THE DIET OF THE INFANT

INTRODUCTION

Of all age groups infants are probably the most vulnerable to inadequate nutrition. Moyer et al[26] states that the "growth and development of an organism as a whole implies the continuous, active participation of all the necessary food nutrients and the surrounding environment; that it is essential that dietaries be scientifically planned considering season, environment, the variability of the foods and differences in age, size, activity, sex, race, nutritive state and physiological activity, in order that chemical requirements be met at all times." For the normal infant, adequate nutrition is achieved by feeding a combination of foods—increasing in amount and in complexity as the child grows and develops —that contains an adequate supply of all essential nutrients in a form that is easily digestible and assimilable.

A question of major concern to medical and health personnel charged with the health supervision of Alaska's Eskimo, Indian and Aleut peoples is: How have the cultural changes, which have increased in tempo since World War II, affected the feeding practices of the infants? With this question in mind, the 555 food intake records, covering 3 to 7 days each, collected for infants under 2 years of age, were analyzed to delineate present day feeding practices and to assess the nutritional adequacy of the diets.

PAST INFANT FEEDING PRACTICES

Only casual references to infant feeding practices are included in early accounts of the Alaskan Eskimo and Indian people. The older women in our study villages were, therefore, questioned about early day practices. A resume of the information obtained through these interviews is presented in the following paragraphs. Most of this information was obtained in the villages of Napaskiak and Akiak which had a larger percentage of older women than the other study villages.

After delivery, infants were fed neither colostrum nor the "first milk" from the mother's breast; the latter was considered too watery. Infants were generally breast-fed until the next child was born, or until the child was two years of age or older. If an infant was being breast-fed at the time the next sibling was born,

the first flow of milk from the mother's breast after delivery—yellowish in color—was discarded since it was considered to be "old milk" and not suitable. Thereafter, one or both children were fed the regular breast flow.

There were very few food taboos for the mother during pregnancy or lactation, and the few in force apparently varied from one locality to another. One of the informants mentioned that during lactation mothers were advised to eat only cooked foods, never raw meat or fish. Cloudberries were not recommended for the first week or two following delivery, for if eaten at this time, they were believed to cause the breasts to dry up. Once lactation was well established, they could be eaten safely. It was apparently a universal practice for lactating mothers to drink fish and meat broth liberally, but otherwise they ate as usual.

If the breast milk was insufficient, the mothers frequently chewed fish livers to a watery pulp and fed this to the baby. This method of infant feeding together with liberal feedings of fish and meat broth, was also used if the mother died. One informant believed that infants did very well on this regime.

Supplemental foods were added to the diets as soon as the infant could hold its head up. The regular family foods were prechewed and passed directly from the mother's mouth into that of the child. Again, premasticated fish liver, especially that from the tom cod, ling cod, or whitefish, was one of the first supplemental foods used. At Unalakleet an early practice was to simmer the tom cod livers in a small amount of water. As the oil escaped and rose to the surface it was carefully scooped off and fed to infants. Frequently, a piece of blubber, carefully secured so the child could not swallow it or choke on it, was given to the child, usually as a pacifier. One infant in this study received a mixture of fats called 'baby agutuk' at about one month of age. This agutuk consisted of a mixture of hydrogenated fat and moose tallow. In former times it would have been moose or caribou tallow and seal oil. Use of such special mixtures was apparently a common practice among the tundra Eskimo of southwestern Alaska. Brandt[17] reported that at Hooper Bay, the white fatty kernel present in the yellow knob above the bill of the male king eider duck was fed to the youngest babies. As soon as teeth developed, the child was given other family foods.

Because premastication of infant foods was considered a possible means of transmitting disease from mother to child, this method of infant feeding was discouraged by health workers. While the practice may persist in some remote villages, it is not widespread today.

FINDINGS OF PRESENT STUDY

Source of Milk in Infant Diets: According to the 555 diet records collected for infants under two years, cow's milk (canned, evaporated) was the only source of milk in 63 percent, breast milk the sole source in 21 percent, and a combination of breast and cow's milk in the remaining 16 percent. At 1 month of age, the records show that 69 percent of these infants were wholly breast fed and 7 percent partially so. At 2 months of age the percentages were 62 and 24 respectively. By three months of age the number wholly formula fed (38 percent) exceeded those wholly breast fed (25 percent). The proportion fed entirely by formula gradually increased and by 13–18 months, 80 percent were receiving formulas; this increased to 91 percent by 19–23 months. (See Fig. 1 and Table 35).

