per cent and the Eskimo guardsmen from the south, 47.1 per cent. The adult women had means of 42.2 and 40.8 per cent for the north and south, respectively, while the children at these same locations had values of 41.3 and 40.1 per cent.

The mean ascorbic acid value in the serum was within the "acceptable" range (Table XXIII), averaging above 0.40 mg. per 100 ml. for all the groups except the adult males in the southern villages who averaged 0.32 mg. per 100 ml. The Kasigluk group had a mean of 0.27 mg. per 100 ml. The highest percentage of subjects having levels of less than 0.1 mg. of vitamin C per 100 ml. of serum was found in the men of the sourthern area (26.3 per cent). In general the highest per cent of women and children with low values was from this area.

Few of the men, women and children had mean serum vitamin A and carotene values in the "deficient" range of less than 10 and 20 μg. per 100 ml., respectively. The men and children at Noatak and the women at Point Hope and Akiak had "low" or "marginal" values for serum carotene.

TABLE XXIV

Total Fatty Acids, Lipid Phosphorus and Cholesterol for National Guard and Villages, by Sex and Age Groups[1]
*Alaska, Nutrition Survey, March 1958**

	National Guard	Bethel Area (2) (South)			Kotzebue Area (3) (North)		
		Children (4)	Women (5)	Men (6)	Children	Women	Men
Total fatty acids (mg./100 ml.)							
No.	21	50	38	20	52	28	20
Mean	270	208	279	246	240	282	279
Standard error	19	8	10	11	8	10	12
Standard deviation	85	60	64	50	60	53	51
Lipid phosphorus (mg./100 ml.)							
No.	21	50	38	20	52	28	20
Mean	8.6	7.8	9.0	8.3	8.6	9.4	9.3
Standard error	0.7	0.2	0.3	0.4	0.3	0.3	0.4
Standard deviation	3.4	1.4	1.9	1.7	2.0	1.5	1.6
Total cholesterol (mg./100 ml.)							
No.	21	48	38	17	44	18	16
Mean	227	158	213	199	162	192	182
Standard error	18	5	7	14	6	7	10
Standard deviation	80	33	42	58	38	31	39

* See Table XVI and XXII for footnote explanations.

TABLE XXV

Blood Lipid Levels, by Village* and Age
Alaska, Nutrition Survey, March 1958

Data	Bethel Area						Kotzebue Area					
	Total	1	2	3	4	5	Total	6	7	8	9	10
No. of subjects												
< 51 years	50	7	9	6	8	20	52	9	8	9	8	18
>15 years	58	11	16	18	3	10	48	4	5	11	13	15
Total fatty acids (mg./100 ml.)												
<15 years	208	236	223	226	211	184	240	198	243	236	260	253
>15 years	268	313	265	260	234	246	281	262	258	297	276	286
Lipid phosphorus (mg./100 ml.)												
<15 years	7.8	8.9	8.6	7.9	8.2	7.0	8.6	7.1	8.4	9.0	9.7	8.9
>15 years	8.8	9.7	9.3	8.1	8.3	8.3	9.4	7.6	8.5	9.9	9.5	9.7
Total cholesterol (mg./100 ml.)												
<15 years	158	192	158	150	163	147	162	146	144	150	200	167
>15 years	209	258	216	188	184	193	187	184	162	184	180	202

* See footnotes Tables XVI and XXII for explanations of areas and villages.

Table XXIV presents serum lipid analyses. Table XXV shows these data by village, and separates them into two age groups, those fifteen years and over and those under fifteen years of age. These data are not remarkable unless it should be noted that they are similar to the levels of the U. S. white population. It may be noted that levels in adult females exceed those in males.

The thiamine excretions for men, women and children were practically all in either the "acceptable" or "high" range by ICNND standards (Table XXVI). The median values for adult males were 190 and 140 μg. per gm. of creatinine for the northern and southern villages, respectively. The lowest recorded median thiamine values were at Newktok in the south.

TABLE XXVI

Urinary Vitamin Excretions by Village* for Men, Women and Children
Alaska, Nutrition Survey, March 1958

	Bethel Area						Kotzebue Area					
	Total	1	2	3	4	5	Total	6	7	8	9	10
No. of subjects†												
Children	78	13	15	13	12	25	103	16	26	21	15	25
Women	57	17	10	10	6	14	63	18	12	16	10	7
Men	50	9	18	18	...	5	59	15	7	12	15	10
Thiamine excretion (mg./gm. creatinine) Medians												
Children	450	370	450	470	110	810	700	900	1,180	1,800	550	260
Women	130	150	110	100	20	500	330	400	400	150	450	160
Men	140	110	110	150	...	550	190	290	350	130	210	110
Riboflavin excretion (μg./gm. creatinine) Medians												
Children	1,190	1,250	730	2,140	800	1,380	1,160	800	2,020	3,740	400	700
Women	760	750	680	700	900	900	910	940	1,290	800	1,000	450
Men	640	450	600	660	...	...	780	1,330	1,550	900	500	310
N′-methylnicotinamide excretion (mg./gm. creatinine) Medians												
Children	16.3	16.5	18.7	20.0	12.0	16.3	18.3	15.0	20.0	21.2	20.0	11.9
Women	13.6	12.9	16.5	13.3	12.5	11.7	14.1	14.6	13.0	13.2	22.0	10.0
Men	12.2	12.5	9.8	12.9	...	12.5	13.6	16.3	13.3	13.3	16.2	9.0

* See footnotes, Tables XVI and XXII.
† Numbers differ slightly for the different analyses. These are number of thiamine determinations.

TABLE XXVII

Food Consumption of Men in Villages—Alaska, 1956–1958

Average Per Day for Each Age Group

Age Group and Data	No. Men	Calories	Protein (gm.)	Fat (gm.)	Carbohydrate (gm.)	Calcium (mg.)	Phosphorus (mg.)*	Iron (mg.)*	Vitamin A (I.U.)	Thiamine (mg.)	Riboflavin (mg.)	Niacin (mg.)*	Vitamin C (mg.)
16–25 yr	26	1,896	136.8	66.8	191.9	958	1,107	12.1	1,395	0.65	1.88	15.9	35
Standard deviation		695	69.7	44.7	91.0	925	502	6.7	917	0.53	1.13	7.8	27
% of consumed calories			28.9	31.2	39.9	...	...	...	...	...	...	...	...
6–40 yr	29	1,815	144.0	77.3	142.9	968	1,106	10.1	1,742	0.68	1.56	15.9	38
Standard deviation		942	136.1	48.2	68.5	1,181	761	9.3	1,921	0.88	1.82	12.7	34
% of consumed calories			31.8	38.3	29.9	...	...	...	...	...	...	...	...
41–54 yr	24	1,933	140.8	72.6	178.0	1,151	1,020	9.2	1,644	0.58	1.61	14.7	30
Standard deviation		752	83.0	46.3	66.8	1,881	606	5.1	1,214	0.42	1.03	14.6	37
% of consumed calories			29.1	33.8	37.1	...	...	...	...	...	...	...	...
55–75 yr	18	1,753	115.6	75.0	158.2	1,057	1,042	10.3	1,721	0.63	1.43	17.6	44
Standard deviation		703	59.7	49.2	86.3	1,051	491	5.7	1,561	0.39	0.66	10.9	49
% of consumed calories			26.4	38.5	35.1	...	...	...	...	...	...	...	...
Mean (all ages)	97	1,855	136.0	72.9	167.6	1,027	1,073	10.5	1,621	0.64	1.64	15.9	36
Standard deviation		784	95.2	46.4	79.4	1,296	605	7.1	1,449	0.61	1.29	11.7	36
% of consumed calories			29.3	35.4	35.3	...	...	...	...	...	...	...	...

* Some of these values are assumed. No chemical analysis available.