The formula usually consisted of a mixture of half evaporated milk and half boiled water. Occasionally an infant was given a much more dilute formula. When questioned some of the mothers stated that they were following instructions given them by hospital personnel or the public health nurse. These instructions were followed long after a more concentrated mixture should have been used. Another less frequent explanation was that the family or village supply of evaporated milk was inadequate. Milk is generally scarce in late winter and spring when family cash is usually low or exhausted. The village supply of milk is often de-

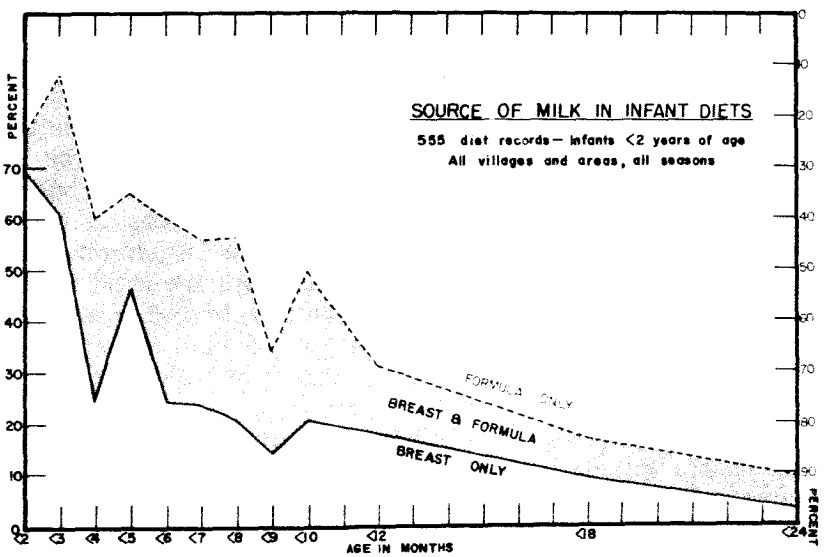

TABLE 35.—SOURCE OF MILK
555 Diets: Breast and Formula-Fed Infants <2 Years
By Age

Food Category	Age in Months					
	1–3	4–7	8–12	13–18	19–23	Total
Breast only	36	18	10	3	.....	67
Breast & Bottle	20	28	25	12	5	90
Breast & Other Supplements	8	10	15	11	4	48
Bottle only	10	13	9	3	.....	35
Bottle & Other Supplements	12	25	73	107	94	311
Not on Breast or Bottle (cup)	.....	.....	.....	.....	4	4
Total No. Records	86	94	132	136	107	555

pleted at this time as well, pending the arrival of the annual supply boat. Most villages, however, now have weekly plane service, and small supplies of milk can be flown in if the weather is good, although at considerable cost. The infant's need for milk is usually given priority during these emergencies, and available supplies are reserved for them. Local storekeepers will usually allow credit for purchase of milk for infants, where they may not extend credit for other items.

Current Infant Feeding Practices: Demand feeding is the universal practice whether the infant is fed by breast or by formula. As with most well-fed infants, Eskimo and Indian babies eventually put themselves on a 3½ to 4 hour feeding schedule. Night feedings, particularly those given in the late evening and early morning hours, sometimes continue until the child is two years of age or even older. Eskimo mothers, in particular, tend to give the breast or formula whenever the child whimpers or cries. This is an old custom, for by tradition Eskimo children have always been indulged in their demands.

Certain observed practices in the bottle feeding of Eskimo and Indian infants lead one to believe that instruction in the proper handling of the bottle and nipple and other utensils used in feeding infants has not kept pace with the increased use of this method.

Generally, the water was boiled, but it was not unusual to see partially filled formula bottles picked up from dirty beds and floors and given to the small infant, sometimes after a toddler had been sucking on it. Opportunities for contamination of bottle and nipple in Eskimo and Indian homes are numerous. Dirt is inevitably brought in from outdoors on the footgear of those responsible for feeding dogs as well as by others. In some villages the dog population exceeds the human population. Although the dogs are tethered in a designated area, pregnant female dogs are usually given shelter in the long entrances or on the porches through which flows most of the traffic into and out of the house. Maintaining proper sanitation practices in the home is difficult at best because of the lack of a safe water supply, running water and adequate refrigeration.

Breast feeding up to three or even five years of age has been reported as a common practice among early Eskimos. This practice, in modified form, has been carried over to the formula fed infant. While only three records of children in this study showed breast feeding beyond 24 months of age, there were 105 records of children over two years of age still receiving part of their milk from the bottle. Most of these records were for children receiving family diets, and the formula, usually given in the late evening or early morning, may have served only as a pacifier.

Prolonged breast or formula feeding has no adverse nutritional consequences if adequate supplementary foods are given. According to our records, however, some infants up to 13 months

TABLE 36.—AVERAGE DAILY INTAKE OF IRON AND VITAMINS
193 Diets: Lactating Women
All Areas and Villages, By Season

Nutrient	Fall	Winter	Spring	Summer	Average All Seasons	NRC Recommended Intakes[4]
Iron (mg.)	28.0	33.4	41.5	15.9	29.7	15
Vitamin A (I. U.)	4527	5421	4851	3029	4457	8000
Thiamine (mg.)	1.325	1.485	1.751	1.371	1.483	1.700
Riboflavin (mg.)	2.444	2.655	2.351	1.719	2.292	2.500
Niacin (mg.)	36.0	36.4	43.0	40.8	39.1	19.0
Ascorbic Acid (mg.)	41	20	19	55	34	150
Total Number Subjects	52	102	22	17	193	

of age were not receiving supplements of any kind. In general, daily supplementation of the infant's diet with cereals, vitamin

TABLE 37.—AVERAGE DAILY INTAKE OF PROTEIN
193 Diets: Lactating Women
By Geographical Area, All Seasons
(NRC Recommended Daily Level—98 gms.)

Protein Intakes	Geographical Area & No. of Records			
	N. Eskimo	SW. Eskimo	N. Central Athapascan	Totals
25 – <50 gms.	1	.....	.....	1
<75 gms.	3	4	1	8
<100 gms.	5	11	3	19
<150 gms.	9	47	6	62
150 gms. & over	23	74	6	103
Total Number of Records	41	136	16	193

TABLE 38.—AVERAGE DAILY INTAKE OF CALCIUM
193 Diets: Lactating Women
By Geographical Area, All Seasons

Calcium Intakes	Geographical Area & No. of Records			
	N. Eskimo	SW. Eskimo	N. Central Athapascan	Totals
<100 – <300 mg.	3	24	4	31
<400 – <500 mg.	13	55	5	73
<600 – <700 mg.	16	35	3	54
<800 – <900 mg.	7	13	1	21
<1000	.....	1	1	2
<1100	2	1	.....	3
<1200	.....	4	.....	4*
<1400	.....	1	1	2
<1500	.....	1	1	2
<2000	.....	1	.....	1**
Total Number of Records	41	136	16	193

* NRC LEVEL 1964
** NRC LEVEL 1958

TABLE 39.—AVERAGE DAILY INTAKE OF IRON
193 Diets: Lactating Women
By Geographical Area, All Seasons
(NRC Recommended Daily Level—15 mg.)

Iron Intakes	Geographical Area & No. of Records			
	N. Eskimo	SW. Eskimo	N. Central Athapascan	Totals
<10 mg.	1	32	1	34
<20 mg.	5	44	8	57
<30 mg.	10	23	3	36
30 & over	25	37	4	66
Total Number of Records	41	136	16	193

preparations, meat, fish, fruits and vegetables was not commonly practiced until infants were 9 to 12 months of age or older (Tables 48, 50, 53, 57).

From a nutritional standpoint, breast feeding without supplementation may be adequate for the first few months of life, provided the mother is healthy, has an adequate diet, and produces enough milk to satisfy the infant's needs. This is not the case for formula fed infants, for whole cow's milk—fresh, evaporated, dried or fortified—is low in iron and ascorbic acid; these nutrients must be added to the infant's diet at a fairly early age. A review of current supplementary food practices reveals that these supplements are not being provided in sufficient quantity or consistently enough to meet the needs of the majority of formula fed infants. Where supplementary foods are not available, suitable vitamin-iron preparations could be used to advantage (Tables 48, 50, 53).

Individual samples of cow's milk and human milk show wide variations in the essential nutrients.[27,28,29] However, average values based on many samples show that human milk is higher in iron and niacin and about four times as high in ascorbic acid as cow's milk. Cow's milk, on the other hand, is slightly higher in thiamine and considerably higher in riboflavin.

The Diet of Lactating Women: The effect of diet on the nutritive content of both human and cow's milk has been demonstrated. Kon and Mawson[30] found that the ascorbic acid content of human milk depends on the daily amounts of this nutrient taken

TABLE 40.—AVERAGE DAILY INTAKE OF VITAMIN A
193 Diets: Lactating Women
By Geographical Area, All Seasons
(NRC Recommended Daily Level—8000 I. U.)