TABLE XXVIII
Food Consumption of Alaskan and Indian Men by Villages, 1956–1958*

Village	No. Men	Calories	Protein (gm.)	Fat (gm.)	Carbo-hydrate (gm.)	Calcium (mg.)	Phos-phorus (mg.)	Iron (mg.)	Vitamin A (I.U.)	Thia-mine (mg.)	Ribo-flavin (mg.)	Niacin (mg.)	Vitamin C (mg.)
South													
Hooper Bay	19	1,495	92.6	55.5	144.6	677	862	6.6	1,288	0.51	0.99	9.6	34
Napaskiak	16	1,467	103.3	71.8	103.7	582	590	4.6	1,467	0.38	0.58	9.8	26
Newktok	11	1,769	143.9	85.8	113.9	2,682	1,140	9.0	1,752	0.75	2.07	26.2	32
Kasigluk	7	2,327	219.0	94.4	150.8	2,651	1,555	12.6	1,712	1.07	2.08	29.0	99
North													
Huslia	27	2,035	149.2	51.0	251.5	632	1,193	14.4	1,442	0.65	2.00	16.5	29
Point Hope	11	2,075	158.9	73.4	196.7	632	1,177	12.2	2,065	0.92	2.40	13.3	19
Shishmaref	6	2,647	164.7	155.1	150.8	899	1,445	17.6	2,725	0.41	2.11	20.8	72
Mean for all villages	97	1,855	136.0	72.9	167.6	1,027	1,073	10.5	1,621	0.64	1.64	15.9	36

* Values expressed as means.

None of the riboflavin excretion data for men, women and children were in the "low" or "deficient" range (Table XXVI). The lowest median adult values of 310 μg. per gm. of creatinine (still in the "high" range by ICNND standards) were at Huslia in the male population (Table XXVI).

The N′-methylnicotinamide values for men, women and children were in the "high" range (above 4.3 mg. per gm. of creatinine), by ICCND standards. Eskimo men in Battalion 1 had a median value of 10.6 and in Battalion 2 13.5 mg. per gm. of creatinine.

Dietary Findings (Villages)

For the purpose of this report a sample of food consumption in the villages was computed for ninety-seven men between the ages of sixteen and seventy-five years. Values were computed using food analysis data from the U. S. Army Medical Research and Nutrition Laboratory, Appendix II, Rodahl,[24] U. S. Department of Agriculture Handbook No. 8[33] and Bowes and Church.[34] In some instances in which food analyses were not available, values were assumed using items of similar nature. These data do not include any added vitamin supplementation.

The men were divided into four age groups, from sixteen to twenty-five, twenty-six to forty, forty-one to fifty-four, and fifty-five to seventy-five years (Table XXVII) and also separated by villages (Table XXVIII) and the food intake values were tabulated according to these divisions. Daily food intakes for all the men averaged 1,855 calories, protein 136.0 gm., fat 72.9 gm. (35 per cent calories) and carbohydrate 167.6 gm. per man. Daily intakes of calcium, phosphorus, iron, vitamin A, thiamine, riboflavin and niacin and ascorbic acid are also summarized in these two tables. These intakes are in some contrast to those observed in the National Guard encampment where the food available to the men was almost unlimited. It must be assumed that the encampment measurements are highly atypical for Eskimo men. At the same time it is clear that the food pattern of Eskimos is highly variable from time to time. Accordingly, dietary surveys covering one or a few days will often be

poor representations of the long-term performance. The excessively low values among some of these ninety-seven men must reflect this kind of sampling error. A more comprehensive measurement of Eskimo food habits will be available when the entire dietary program is complete.

The average daily caloric intake of the men living in the villages was considerably below the National Research Council allowance[35] for men weighing 60 kg. and performing moderate activities. These minimal allowances of 2,850 calories for men aged twenty-five, 2,700 for men aged forty-five, and 2,250 for men aged sixty-five are much higher than the average intake of 1,855 calories per man per day of the Eskimo and Indian men. These values were also lower than the 2,867 calories reported by Rodahl[24] for a group of Eskimos at Anaktuvuk Pass.

This deficit of calories may then reflect upon the protein intake of 136 gm. per day. Under these circumstances such a protein intake—amounting to 25 to 30 per cent of the calories—may be in the physiologic sense modest or even marginal. However, there was great individual variation, ranging from 22.9 to 379.5 gm. per day. In general, values found in this study agree with the observations of Rodahl[24] who found the protein intake averaged 29.9 per cent of the total calories consumed by the Eskimos they studied.

Meat and fish are the most important daily food items. In villages favorably located for hunting and fishing, the people have meat or fish twice daily, sometimes thrice. This is especially true in the northern arctic villages.

The thiamine intakes (0.65 mg. per day) were considerably lower than the recommended allowances of the National Research Council.[35] The latter states that the intake of males should not be below 1 mg. per day, and alternatively presents data indicating that the minimal requirements for adults should be approximately 0.2 to 0.3 mg. per 1,000 calories consumed.

The riboflavin consumption of 1.65 mg. daily was sufficient to prevent deficiencies and to provide adequate body stores. The niacin intake of 16 mg. per day was satisfactory according to the ICNND guide, but slightly lower than the recommended National Research Council allowance of 18 to 21 mg. daily for adult males between the ages of twenty-five and sixty-five. It should be noted that even though some of the dietary intakes of the B vitamins were marginal according to the allowances recommended by the National Research Council, the clinicians found little or no B vitamin deficiencies in the Eskimo or Indian populations surveyed, nor would these have been expected at such intakes.

The calcium intake of 1 gm. per day and the calcium:phosphrous ratio were adequate. These satisfactory levels were primarily due to the high consumption of fish, which in many instances were eaten whole, especially blackfish and needlefish. Whole blackfish contained 880 mg. and the sticklebacks or needlefish 901 mg. of calcium per 100 gm. of fish. These calcium and phosphorus intakes, as bone, raise the question of whether a vitamin D requirement exists for even the children.

The average daily intake of 10 mg. of iron should be sufficient to maintain normal nutrition. The cause of the mild anemia which has been reported among the Eskimos[27] is still unexplained. In the present survey neither the extent nor severity of anemia was notable.

Infant feeding practices among the Eskimos have undergone considerable change since the white man first invaded the Arctic. In the old Eskimo culture, babies were breast fed for at least two years, sometimes considerably longer, the child usually being weaned with the advent of another child in the family. Family foods were introduced to the child by the mother who premasticated them and then transferred them from her mouth to that of the child. By the time the child had sufficient teeth it had already learned to accept and enjoy the taste of the usual family foods. Because of the possible relationship of this premastication practice to the spread of tuberculosis, this custom has been effectively discouraged. Unfortunately, no good substitute has been introduced to replace it. As a consequence, the diet of the toddler and young preschool child is often nutritionally deficient.

The dietary intakes of vitamin A are of great interest in relation to the observations discussed

TABLE XXIX
Fat Content of Commonly Eaten Meats*

Alaskan Eskimo Diet			United States Diet		
Item	Protein	Fat	Item	Protein	Fat
Seal	32	1.8	Veal side	19	12
Walrus	27	12.0	Chicken	20	13
Whale	24	0.7	Pork side	12	45
Oogruk	27	0.4	Lamb side	16	28
Caribou	27	1.2	Beef roast	17	23
Moose	26	1.1	Beef steak	16	25
Polar bear	26	3.1	Hamburger	16	28
Beaver	14	39.0	Frankfurter	14	21

* Grams per one hundred grams edible portion, uncooked.

TABLE XXX
Guide to Interpretation of Nutrient Intake Data
Young Adult Males

Nutrient	Deficient	Low	Acceptable	High
Niacin (mg./day)	<5	5–9	10–15	>15
Riboflavin (mg./day)	<0.7	0.7–1.1	1.2–1.5	>1.5
Thiamine (mg./1,000 cal.)	<0.2	0.20–0.29	0.3–0.5	>0.5
Ascorbic acid (mg./day)	<10	10–29	30–50	>50
Vitamin A (I.U./day)	<2,000	2,000–3,499	3,500–5,000	>5,000
Calcium (gm./day)	<0.3	0.30–0.39	0.4–0.8	>0.8
Iron (mg./day)	<6.0	6–8	9–12	>12
Protein (gm./kg.)	<0.5	0.5–0.9	1.0–1.5	>1.5

NOTE: These guides are intended to apply to twenty-five year old physically active males 67 inches (170 cm.) in height and 143 pounds (65 kg.) in weight, living in a temperate climate and consuming a varied diet. The quantities specified *should never be considered as inflexible "requirements."* In interpreting nutrition surveys of population groups, average values falling in one or another of the above categories conceal the fact that some individuals will receive more and others less than average. In addition, it is known that there is much variability from one to another individual in their requirement for various nutrients. Variations in body size, activity, climate, types of food available and other factors modify requirements and, consequently, interpretation of survey data. The nutrient content of food may be altered materially during food preparation, a fact which must always be considered in evaluating dietary intake data.