Vitamin A Intakes	Geographical Area & No. of Records			
	N. Eskimo	SW. Eskimo	N. Central Athapascan	Totals
<1500 I. U.	1	18	.....	19
<3000 I. U.	6	39	7	52
<4500 I. U.	10	33	4	47
<6000 I. U.	5	18	.....	23
<7500 I. U.	5	11	1	17
<9000 I. U.	4	11	1	16
9000 & over	10	6	3	19
Total Number of Records	41	136	16	193

TABLE 41.—AVERAGE DAILY INTAKE OF ASCORBIC ACID
193 Diets: Lactating Women
By Geographical Area, All Seasons
(NRC Recommended Daily Level—150 mg.)

Ascorbic Acid Intakes	Geographical Area & No. of Records			
	N. Eskimo	S.W. Eskimo	N. Central Athapascan	Totals
<15 mg.	21	91	6	118
<30 mg.	7	8	3	18
<45 mg.	3	17	.....	20
<60 mg.	4	6	1	11
<150 mg.	3	12	5	20
150 mg & over	3	2	1	6
Total Number of Records	41	136	16	193

in by lactating women. Thus seasonal increases in the ascorbic acid content of breast milk would be expected among Alaskan Eskimos and Indians in areas where edible greens and cloudberries are used generously when available. In our study we found the ascorbic acid intakes of lactating women were highest in summer (average of 55 mg.) and fall (average of 41 mg.) and lowest in winter and spring (averaging about 20 mg.) (Table 36).

Although there was a wide range in individual average daily intakes of ascorbic acid, about 60 percent of the diets of lactating women showed intakes below 15 mg. daily. These low intakes occurred in all geographic areas but were more prevalent in southwest Alaska. Average daily intakes of iron and vitamin A below the level recommended by the National Research Council were also more common in this area.

The protein intakes of most lactating women were well above the NRC recommended level. Very few, however, reached the recommended calcium levels. In about 90 percent of the records the average daily calcium intake was below the recommended level of one gram; about 50 percent showed average daily intakes under 500 mg.

Milk, the chief source of calcium, is not a regular part of the adult Eskimo and Indian diet except as it is used in place of cream in coffee. Often this is as little as 1 teaspoon and occasionally as much as two tablespoons per cup of coffee. Many do not use it. The only other major source of calcium is fish, particularly needlefish and blackfish which are eaten whole. They are available, mostly in the Kuskokwim-Yukon delta area, from late fall throughout the winter but even then only sporadically. (Tables 36–41).

Adequacy of the Infant Diet and Nutrient Source: A total of 282 diet records covering 3 to 7 days each for formula fed infants under 2 years of age were converted to mean daily nutrient intakes. Most of the diets for infants up to 11 months of age were adequate or better in respect to their content of protein, calcium, vitamin A and riboflavin. Protein and vitamin A intakes below the recommended allowances began to show up between the 12th and 23rd months of age. The percent of diets with calorie, iron, niacin and ascorbic acid intake levels below the recommended allowances remained high throughout the first two years of life (Table 42, 53, 62, 70, 72).

The nutrient content of the infant diet, like that of older children and adults, was extremely variable. Mean intakes of all the major nutrients varied from very low to very high; these extremes in intake occurred at all seasons. High intakes, especially of iron, vitamin A, niacin and ascorbic acid, depended on the seasonal availability of particular kinds of local food products. Mean ascorbic acid intakes, for example, tended to be highest in late summer and early fall, especially in tundra areas where cloudberries are available. Low nutrient intakes were more common from mid-winter through early spring when supplies of imported and stored local foods are generally exhausted and fresh supplies not yet available (Table 43).

TABLE 42.—PERCENTAGE OF DIETS WITH AVERAGE DAILY INTAKES BELOW THE RECOMMENDED ALLOWANCE: NINE NUTRIENTS[4]
282 Diets—Formula-Fed Infants—<2 Years
By Age Group, All Seasons

Nutrient	Percent Intakes Below NRC Recommended Allowance By Age Group			
	To 5 Mos.	6–11 Mos.	12–17 Mos.	18–22 Mos.
Calories	75.8	82.8	85.8	67.8
Protein	.....	.....	28.2	23.8
Calcium	.....	10.0	39.3	51.1
Iron	100.0	90.0	73.7	48.8
Vitamin A	.....	.....	16.1	20.2
Thiamine	41.3	68.5	69.6	61.9
Riboflavin	.....	.....	.....	7.1
Niacin	72.4	81.4	58.5	40.4
Ascorbic Acid	68.9	87.1	79.7	77.3
Total Number Diets	29	70	99	84

Repeated shortages of essential nutrients in the infant diet are bound to adversely affect the general health and well being as well as the growth pattern of the infant and young child, especially if they persist for any length of time (Tables 44 and 57).