Prepared by the Interdepartmental Committee on Nutrition for National Defense.

of low serum vitamin A levels and suggestive clinical signs of deficiency of vitamin A. It appears that the chemical and clinical findings agree with dietary practices. The error was in assuming that because vitamin A was abundant in the food environment it was, in fact, eaten. This does not seem to be so.

The fat intake of the ninety-seven men studied was surprising, since the average daily consumption for the four age groups was only 35 per cent of the total calories consumed. These values were considerably lower than the fat-caloric intake of American military populations which average 43 per cent of the total calories consumed.[37] On the other hand, these values are in agreement with the work of Rodahl[24] who reported a fat:calorie ratio of 35.2 per cent in the diet of inland Eskimos living at Anaktuvuk Pass in Alaska. This finding is contrary to the popular belief that Eskimos consume a high fat diet, since they have large quantities of seal and oogruk oil and blubber available. It is probably explained in part by the distribution of fat in the marine animals these people eat. The fat of a seal and many other arctic animals is predominantly in the subcutaneous layer of blubber. The muscles contain little of the marbling characteristic of domestic fattened animals. This fact is emphasized in comparison of fat content of various meats shown in Table XXIX.

The average ascorbic acid intake of 36 mg. per day was low but only when compared to the National Research Council recommended allowances of 75 mg. per day;[35] however, this average intake was in the "acceptable" range according to the ICNND guide for interpretation of nutrient intake (Table XXX). Of the ninety-seven diets studied fifty-three individuals consumed less than 30 mg. per day ("low" intake 10 to 29 mg.).

In summary, the important clinical findings consisted of occasional thyroid enlargement among northern Eskimos and Athabascan Indians, rare Bitot's spots, xerosis, phlyctenular corneal scarring, extensive and variable caries, attrition of the teeth and periodontal disease, and cutaneous hyperpigmentation. The important negative findings were the lack of signs of inanition, anemia, cardiovascular disease, or of specific signs of deficiency of B vitamins or protein. The most serious medical problems observed were the high prevalence of

infectious disease, especially tuberculosis, the frequency of corneal scar and the generally poor teeth. Many of the observed defects suggested strong age and geographic patterns which promise to enlighten the search for causation.

The clinical examinations revealed no striking evidence of nutritional disease. When field observations revealed the widespread multivitamin supplementation of the Eskimo school children it was reasonable to expect that this practice, taken together with the high meat diet, would prevent vitamin deficiencies in the children. Still, it was not clear how deficiency of ascorbic acid could be avoided entirely, since the visible intake of this vitamin among the unsupplemented adults appeared very low. No sign of scurvy was seen. Only two or three cases of known scurvy among Alaskan Eskimos have ever been reported by examining physicians and these were in infants who were "neglected." The usual symptoms of ascorbic acid deficiency (spongy bleeding gums and easy bruising) were not evident on clinical examination. Therefore, it must be assumed that the diet contains at least the minimal quantities of vitamin C required to prevent these symptoms. This "riddle" required biochemical tests of the subjects and their dietaries. In the same way the apparently high intake of vitamin A from the fish and seal oils and livers did not fit well with the observations of occasional Bitot's spots, follicular hyperkeratosis and generally rough skin. The clinical observations confirmed the belief that the prime health impairments of the Eskimo are related to infectious agents.

A few people were seen with active phlyctenular keratoconjunctivitis but these lesions were uncommon and comprised less than 0.1 per cent of the entire population observed. The involvement was sometimes unilateral. School teachers have been instructed to treat this disorder, easily recognized and severely disabling, with topical application of a cortisone ointment. The treatment gives prompt relief and seems to leave minimal scarring. It would be of great practical importance to determine whether these episodes of phlyctenular keratoconjunctivitis are indeed related to infection and hypersensitivity alone, or whether vitamin A nutriture may play some role in the precipitation of the syndrome. It would be of interest to collect biochemical and clinical data from subjects with this lesion. In the meantime prompt steroid therapy is of great importance for the prevention of permanent disability.

The exact nature of snow blindness seems not to be established. Whether there is a distinct entity, precipitated by excessive light and without corneal ulceration, is not clear. Certainly the Eskimos have been making and using narrow aperture "glasses" for many centuries, since these tools have been excavated by archeologists. Nevertheless, the occurrence of phlyctenular keratoconjunctivitis has been very common in these people as judged by the presence of residual scars, and it is a continuing, although lessening, medical problem. The causation is not established, but it appears at least as probable that dietary factors are important as that the doctrinal assignment of cause to tuberculosis is true.[32,38] The evidence indicates that while tuberculosis is often associated with phlyctenular keratoconjunctivitis this is not invariably the case.

Despite the extensive use of isoniazid therapy no signs of pyridoxine deficiency were seen. In the children the vitamin supplements given at school may have forstalled this complication, but it appears that if pyridoxine deficiency is a complication of isoniazid therapy,[39] it would be seen in the adults not given vitamin supplements. Perhaps it is not seen because the Eskimos receive a smaller daily dose (5 mg. of isoniazid per kg. of body weights) than the patients in whom pyridoxine deficiency has been noted to result from the administration of isoniazid at a level of 20 mg. per kg. of body weight per day.

The dental findings suggest that some environmental change is accelerating the development of dental disease in these Eskimo people. This circumstance offers an unusual opportunity to study the pathogenesis of caries. Perhaps the most ominous aspect of the Eskimos' food and health situation today is the uncertain disturbance of their precarious health balance which the steady introduction of white men's

foods and food habits will effect. The isolation of the areas will tend to prevent the importation of varieties of foods. The replacement of essentially whole and raw food animals with sugar and flour will almost certainly disrupt the remarkable food adaptation which the Eskimo has had to his food supply. At the very least, continuing surveillance of nutritional status among the Eskimos will be necessary to detect incipient calamities. A continuing program of education and health service should be projected to ease this inevitable cultural transition.

Total serum protein values in this study are slightly higher in women than in children and men. They are higher in the population in the Bethel area by 0.5 gm. per 100 ml., compared to the rest of the survey—this includes comparison with National Guardsmen from the same area, and evidently reflects laboratory variations rather than a real difference. This can be accounted for by the fact that protein was determined on plasma from subjects in the Bethel area and on serum from the subjects in the other areas. A factor of 0.3 gm. per cent for fibrinogen would make these values comparable.

There is no indication of difference in total serum protein values between the two battalions of National Guardsmen. The variation in the National Guard data is exceptionally low (standard deviation = 0.24). There is no evidence of differences between the villages within each group of five villages examined.

The slightly higher mean serum protein levels of the Eskimo men, women and children that averaged between 6.9 and 7.8 gm. per 100 ml. are in agreement with the work of Pett and Lupien[40] who reported values ranging from 7.0 to 7.5 gm. per 100 ml. for the Eastern Canadian Eskimos. Totter and Shukers[41] found average values of 7.7 gm. of protein per 100 ml. of serum. Their lowest reported value of 6.5 gm. was slightly higher than the lowest value in this study (6.3 gm.). Darby et al.[42] in work with the Navajo Indian also reported values that ranged from 6.9 to 8.0 gm. per 100 ml. for adults. In a study on Chinese Nationalist troops Consolazio et al.[43] found the serum protein values ranged from 7.5 to 7.7 gm. per 100 ml. In the Newfoundland study,[44] the proteins averaged 6.9 gm. per 100 ml., with a range of 6.2 to 8.0 gm., which was slightly lower than the values for the Eskimos. Recently in a study in 130 military personnel at the U. S. Army Medical Research and Nutrition Laboratory,[45] serum protein values were found to range from 6.2 to 6.7 gm. per 100 ml. for men between the ages of eighteen and forty-nine years. Less than 1 per cent of all the Eskimo and Indian population examined had values below 6.0 gm. of protein per 100 ml. of serum.

The high serum protein values found in the Alaskan Eskimos may be due to their high protein intake, although it has not been shown in experimental studies that a "super" level of serum protein can be achieved with high levels of dietary protein. A more probable explanation is that the high level of infectious disease among these people has produced an increase of globulin and especially gamma globulin.[46–48] The serum proteins were not fractionated, so that this cannot be evaluated for the present data.

A usual pattern of differences between men, women and children was found in the hematologic studies. Average levels of hemoglobin appear somewhat low, but there is little evidence of gross anemia. Hematocrit levels are not remarkable, so that levels follow the mean corpuscular hemoglobin concentration pattern of low hemoglobin values. In the National Guard, the northern battalion (Battalion 1) had significantly ($P = 0.1$) higher hemoglobin levels than the southern battalion (Battalion 2), but the difference was relatively trivial in size. The population in the northern villages had slightly lower hemoglobin values and higher hematocrit levels than those in the southern villages, producing considerably lower mean corpuscular hemoglobin concentrations. This, however, is probably a laboratory artifact.

SUMMARY

The Alaskan aboriginal people have had, and continue to have, a remarkably successful adaptation to their rigorous and unique food supply. This adaptation is imperiled in the

cultural transition they are now undergoing.

Specific nutritional deficiencies are not a health problem at this time. Infectious disease is the main health problem, and no obvious way appears whereby nutritional improvement will affect this situation. Housing and medical care seem more important than dietary improvement.

Two dietary "riddles" appear among these people. The intake of vitamin C is often low but scurvy is not seen. This may be accounted for by a sporadic intake of a few exceptionally rich sources of vitamin C in the diet, e.g., willow leaves and cloudberries, aided by effective if unpremeditated ways of preserving these during winter.

The other riddle involves vitamin A. The food sources of vitamin A are rich and plentiful, and yet the plasma levels are often low, and clinical signs suggesting past or present deficiency are seen. It is suspected but not established that vitamin A deprivation may contribute to the problem of phlyctenular keratoconjunctivitis. Studies of the absorption and utilization of vitamin A in these people are needed.

Dental disease is rampant and increasing. It appears related to the cultural transition, being a more serious problem in the more acculturated groups. Two opportunities are presented: (1) to study the pathogenesis of dental disease and (2) to minimize the ravages of a diet perhaps damaged by same dietary change.

The Eskimo people deserve and need medical and technical help. It appears inevitable that they will be acculturated and in time will leave their barren ground. Unless the medical and social assistance now given by the state and federal governments and private charities is augmented, this noble and resourceful people will continue to suffer from the health hazards and physical limitations which were characteristic of the rest of the United States over fifty years ago. There is an opportunity in Alaska to prevent all this waste of human beings with modern methods of public health and medical science. The present efforts in Alaska are insufficient for the tasks.

APPENDIX I

Nutrient Composition of Recipes for Eskimo Foods, as Calculated

Food Item and Amount	Weight (gm.)	Calories	Protein (gm.)	Fat (gm.)	Carbohydrate (gm.)	Calcium (gm.)	Phosphorus (gm.)	Iron (mg.)	Vitamin A (I.U.)	Thiamine (mg.)	Riboflavin (mg.)	Niacin (mg.)	Vitamin C (mg.)
Akootak (T. Barry, Napaskiak)													
Salmonberries, 7 cups	938	490	10.5	3.5	51.0	343	322	7.7	1,120	0.21	0.56	3.6	801
Red berries, 1 cup	134	70	1.5	0.5	17.0	49	46	1.1	160	0.03	0.08	0.4	29
Seal oil, 2 cups	440	3,960	0	440.0	0	0	0	0	12,263	0	0	0	0
Pike, cooked	768	619	143.6	1.2	8.4	2,488	1,306	4.2	100	0.10	0.10	0.7	17
Sugar, 1½ cups	300	1,155	0	0	300.0	0	0	0	0	0	0	0	0
Total	2,580	6,294	155.6	445.2	376.4	2,880	1,674	13.0	13,643	0.35	0.74	4.7	851
Nutrient composition/100 gm.		244	6.0	17.2	14.6	112	65	0.5	528	0.01	0.03	0.2	3
Moose Burgers (G. Yaska, Jr., Hustia)													
Moose meat	3,864	4,313	985.3	41.3	0	618	3,900	42.0	0	0.81	14.10	4.2	154
Potato, 1 med.	142	118	2.8	0.1	27.1	16	80	1.0	30	0.14	0.06	1.6	22
Flour, 6 tbsp.	84	306	8.8	0.8	63.9	13	73	0.7	0	0.05	0.04	0.5	0
Moose grease, 6 tbsp.	84	756	0	84.0	0	0	0	0	0	0	0	0	0
Total	4,174	5,493	996.9	126.2	91.0	647	4,073	43.7	30	1.00	14.20	6.3	176
Nutrient composition/100 gm.		132	23.9	3.0	2.4	56	98	1.0	1	0.03	0.34	0.2	4

Moose Roast (G. Yaska, Huslia)

Moose meat	2,912	3,249	742.6	32.0	0	466	2,800	32.0	0	0.61	10.62	3.2	116
Potatoes, 2 small	100	83	2.0	0.1	19.1	11	56	0.7	20	0.11	0.04	1.2	17
Macaroni, 1/2 cup	55	208	7.0	0.8	42.1	12	91	0.8	0	0.05	0.03	1.1	0
Moose grease, 4 tbsp	56	0	56.0	0	0	0	0	0	0	0	0	0	0
Catsup, 2 tbsp	34	34	0.6	0.2	8.4	4	6	0.2	640	0.04	0.02	0.8	4
Total	3,157	3,574	808.2	33.1	69.6	498	2,953	33.7	660	0.81	10.71	6.3	137
Nutrient composition/100 gm.		113	25.6	1.0	2.2	16	94	1.1	21	0.02	0.34	0.2	4

Bear Meat Soup (A. Henry, Huslia)

Bear meat	3,312	4,316	847.9	102.7	0	563	0	0	0	0.65	19.00	0	76
Rice, 1/2 cup (dry)	64	231	4.8	0.2	50.6	15	87	0.5	0	0.04	0.01	0.8	0
Macaroni, 1/2 cup (dry)	55	208	7.0	0.8	42.1	12	91	0.8	0	0.05	0.03	1.1	0
Vegetable soup, 1 can	314	230	5.6	5.6	45.5	65	97	2.2	3,120	0.06	0.25	1.9	22
Salt, 1/2 tsp	0	0	0	0	0	0	0	0	0	0	0	0	0
Pepper, 1/2 tsp	0	0	0	0	0	0	0	0	0	0	0	0	0
Water, 4 qt	3,720	0	0	0	0	0	0	0	0	0	0	0	0
Total	4,773	4,985	865.3	109.3	138.2	655	275	3.5	3,120	0.81	19.29	3.8	98
Nutrient composition/100 gm.		104	18.1	2.3	2.9	14	6	0.1	1	0.02	0.40	0.1	2

Moose Meat Stew

Moose meat	2,990	3,346	762.5	32.9	0	478	0	0	0	6.28	10.91	0	120
Potatoes, 2 med	248	238	5.6	0.2	54.2	32	160	2.0	60	0.28	0.12	3.2	44
Rice, 1/2 cup (dry)	96	346	7.3	0.3	75.8	23	160	0.7	0	0.06	0.02	1.6	0
Carrots, 1 can	246	69	1.2	1.0	15.0	54	59	1.5	29,520	0.06	0.05	0.8	6
Dried onions, 2 tbsp	12	16	0.4	0	4.0	12	16	0	0	0	0	0	0
Salt and pepper	0	0	0	0	0	0	0	0	0	0	0	0	0
Water, 4 qt	3,720	0	0	0	0	0	0	0	0	0	0	0	0
Total	7,318	4,015	777.0	34.4	149.0	599	395	4.2	29,580	6.68	11.10	5.6	174
Nutrient composition/100 gm.		55	10.6	0.5	2.0	8	6	0.1	404	0.06	0.15	0.1	2

Moose Meat Stew (Soup)