The tremendous change in infant feeding customs that has taken place in the last quarter century emphasizes the critical need for a continuing program of nutrition education for Eskimo and Indian mothers. This is evident from our data which show that 50 percent or more of each of the eleven major nutrients in the formula-fed infants' diet now comes from imported foods. Of the ten major food groups contributing nutrients to these diets, cow's milk was the most important. It was the source of one-half or more of the calories, protein, fat, calcium and riboflavin and almost half of the vitamin A (Table 45).

Local foods contributed significantly to four major nutrients in these diets, namely, protein, iron, niacin and ascorbic acid. There were, however, seasonal variations in the importance of local foods as sources of these nutrients. For example, local foods rich in pro-vitamin A were more important in spring and early summer diets than at other times of the year. These nutrient sources were not equally available to all Eskimos and Indians (Tables 46 and 47).

TABLE 43.—NUTRIENT DISTRIBUTION AND INTAKE RANGES
282 Diets: Formula-Fed Infants <2 Years
All Areas and Villages, All Food Sources, By Season

Nutrients	Fall (58)*			Winter (150)*			Spring (39)*			Summer (35)*		
	High	Low	Ave.	High	Low	Ave.	High	Low	Ave.	High	Low	Ave.
Calories	1670	259	899	1909	370	869	1557	516	899	1290	405	851
Protein (gm)	128.2	13.2	49.9	131.5	16.2	42.3	91.0	26.4	48.3	113.5	17.6	44.9
Fat (gm)	97.6	14.4	43.2	89.4	17.4	42.4	70.6	23.6	44.1	66.9	19.2	40.9
Carbohydrates (gm)	148.0	18.6	77.3	191.3	27.9	80.4	210.3	37.2	77.5	127.7	35.0	76.3
Calcium (mg)	1717	282	956	2150	162	983	1813	196	1059	2025	270	944
Iron (mg)	46.7	0.6	5.2	36.1	0.6	5.1	11.6	0.8	4.6	25.1	0.6	4.7
Vitamin A (I.U.)	11185	756	3024	13219	351	3368	8123	1169	2543	3337	1005	1858
Thiamine (mg)	4.528	0.090	0.567	4.625	0.135	0.705	1.400	0.180	0.466	0.816	0.120	0.419
Riboflavin (mg)	6.283	0.678	1.733	6.149	0.539	1.822	2.879	0.905	1.893	3.021	0.899	1.589
Niacin (mg)	41.4	0.6	6.6	35.0	0.6	6.4	26.9	0.7	6.2	22.3	0.6	5.9
Ascorbic Acid (mg)	153	0	26	190	0	18	57	0	7	244	0	24

* Number of Records

TABLE 44.—PERCENTAGE OF NUTRIENT INTAKES BELOW NRC RECOMMENDED ALLOWANCES[4]
282 Diets: Formula-Fed Infants <2 Years
By Season

Season	Nutrient								
	Calories	Protein	Calcium	Iron	Vitamin A	Thiamine	Ribo-flavin	Niacin	Ascorbic Acid
Fall	82.8	28.1	46.9	76.6	31.3	75.0	4.7	67.2	70.3
Winter	85.8	29.0	42.6	78.4	30.2	70.4	11.7	67.3	81.5
Spring	82.2	13.3	31.1	73.3	28.9	84.4	11.1	73.3	93.3
Summer	97.1	31.4	45.7	85.7	54.3	91.4	.....	82.9	82.9
Average	85.9	26.8	42.1	78.1	33.0	75.8	8.8	69.9	81.0

TABLE 45.—AVERAGE DAILY INTAKE OF NUTRIENTS FROM SELECTED FOOD GROUPS
282 Diets—Formula-Fed Infants <2 Years
All Areas and Villages, All Seasons, All Food Sources