Moose meat	11,040	12,353	2,815.2	121.4	0	1,770	0	0	0	2.31	40.30	0	442
Moose fat	1,200	10,800	0	1,200.0	0	0	0	0	0	0	0	0	0
Rice, 1/2 cup (dry)	96	346	7.3	0.3	75.8	23	160	0.7	0	0.06	0.02	1.6	0
Macaroni, 1 cup (dry)	110	415	14.1	1.5	84.2	24	182	1.6	0	0.10	0.07	2.2	0
Dried onions, 1 tbsp	6	8	0.2	0	2.0	12	8	0	0	0	0	0	0
Tabasco, 3 drops	0	0	0	0	0	0	0	0	0	0	0	0	0
Pepper, 1/4 tsp	2	0	0	0	0	0	0	0	0	0	0	0	0
Potatoes, 2 small	200	166	4.0	0.2	38.2	22	112	1.4	40	0.22	0.08	2.4	34
Water, 4 qt	3,720	0	0	0	0	0	0	0	0	0	0	0	0
Total	16,374	24,088	2,840.8	1,323.4	200.2	1,851	462	3.7	40	2.69	40.47	6.2	476
Nutrient composition/100 gm.		147	17.3	8.1	1.2	12	3	0.02	0	0.02	0.25	0.04	3

APPENDIX I *Continued*

Food Item and Amount	Weight (gm.)	Calories	Protein (gm.)	Fat (gm.)	Carbohydrate (gm.)	Calcium (gm.)	Phosphorus (gm.)	Iron (mg.)	Vitamin A (I.U.)	Thiamine (mg.)	Riboflavin (mg.)	Niacin (mg.)	Vitamin C (mg.)
Moose Meat Stew (A. Henry, Huslia)													
Moose meat	9,016	10,089	2,299.1	99.2	0	1,443	0	0	0	1.89	32.91	0	360
Rice, 1/2 cup (dry)	96	346	7.3	0.3	75.8	23	160	0.7	0	0.06	0.02	1.6	0
Potatoes, 2 med	248	238	5.6	0.2	54.2	32	160	2.0	60	0.28	0.12	3.2	44
Dried onions, 1 tbsp	6	8	0.2	0	2.0	12	8	0	0	0	0	0	0
Salt, 1 tsp	6	0	0	0	0	0	0	0	0	0	0	0	0
Pepper, 1/4 tsp	2	0	0	0	0	0	0	0	0	0	0	0	0
Carrots, 1 can	346	69	1.2	1.0	15.0	54	59	1.5	29,520	0.06	0.05	0.8	6
Water, 4 qt	3,720	0	0	0	0	0	0	0	0	0	0	0	0
Total	13,340	10,750	2,313.4	100.7	147.0	1,564	387	4.2	29,580	2.29	33.10	5.6	410
Nutrient composition/100 gm.		81	17.3	0.8	1.1	12	3	0.03	222	0.02	0.25	0.04	3
Moose Soup													
Moose meat	1,610	1,798	410.6	17.7	0	258	0	0	0	0.34	5.88	0	64
Rice, 1/2 cup	96	346	7.3	0.3	75.8	23	160	0.7	0	0.06	0.02	1.6	0
Macaroni, 1 cup (dry)	110	415	14.1	1.5	84.2	24	182	1.6	0	0.10	0.07	2.2	0
Vegetable soup, 1 can	314	230	5.6	5.6	45.5	65	97	2.2	3,120	0.06	0.25	1.9	22
Salt and pepper	8	0	0	0	0	0	0	0	0	0	0	0	0
Water, 3 1/2 qt	3,220	0	0	0	0	0	0	0	0	0	0	0	0
Total	5,358	2,789	437.8	25.1	205.5	370	439	4.5	3,120	0.56	6.22	5.7	86
Nutrient composition/100 gm.		52	8.2	0.5	3.8	7	8	0.1	58	0.01	0.12	0.1	2
Salmonberry Ice Cream (Alexie (Smith) Maxie, Napaskiak)													
Tallow, 2 1/2 cups	550	4,960	0	550	0	0	0	0	0	0	0	0	0
Seal oil, 2 cups	440	3,960	0	440	0	0	0	0	12,270	0	0	0	0
Sugar, 1 cup	200	770	0.1	0	199.0	0	0	0	0	0	0	0	0
Water, 1/2 cup (cold)	120	0	0	0	0	0	0	0	0	0	0	0	0
Salmonberries, 3 cups	369	210	4.5	1.5	51.0	147	138	3.3	480	0.09	0.24	1.2	345
Red berries, 2 1/2 cups	308	175	3.8	1.3	42.5	124	115	2.8	400	0.08	0.20	1.0	3
Total	1,987	10,075	8.4	992.8	292.5	271	253	6.1	13,150	0.17	0.44	2.2	348
Nutrient composition/100 gm.		510	0.4	50.0	14.7	14	13	0.3	662	0.01	0.02	0.1	18
Sourdough Bread													
Flour, 4 cups	440	1,540	40.4	4.4	324.8	1,200	840	5.6	0	0.32	0.20	5.2	0
Water, 4 cups	960	0	0	0	0	0	0	0	0	0	0	0	0
Baking soda, 1 tsp	10	0	0	0	0	0	0	0	0	0	0	0	0
Fat, 1/2 cup (melted)	140	1,260	0	140	0	0	0	0	0	0	0	0	0
Salt, 1/2 tsp	5	0	0	0	0	0	0	0	0	0	0	0	0
Sugar, 1 tbsp	12	40	0	0	12	0	0	0	0	0	0	0	0
Total	1,567	2,840	40.4	144.4	336.8	1,200	840	5.6	0	0.32	0.20	0.52	0
Nutrient composition/100 gm.		181	2.6	9.2	21.5	77	54	0.4	0	0.02	0.01	0.03	0

Polar Bear Soup (Jacob Lane's Family, Point Hope)

Meat, 5 lb.	2,270	3,092	601.6	70.4	0	363	0	0	0	0	13.0	0	90
Rice, 1 cup	191	696	14.5	0.6	651.7	46	260	1.5	0	0.13	0.05	3.1	0
Salt, 3 tsp.	21	0	0	0	0	0	0	0	0	0	0	0	0
Onions, 1/2 cup	75	49	1.5	0.2	11.3	35	48	0.6	60	0.04	0.04	0.2	0
Macaroni, 1 1/2 cups (dry)	165	622	21.2	2.2	106.3	36	273	2.4	0	0.15	0.11	3.3	0
Water, 4 qt.	4,000	0	0	0	0	0	0	0	0	0	0	0	0
Total	6,722	4,459	638.8	73.4	269.3	480	581	4.5	60	0.32	13.20	6.6	90
Nutrient composition/100 gm.		66	9.5	1.1	4.0	7	9	0.1	1	0.05	0.20	0.1	1

Eskimo Pancake (Ahsaylbeyak, Kasigluk)

Flour, 2 1/2 cups	275	963	25.2	2.6	203.0	750	525	3.5	0	0.20	0.12	3.2	0
Salt, 1 tsp.	10	0	0	0	0	0	0	0	0	0	0	0	0
Whitefish roe	300	260	24.0	15.0	7.2	112	0	0	0	0	0	0	37.5
Water, 2 cups	440	0	0	0	0	0	0	0	0	0	0	0	0
Total	1,025	1,223	49.2	17.6	210.2	867	525	3.5	0	0.20	0.12	3.2	37.5
Nutrient composition/100 gm.		119	4.8	1.7	20.5	7	5	0.4	0	0.02	0.01	0.3	4

Eskimo Ice Cream (Tocktoo Family, Shishmaref)

Oogruk oil, 2 cups	440	3,960	0	440.0	0	0	0	0	12,270	0	0	0	0
Water, 3/4 cup	165	0	0	0	0	0	0	0	0	0	0	0	0
Salmonberries, 10 cups	1,230	700	15.0	5.0	170.0	490	460	11.0	1,600	0.30	0.80	4.0	1,150
Sugar, 8 tbsp.	96	384	0	0	99.2	0	0	0	0	0	0	0	0
Reindeer back fat, 1 piece	276	2,452	1.9	271.4	0	0	0	0	0	0	0	0	0
Total	2,207	7,496	16.9	716.4	269.2	490	460	11.0	13,870	0.30	0.80	4.0	1,150
Nutrient composition/100 gm.		343	0.8	32.4	12.2	22	21	0.5	630	0.01	0.04	0.2	52

Duck Soup (Kasigluk)