Food Group	Nutrients										
	Calorie	Protein (gm)	Fat (gm)	Carbo-hydrate (gm)	Calcium (mg)	Iron (mg)	Vitamin A (I.U.)	Thiamine (mg)	Ribo-flavin (mg)	Niacin (mg)	Ascorbic Acid (mg)
Dairy	481	25.3	27.1	33.8	895	1.0	1288	0.149	1.293	0.9	1
Meat	36	6.1	1.1	0.8	3	1.5	170	0.029	1.106	1.1	.....
Fish	57	9.4	2.0	0.2	10	0.3	199	0.031	0.088	1.6	.....
Egg	4	0.3	0.3	.....	1	0.1	24	0.001	0.005	.....	.....
Fats as such	20	.....	2.3	.....	.....	.....	78	.....	.....	.....	.....
Grains	209	4.5	8.3	29.2	67	1.6	21	0.156	0.102	1.2	.....
Sugar	30	0.1	0.2	7.2	2	.....	.....	.....	.....	.....	.....
Fruits	30	0.2	1.1	5.1	4	0.1	115	0.011	0.009	0.1	9
Vegetables	6	0.2	0.1	0.9	2	0.1	115	0.004	0.005	0.1	1
Miscellaneous	4	0.2	0.1	0.6	1	0.2	687*	0.158*	0.151*	1.2*	7*
Average Daily Intake	877	46.3	42.6	77.8	985	4.9	2697	0.539	1.759	6.2	18

* Mostly multiple vitamin preparations

TABLE 46.—PERCENT NUTRIENT FROM FOOD SOURCE
282 Diets: Formula-Fed Infants <2 Years
All Areas and Villages, All Seasons

Nutrient	Food Source			
	Local	Imported	Mixed	Vitamins
Calories	11.2	86.0	2.8	.....
Protein	31.1	65.0	3.9	.....
Fat	8.5	88.2	3.2	0.1
Carbohydrate	1.8	96.6	1.6	.....
Calcium	1.4	98.5	0.1	.....
Iron	32.9	57.8	6.3	3.0
Vitamin A	17.3	63.4	2.4	16.9
Thiamine	13.4	66.2	3.2	17.2
Riboflavin	10.7	81.8	2.1	5.4
Niacin	45.1	38.1	5.1	11.7
Ascorbic Acid	33.7	25.7	10.6	30.0

Although certain local foods first appeared in the diets of very young infants, they were not commonly used until infants were 9 months of age or older. Fish, for example, was recorded on only 1 out of 26 diet records collected for infants up to 4 months of age, but it appeared as a supplement on slightly more than half of the diet records for infants 9 to 12 months of age.

Meat appeared in the diet of only one infant under 5 months of age; on about one-fourth of the diets for infants 9 to 10 months of age, increasing to over half of the diets for those 11 to 12 months of age (Table 48).

Blubber first appeared in the diet of a 5 month old infant; by the 12th month of age about one-fifth were receiving blubber. One month-old infant was given "baby agutuk" but this mixture of fats was apparently not a common infant dietary supplement, for only about one-third of the records for infants 12 months of age showed its use. According to informants, however, its use was more common at fall berry camps where it was mixed with the fresh berries, or in certain tundra villages where it was mixed with cooked fresh fish liver, and in the north where it was mixed with cooked fresh caribou meat (Table 49).

Wild edible greens and roots did not appear on the diets of infants under 11 months of age and even after this age very few infants received them as supplements (Table 50).

Detailed examples of the seasonal use of local (italics) and other foods in the diets of four infants at Hooper Bay are

TABLE 47.—PERCENT NUTRIENT FROM FOOD SOURCE
282 Diets: Formula-Fed Infants <2 Years
All Areas and Villages, By Season

Nutrient	Local Food				Imported Food				Mixed Food				Vitamins			
	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer
Calories	11.8	9.7	10.9	12.0	83.9	88.0	88.2	84.0	4.1	2.3	0.9	4.0	0.2	.....	.....	.....
Protein	34.9	26.6	31.0	31.9	60.8	69.5	66.7	63.1	4.3*	3.9	2.3	5.0	.....	.....	.....	.....
Fat	8.7	9.3	8.2	8.2	85.8	88.2	91.5	86.9	5.1	2.5	0.3	4.9	0.4	.....	.....	.....
Carbohydrate	1.6	0.7	0.7	4.1	95.8	98.2	98.7	93.8	2.6	1.1	0.6	2.1	.....	.....	.....	.....
Calcium	1.2	1.3	1.4	1.6	98.6	98.5	98.5	98.2	0.2	0.2	0.1	0.2	.....	.....	.....	.....
Iron	24.6	31.5	37.9	37.6	56.3	63.0	59.3	52.4	7.1	5.3	2.8	10.0	12.0	0.2	.....	.....
Vitamin A	14.1	12.0	20.7	22.5	58.1	54.9	68.7	71.9	3.5	1.4	0.4	4.2	24.3	31.7	10.2	1.4
Thiamine	14.7	7.1	14.9	16.8	62.9	50.8	74.0	77.1	4.2	1.6	1.5	5.3	18.2	40.5	9.6	0.8
Riboflavin	10.1	8.7	10.8	12.9	81.3	77.0	85.6	83.5	2.5	1.4	1.1	3.4	6.1	12.9	2.5	0.2
Niacin	44.0	32.5	48.6	55.4	37.6	37.0	40.7	37.2	6.3	3.7	3.5	6.8	12.1	26.8	7.2	0.6
Ascorbic Acid	25.5	17.0	20.7	71.8	35.7	13.1	40.7	13.4	18.5*	7.6	1.7	14.2	20.3	62.3	36.9	0.6