Ducks, 4, 150 gm. each	600	1,240	91.2	94.4	0	76	920	23.2	0	0	0	0	0
Rice, 3/4 cup (raw)	191	692	14.5	0.6	151.7	46	260	1.5	0	0.13	0.05	3.1	0
Potatoes, 3 small	172	144	3.6	0.1	33.5	20	97	1.2	30	0.17	0.08	2.1	25
Salt, 2 tbsp.	24	0	0	0	0	0	0	0	0	0	0	0	0
Onion, 1	110	49	1.5	0.2	11.3	35	48	0.6	60	0.04	0.04	0.2	10
Water, 4 qt.	4,000	0	0	0	0	0	0	0	0	0	0	0	0
Total	5,097	2,125	110.8	95.3	196.5	177	1,325	26.5	90	0.34	0.17	5.4	35
Nutrient composition/100 gm.		42	2.2	1.9	3.9	3	26	0.5	1	0.01	0	0.1	1

Eskimo Ice Cream (Kasigluk)

Fresh whitefish, 1/2	100	105	23.4	1.3	0	356	0	0	106	0.13	0.22	0	4
Snowdrift, 3 tbsp.	42	378	0	42.0	0	0	0	0	0	0	0	0	0
Seal oil, 1 1/2 cups	330	2,970	0	330.0	0	0	0	0	9,197	0	0	0	0
Sugar, 1/2 cup	100	385	0	0	100.0	0	0	0	0	0	0	0	0
Salmonberries, 1 1/2 qt.	738	420	9.5	3.5	102.0	294	276	6.6	960	0.18	0.48	2.4	690
Cranberries, 1 1/2 cups	170	81	0.7	1.2	19.2	24	18	1.1	75	0.05	0.03	0.2	20
Total	1,380	4,339	33.6	378.0	221.2	674	294	7.7	10,338	0.36	0.73	2.6	714
Nutrient composition/100 gm.		314	2.4	27.4	16.0	49	21	0.6	749	0.03	0.05	0.2	52

APPENDIX I *Continued*

Food Item and Amount	Weight (gm.)	Calories	Protein (gm.)	Fat (gm.)	Carbohydrate (gm.)	Calcium (gm.)	Phosphorus (gm.)	Iron (mg.)	Vitamin A (I.U.)	Thiamine (mg.)	Riboflavin (mg.)	Niacin (mg.)	Vitamin C (mg.)
Seal Meat Soup (Tusroyluke, Point Hope)													
Seal meat bone, 1¼ lb.	567	828	183.7	10.3	0	68	0	0	0	0.68	1.91	0	14
Dry onion shreds, 2 tbsp.	15	38	1.0	0.2	8.7	32	44	0.5	50	0.02	0.03	0.2	9
Salt, 2 tbsp.	24	0	0	0	0	0	0	0	0	0	0	0	0
Flour, 1½ cups	165	578	15.6	1.7	211.8	448	798	4.8	0	0.72	0.44	5.7	0
Water, 4 qt.	4,000	0	0	0	0	0	0	0	0	0	0	0	0
Total	4,771	1,444	200.3	12.2	130.5	548	842	5.3	50	1.42	2.38	5.9	23
Nutrient composition/100 gm.		30	4.2	0.3	2.7	11	18	0.1	1	0.03	0.05	0.1	1
Moose Soup (Derendorf, Huslia)													
Moose meat, 1 piece (6″ × 6″ × 2″)	1,656	1,853	422.4	18.2	0	265	0	0	0	0.35	6.04	0	66
Macaroni, 2 cups (dry)	210	830	28.2	3.0	168.4	48	364	3.2	0	0.20	0.14	4.4	0
Rice, 1 cup (dry)	187	677	14.2	0.6	148.5	45	254	1.5	0	0.38	0.06	7.2	0
Onion, ½ med.	55	25	0.7	0.1	5.7	18	24	0.3	30	0.02	0.02	0.1	5
Potatoes, 3 med.	426	354	8.4	0.3	81.3	48	240	3.0	90	0.42	0.18	4.2	66
Catsup, 1 tbsp.	17	17	0.3	0.1	4.2	2	3	0.1	320	0.02	0.01	0.4	2
Water, 4 qt.	3,720	0	0	0	0	0	0	0	0	0	0	0	0
Total	6,271	3,756	474.2	22.3	408.1	426	885	8.1	440	1.39	6.45	16.3	139
Nutrient composition/100 gm.		60	7.6	0.4	6.5	7	14	0.1	7	0.02	0.11	0.2	2
Beef and Vegetable Soup (Fred Bifelt, Huslia)													
Canned vegetable mix, 1 can.	330	203	10.3	4.4	35.9	81	125	1.9	0	0.12	0.19	0.31	19
Canned tomato sauce, 1 can.	2,149	90	4.5	1.2	17.9	27	92	2.7	16,800	0.22	0.17	4.50	69
Canned carrots, 1 can	246	69	1.2	1.0	15.0	54	58	1.5	29,520	0.06	0.05	0.8	6
Rice, ½ cup (raw)	96	346	7.2	0.3	75.9	23	130	0.7	0	0.06	0.02	1.5	0
Potatoes, 3 med.	297	279	7.2	0.3	66.9	39	195	2.4	60	0.33	0.15	4.2	51
Onion, 1 med.	110	49	1.5	0.2	11.3	35	48	0.6	60	0.04	0.04	0.2	10
Macaroni, ½ lb.	227	856	29.1	3.2	173.7	50	375	3.4	0	0.21	0.13	4.6	0
Beef, 3¼ lb.	1,362	3,126	200.0	252.0	0	114	176	29.7	0	0.87	1.77	48.0	0
Water, 8 qt.	8,000	0	0	0	0	0	0	0	0	0	0	0	0
Total	10,917	5,018	261.0	262.6	396.6	388	1,200	42.9	34,320	1.91	2.52	65.1	155
Nutrient composition/100 gm.		46	2.4	2.4	3.6	36	11	0.4	314	0.01	0.02	0.6	1

Clam Soup (Fred Bifelt, Huslia)

Minced clams, 3 cans	270	132	20.0	2.7	5.4	222	318	16.2	210	0.12	0.24	2.7	0
Potatoes, 3 med	297	279	7.2	0.3	66.9	39	195	2.4	60	0.33	0.15	4.2	51
Onion, 1 med	110	49	1.5	0.2	11.3	35	48	0.6	60	0.04	0.04	0.2	0
Rice, 2/3 cup (dry)	128	461	9.8	0.4	100.6	31	174	1.0	0	0.08	0.04	2.1	0
Macaroni, 2/3 cup (dry)	82	308	10.4	1.2	62.0	18	135	1.2	0	0.08	0.05	1.7	0
Milk, evaporated 1/2 can	192	265	13.4	15.2	19.0	467	374	0.4	768	0.10	0.69	0.4	2
Water, 4 qt	4,000	0	0	0	0	0	0	0	0	0	0	0	0
Total	5,079	1,494	62.3	20.0	265.2	812	1,244	21.8	1,098	0.75	1.21	11.3	63
Nutrient composition/100 gm.		29	1.2	0.4	5.2	16	24	0.4	21	0.01	0.02	0.2	1

Moose Meat Soup (George Yaska, Huslia)

Moose meat	1,672	1,867	426.4	18.4	0	268	0	0	100	0.35	6.10	0	67
Potato, 1 med	126	105	2.5	0.1	24.1	14	71	0.9	20	0.12	0.04	1.3	17
Rice, 1/2 cup	137	338	7.1	0.3	74.3	23	127	0.8	0	0.19	0.03	3.6	0
Macaroni, 1 cup	110	415	14.1	1.5	84.2	24	182	1.6	0	0.10	0.07	2.2	0
Shortening, 4 tbsp	48	432	0	48.0	0	0	0	0	0	0	0	0	0
Water, 4 qt	4,000	0	0	0	0	0	0	0	0	0	0	0	0
Total	6,093	3,157	450.2	68.3	182.6	329	380	3.3	120	0.76	6.24	7.1	84
Nutrient composition/100 gm.		52	7.4	1.1	3.0	5	6	0.1	2	0.01	0.10	0.1	1

Black Bear Soup (F. Olin, Huslia)