* Mostly from local food sources

TABLE 48.—PROTEIN SUPPLEMENTS USED IN INFANT DIETS
Breast and Formula-Fed Infants <2 Years*
All Areas and Villages, All Seasons, By Age

Protein Supplement	Age Level and Number of Records				
	3 Mos.	4–7 Mos.	8–12 Mos.	13–18 Mos.	19–23 Mos.
Eggs	.....	.....	17	18	16
Meat: Flesh	.....	1	50**	85	79
Liver	.....	.....	1	6	1
Fish: Flesh	.....	4	66***	85	80
Liver	.....	.....	10	9	3
Total Records	86	94	132	136	107

* 555 Diet Records of 3 to 7 days each.
** Mostly after 9 mos. of age.
*** Mostly after 8 mos. of age.

TABLE 49.—USE OF FAT SUPPLEMENTS IN INFANT DIETS
Breast and Formula-Fed Infants <2 Years*
All Areas and Villages, All Seasons, By Age

Fat Supplement	No. Records Showing Use at Different Age Levels				
	<3 Mos.	4–7 Mos.	8–12 Mos.	13–18 Mos.	19–23 Mos.
Butter Oleo	.....	1	13	35	47
Hydrogenated	.....	1	6	6	7
Seal Mammal Blubber/ Oil	.....	3	18	23	28
Agutuk**	1	.....	26	35	24
Other	.....	1	12	18	26
Total Number of Records Analyzed	86	94	132	136	107

* 555 Diet Records of 3 to 7 days each.
** Used mostly in fall of the year and, except for <3 months, contained local berries also.

presented in Table 51. A more general seasonal appearance of local foods on 141 food intake records from this same village is shown in Tables 51 and 52.

TABLE 50.—USE OF FRUITS AND VEGETABLES IN INFANT DIETS
Breast and Formula-Fed Infants <2 Years*
All Areas and Villages, All Seasons, By Age

Fruit Supplement	No. Records Showing Use at Different Age Levels				
	<3 Mos.	4–7 Mos.	8–12 Mos.	13–18 Mos.	19–23 Mos.
Fruit					
Infant, canned**	4	5	14	7	2
Other, canned	.....	.....	13	32	23
Juice, canned**	1	9	14	11	9
Dry, cooked/raw	.....	.....	13	22	17
Fresh (apples, oranges)	.....	.....	3	5	6
Local berries, raw***	.....	.....	16	25	27
Agutuk***	.....	.....	26	35	24
Vegetables					
Infant, canned**	1	4	8	8	.....
Other, canned	.....	1	7	16	13
Local greens	.....	.....	2	2	4
Local root vegetables	.....	.....	2	3	2
Total Number of Records Analyzed	86	94	132	136	107

* 555 Diet Records of 3 to 7 days each.
** Used mostly in Northern Alaska by both the Eskimo and Athapascan Indian.
*** Used mostly in fall of the year.

Vitamin supplementation of the infants' diet was not a common practice. Less than 10 percent of the 555 infant food intake records showed daily use of a vitamin preparation at the time the records were collected. Vitamin preparations were used more frequently during the winter season than at other times and also more frequently in northern than in southwestern villages. Their use was more evident immediately following a visit to the village by a public health nurse (Tables 53 and 54).

Calories: The National Research Council recommends that the caloric allowances for infants under one year of age be estimated on an individual basis as follows: 120 calories per kilogram body weight for infants 1 to 6 months of age, and 100 calories per kilogram for infants 7 to 12 months of age. To facilitate machine calculation, total caloric allowance for the 0 to 5 month age level was estimated at 800 calories and that for the 6 to 11 month age

TABLE 51.—USE OF SUPPLEMENTAL FOODS * ON INFANT DIETS (4 INFANTS—HOOPER BAY)