Bear meat	908	1,237	232.3	34.2	0	187	(1,179)	(21.6)	0	(0.63)	6.31	(35.6)	25
Rice, 1/2 cup	96	346	7.3	0.3	75.8	23	160	0.7	0	0.06	0.02	1.6	0
Macaroni, 1/2 cup	55	208	7.0	0.8	42.1	12	91	0.8	0	0.05	0.03	1.1	0
Dry onion, 1/4 cup	15	20	0.5	0.1	4.6	17	24	0.2	28	0.01	0.01	0.1	12
Water, 4 qt	3,720	0	0	0	0	0	0	0	0	0	0	0	0
Total	4,794	1,811	247.1	35.4	122.6	239	1,454	23.3	28	0.74	6.37	38.4	37
Nutrient composition/100 gm.		38	5.2	0.7	2.5	5	30	0.5	1	0.02	0.13	0.8	1

Indian Ice Cream (F. Olin, Huslia)

Pike, 1 (dressed)	535	431	100.0	0.9	4.5	1,733	(200)	(1.6)	440	0	0.69	(4.6)	12
Moose grease, 2 cups	448	2,976	0	330.0	0	0	0	0	0	0	0	0	0
Wesson oil, 1 cup	220	1,768	0	200.0	0	0	0	0	0	0	0	0	0
Sugar, 1 cup	200	770	0.1	0	199.0	0	0	0	0	0	0	0	0
Raisins, 1 cup	160	429	3.7	0.8	113.9	125	206	5.3	80	0.24	0.13	0.8	0
Total	1,425	6,374	103.8	531.7	317.4	1,858	406	6.9	520	0.24	0.82	5.4	12
Nutrient composition/100 gm.		454	7.3	37.3	22.3	130	28	0.5	40	0.22	0.06	0.4	1

Appendix II

Chemical Composition of Alaskan Foods, 1958

Nutrients per 100 gm. of Food

Food Items, Origin and Date Collected	Moisture (gm.)	Ash (gm.)	Protein (gm.)	Fat (gm.)	Carbohydrate (gm.)	Calcium (mg.)	Vitamin A (I.U.)	Thiamine (μg.)	Riboflavin (μg.)	Vitamin C (mg.)
Mammals, fresh meat										
Polar Bear, Point Hope, March 1958	70.3	1.1	25.6	3.1	0.0	17	1,400	23	573	2
Caribou, Noatak	70.6	1.1	26.7	1.2	0.4	28	Trace	167	509	2
Caribou, Point Hope, March 1958.	68.7	1.1	28.9	1.1	0.0	15	Trace	113	670	3
Caribou, Shishmaref, March 1958.	70.8	1.5	26.6	1.2	0.0	10	Trace	186	772	4
Moose, Noatak, March 1958	72.4	1.0	25.5	1.1	0.0	16	1,000	21	365	4
Muskrat, Kasigluk, 1958	73.4	1.1	22.4	1.3	0.0	25	2,820	90	372	5
Beaver, Allakaket, March 1958	46.2	0.6	14.3	39.0	0.0	...	...	61	310	2
Seal, Point Hope, March 1958	64.7	1.1	32.4	1.8	0.0	12	...	120	337	3
Seal, Shishmaref, March 1958	68.5	1.2	29.6	0.4	0.3	33	...	0	380	6
Walrus, St. Lawrence, March 1958	59.9	1.3	26.5	11.6	0.0	15	...	281	372	4
Walrus, Shishmaref	76.5	0.7	15.4	5.2	0.0	...	...	...	...	2
Oogruk, Shishmaref, April 1958	69.6	1.2	26.7	0.4	0.0	10	14,00	135	273	25
Whale, Point Hope, July 1958	75.0	0.9	23.6	0.7	0.0	17	...	85	80	8
Muktuk, Hide, Point Hope, July 1958	68.1	0.2	12.3	1.2	18.2	13	...	501	0	2
Meats, dried										
Seal, Newktok Camp, 1958	41.2	2.6	46.0	6.6	0.0	19	360	174	353	7
Walrus, Savoonga, 1958	33.6	2.7	54.5	4.9	4.2	23	1,732	84	282	5
Muskrat, Kasigluk 1958	33.3	2.1	28.4	36.2	0.0	130	4,170	41	535	6
Oogruk, Shishmaref, 1957	19.0	3.3	75.0	2.8	0.0	21	2,160	84	390	3
Walrus Liver, Fresh, St. Lawrence, May 1958	73.4	1.2	17.6	3.2	4.6	23	17,800	151	912	19
Fats and oils										
White Fish Oil. St. Lawrence, 1958	0.0	0.0	0.0	100.0	0.0	14	...	0	26	1
Seal Oil, Nunivak, 1957	0.0	0.0	0.0	100.0	0.0	...	3,990	0	...	0
Seal Oil, Akiak	0.0	0.0	0.0	100.0	0.0	18	4,080	20	62	1
Seal Oil (Old), Nunivak, 1957	0.0	0.0	0.0	100.0	0.0	14	2,787	0	73	1
Seal Oil (New), St. Lawrence, 1958	0.0	0.0	0.0	100.0	0.0	Trace	2,407	0	117	0
Seal Blubber, Shishmaref 1958	1.0	0.0	0.7	98.3	0.0	11	2,360	0	24	1
Walrus Oil (Old), St. Lawrence, 1957	0.2	0.0	0.0	99.8	0.0	11	3,266	0	64	1
Walrus Oil (New), St. Lawrence, 1958	0.0	0.0	0.0	100.0	0.0	15	2,520	26	Trace	0
Oogruk Oil (Old), Shishmaref, 1957	0.5	0.0	0.0	99.5	0.0	Trace	642	0	45	0
Muktuk Blubber, Point Hope, 1958	9.5	0.9	2.8	85.2	1.7	15	278	243	...	...
Seal Blubber, Point Hope	1.0	0.0	0.0	99.0	0.0	...	...	501	59	7
Oogruk Oil (Old), St. Lawrence	0.5	0.0	0.0	99.5	0.0	...	2,510	0	...	1
Fish flesh, dried										
Smoked Salmon	11.1	3.5	46.4	36.6	2.4	18	...	28	204	3
King Salmon, Kasigluk	14.1	3.3	51.0	24.9	6.7	19	219	99	224	5
Dog Salmon, Shishmaref, 1958	26.2	3.7	55.7	1.2	...	58	143	360	60	5
Pike, Kasigluk, June 1958	22.6	3.9	68.7	2.8	2.0	32	...	51	98	4
White Fish, Kasigluk, 1958	18.0	5.7	69.0	3.2	0.9	960	...	51	112	15
Fish eggs, fresh										
White Fish	83.8	0.6	8.0	5.0	2.4	54	...	137	673	13
King Salmon, Akiak,, 1957	46.0	1.9	30.4	15.0	6.7	30	185	231	700	2
Herring, Nelson Island	73.7	1.3	23.6	0.2	1.2	46	...	10	298	7
Lush Fish, Shishmaref, June 1958.	74.3	1.8	18.2	4.5	1.2	11	...	108	547	8
Smelt	61.6	1.5	21.4	5.6	9.9	32	...	...	...	...
Fish eggs, dried										
Herring, Nelson Island	20.4	2.7	64.4	4.0	8.5	25	...	0	208	8
Fish liver, fresh										
White Fish, Noatak	78.8	0.7	11.0	4.4	5.1	55	8,300	14	952	8
Rainbow Trout	...	...	...	...	...	9	1,720	289	882	15
Fresh Fish, Shishmaref, March 1958	60.2	1.0	8.3	24.7	5.8	40	...	186	402	7
Lush Fish, Akiak	45.9	0.5	5.6	42.0	6.0	...	3,940	...	...	4
King Salmon, Bethel, June 1958	69.8	1.3	16.6	8.0	4.3	28	3,140	97	703	13
King Salmon, Testes, Bethel, 1958.	80.0	2.2	16.3	1.5	0.0	13	...	194	201	31
Fish flesh, fresh										
White Fish, Noatak	70.9	2.0	25.8	1.3	0.0	356	106	135	222	6
Blackfish (Whole), Kasigluk, April 1958	79.4	1.7	16.9	0.7	1.4	880	83	0	214	6
Stickleback (Whole), Hooper Bay.	71.9	4.5	20.7	2.2	0.7	901	467	44	1,434	6
Rainbow Trout, Noatak, March 1958	72.9	1.2	24.4	1.5	0.0	54	Trace	74	185	5
Lush Fish, Shishmaref, March 1958	74.2	1.0	24.2	0.7	0.0	81	101	167	380	5
Lush Fish, Akiak, April 1958	78.7	1.1	19.7	0.5	0.0	20	Trace	74	74	3
Tomcod, Turamak, June 1958	78.1	1.6	19.6	0.3	0.0	250	...	55	139	2

APPENDIX II *Continued*

Food Items, Origin and Date Collected	Moisture (gm.)	Ash (gm.)	Protein (gm.)	Fat (gm.)	Carbohydrate (gm.)	Calcium (mg.)	Vitamin A (I.U.)	Thiamine (μg.)	Riboflavin (μg.)	Vitamin C (mg.)
Tomcod, Point Hope	71.7	4.3	20.2	3.8	0.0	494	120	269	625	5
Pike, Head End, Kasigluk	80.1	1.1	18.4	0.4	0.0	80	...	75	51	2
Pike, Middle Cut, Kasigluk	77.7	2.4	18.7	0.2	1.1	62	900	36	88	6
Pike, Tail Cut, Kasigluk	80.1	1.7	17.5	0.7	0.0	28	...	42	49	4
Smelts (Whole)	79.8	2.3	15.3	2.4	0.2	476	...	41	812	1
King Salmon, Head End, Bethel, June 1958	69.5	2.5	4.6	7.1	...	20	...	156	50	8
King Salmon, Middle, Bethel, June 1958	70.5	1.8	21.4	3.3	0.0	22	...	105	108	4
King Salmon, Tail End, Bethel, June 1958	66.1	0.9	5.5	8.4	9.1	14	...	219	46	5
Grayling, Noatak	70.2	4.8	23.4	1.6	0.0	532	81	...	...	4
Birds										
Ptarmingan, Lower Kuskokwim	71.2	1.7	25.7	1.4	0.0	351	Trace	71	229	7
Murre	58.9	1.2	5.3	2.5	32.2	17	...	122	588	7
Eider Duck, St. Lawrence, July 1958	68.3	1.1	12.3	1.1	17.2	17	...	801	676	12
White-breasted Auklet	65.1	0.7	29.7	2.2	2.7	25	...	482	660	6
Crested Auklet	68.0	1.5	25.5	5.0	0.0	23	...	179	1,117	9
Least Auklet	64.4	1.6	28.8	3.4	1.8	15	...	532	738	11
Sea Pigeon	79.8	0.8	16.6	2.2	0.7	34	...	562	892	19
Cormorant, Legs, St. Lawrence	71.1	1.3	23.8	1.9	1.9	18	...	219	252	15
Cormorant, Breast, St. Lawrence, July 1958	73.4	1.3	21.2	1.9	2.2	21	...	33	689	5
White Breasted Puffin	67.0	1.4	26.7	2.5	2.4	17	...	315	358	15
Goose, Newktok Camp	71.5	2.0	24.0	0.6	0.0	18	...	89	545	5
Goose Liver	...	...	...	...	...	16	...	...	...	...
Devil Fish, Newktok Camp, 1958	80.8	1.5	11.7	5.3	0.7	329	...	46	95	3
Plants Marine Algae (Seaweeds)										
Alaria, St. Lawrence, 1958	73.9	5.4	1.6	0.4	18.6	303	...	74	102	69
Laminaria, St. Lawrence, 1958	84.2	3.2	0.5	0.2	11.9	138	...	42	99	50
Agarium, St. Lawrence, 1958	70.9	5.8	3.9	0.2	19.3	720	...	29	87	33
Flowering Plants										
Greens, St. Lawrence, 1958	80.5	1.2	4.3	0.8	13.2	205	...	49	258	377
Willow Leaves, St. Lawrence, 1958	66.5	0.7	3.7	1.2	28.0	129	...	88	186	298
Sedum, St. Lawrence, 1958	85.6	0.6	2.1	1.1	10.6	262	...	81	214	76
Sourdock, St. Lawrence, 1958	86.2	0.7	3.7	0.3	10.2	19	...	157	186	215
Salmonberries, Shishmaref, 1958	83.5	0.4	1.6	0.4	14.1	13	302	30	70	115

NOTE: Before considering the chemical composition of fish, it should be realized that there is a considerable variation in such composition, so that analyses made on only a few samples cannot be considered representative, and, in fact, in many cases variation is so great that average composition is of only theoretical interest, since actually individual fish will vary so widely from such average values. Doubtless the component of fish varying to the greatest degree is the oil (or fat) content. In addition to season of the year, other factors which may cause variation of oil content of fish include the nature of the food of the fish, locality where fish are caught, and the size and age. The water content of many species varies inversely with the fat or oil content. Fish also vary in composition at different sections of the same fish; fat content, for instance, is lower near the tail than the head. (Excerpt from The Chemistry and Technology of Food and Food Products, vol. 2, Chap. 22, pp. 933–974. Edited by Morris B. Jacobs, New York, 1951. Interscience Publishers, Inc.)

APPENDIX III

CRITERIA FOR ORAL EXAMINATIONS, ALASKA NATIONAL GUARD

Dental Caries

Each tooth in the mouth was recorded either as free of caries, decayed, missing or filled. Frank cavitation was required before a lesion was recorded as carious. A tooth with a crown so destroyed by caries that filling was impracticable was recorded as indicated for extraction and tabulated as a missing tooth. In tabulation a tooth with a filling and a separate carious lesion was counted, once only, as a filled tooth.

In arches so crowded that no room remained for eruption of one or more bicuspids these teeth were considered to be unerupted rather than missing if the unerupted crown could be palpated below the gingivae at the margin of the alveolar crest.

Findings are presented as the mean numbers of decayed plus missing plus filled teeth (the DMF mean) per man, based on the twenty-eight permanent teeth exclusive of the third molars. These are cumulative data and describe the total caries experience from the age of about six years (when the permanent teeth begin to erupt) to the time of examination.

Periodontal Score

The condition of the tissues supporting each tooth was scored on the following scale, which is based on the clinical syndrome in marginal periodontitis:

Score	Observation
0	Supporting tissues negative for specified signs
1	Presence of an overt area of gingivitis, not circumscribing the tooth
2	Presence of an overt area of gingivitis circumscribing the tooth
6	Presence of gingivitis plus a frank periodontal (not gingival) pocket; i.e., external evidence of destruction of deeper tissues
8	Evidence of tissue destruction so advanced that function of the tooth is seriously impaired

These findings are presented as the mean score per man for the teeth remaining in his mouth. This is a morbidity measure; it disregards evidence of past disease not presently active.

Gingival Recession

In each mouth the number of teeth in which gingival recession had exposed the root were counted and tabulated as a percentage of the total number of teeth in that mouth.

These findings are presented as the mean per cent per man. This figure supplements the morbidity index described, in that it furnishes a useful estimate of cumulative, or lifetime tissue destruction.

APPENDIX IV

Suggested Guide to Interpretation of Biochemical Data*

Data	Deficient	Low	Acceptable	High
Blood Data, Young Adult Males				
Hemoglobin (gm./100 ml.) sea level	<12.0	12.0–13.9	14.0–14.9	≥15.0
Hematocrit (PCV) (per cent), sea level	<36	36–41	42–45	≥46
Total plasma protein (gm./100 ml.)	<6.0	6.0–6.4	6.5–6.9	≥7.0
Plasma ascorbic acid (mg./100 ml.)	<0.1	0.10–0.19	0.20–0.39	≥0.4
Plasma vitamin A (μg./100 ml.)	<10	10–19	20–49	≥50
Plasma carotene (μg./100 ml.)		20–39	40–99	≥100
Urinary Excretion Data, Young Adult Males				
N′-Methylnicotinamide mg./6 hours	<0.2	0.2–0.59	0.6–1.5	≥1.6
mg./gm. creatinine	<0.5	0.5–1.59	1.6–4.2	≥4.3
Riboflavin μg./6 hours	<10	10–29	30–99	≥100
μg/gm. creatinine	<27	27–79	80–269	≥270
Thiamine: μg./6 hours	<10	10–24	25–49	≥50
μg./gm. creatinine	<27	27–65	66–129	≥130

* From ICNND Manual for Nutrition Surveys.[49]

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