Record Month	Food Pattern by Monthly Age			
	Infant #1	Infant #2	Infant #3	Infant #4
January	(5 mo) Formula, *poke-fish*.	(6 mo) Formula, occasionally cod liver oil.	(12 mo) Breast-formula, fried bread, *agutuk*.	(14 mo) Formula, multiple vitamin supplements.
March	(7 mo) Formula, macaroni.	(8 mo) Formula, cereal, spaghetti.	(14 mo) Formula, bread.	(16 mo) Formula, bread.
April	(8 mo) Formula, bread, cereal.	(9 mo) No Record.	(15 mo) No Record.	(17 mo) Formula, bread with lard, *seal meat, duck meat.*
May	(9 mo) Formula, cereal, *duck eggs.*	(10 mo) Formula, *fish*—cooked and raw.	(16 mo) Formula, bread, soup, *duck eggs.*	(18 mo) Formula, bread, *duck eggs*, cooked *fish*, *goose* meat.
June	(10 mo) Formula, cereal, *duck eggs*, cooked *fish.*	(11 mo) Formula, bread, cereal, *fish* cooked.	(17 mo) Formula, bread, cereal.	(19 mo) No Record.
July	(11 mo) No Record.	(12 mo) Formula, cereal, pilot bread, *duck meat*, canned fruit, canned pork & beans.	(18 mo) Formula, bread, *salmonberries, agutuk.*	(21 mo) No Record.
August	(12 mo) Formula, bread, dry *fish, salmonberry agutuk, salmonberries.*	(13 mo) Formula, bread, cereal, *salmonberry agutuk, salmonberries.*	(19 mo) Formula, bread, *salmonberry agutuk, salmonberries.*	(20 mo) No Record.
September	(13 mo) Formula, bread,	(14 mo) Formula, bread, ce-	(20 mo) No Record.	(22 mo) Formula, bread, *tom*

	cereal, candy, *tom cod livers, agutuk, salmonberries, cooked fish.*	real, *agutuk, tom cod livers, salmonberries, duck meat*		*cod livers, fish*—(poke, dry and cooked), *seal meat.*
October.....	(14 mo) No Record.	(15 mo) Formula, bread with margerine, cooked dry beans.	(21 mo) Formula, bread, cereal, *berry agutuk*	(23 mo) No Record.

* Local foods in italic.

TABLE 52.—SEASONAL SUPPLEMENTATION OF INFANT DIETS WITH LOCAL FOODS
Hooper Bay
(141 Food Intake Records for 35 Infants 6–23 Months of Age)

Local Foods	Times Appeared on Diets, By Season				
	Spring	Summer	Autumn	Winter	
	(May–June)	(July–August)	(Sept–Oct)	(Nov–Jan)	(Feb–April)
Berries, fresh or as agutuk	.....	14	26	16*	4*
Eggs, wildfowl	12	.....	.....	.....	.....
Fish:					
Cooked	15	3	14	9	9
Dry*	3	7	8	3	.....
Poke*	.....	.....	5	16	4
Liver (mostly tom cod)	1	.....	7	1	1
Meat:					
Duck, Goose	5	9	6	1*	1*
Seal	2	1	4	5	11
Beluga	.....	.....	1	.....	.....
Seal Liver	.....	.....	.....	.....	2
No. Records	29	22	27	29	34

* Stored Product.

TABLE 53.—VITAMIN SUPPLEMENTATION
Breast and Formula-Fed Infants <2 Years*
All Seasons, By Age, By Area

Area	Age Level and Number of Records				
	3 Mos.	4-7 Mos.	8-12 Mos.	13-18 Mos.	19-24 Mos.
Northern Eskimo					
4 Villages Daily	8	12	2	2	4
Occas.	2	3	3	6	2
Southwestern Eskimo					
5 Villages Daily	3	5	4	6	.....
Occas.	.....	2	1	.....	1
Athapascan Indian					
2 Villages Daily	7	4	5	7	3
Occas.	.....	.....	.....	.....	1
Total No. Records	86	94	132	136	107

* 555 Diet Records of 3 to 7 days each.

group at 940 calories daily, regardless of body weight. Caloric intakes are presented in Table 55.

While more than three-fourths of the diets for infants up to 5 months of age showed intakes of less than 800 calories daily, these may not be deficiencies. The lower intake may well have been for the younger infants in this grouping. The medium birth weight of 975 Alaskan Eskimo babies born in the Bethel USPHS Hospital was 7 to 7½ pounds[31]. The caloric requirement at this weight would be approximately 370 calories and would gradually increase under normal conditions of growth and development.

TABLE 54.—PERCENT OF TOTAL VITAMIN INTAKE FROM PHARMACEUTICAL SUPPLEMENTS
282 Diets: Formula-Fed Infants <2 Years
By Season

Vitamin	Fall	Winter	Spring	Summer
Vitamin A	24.3	31.7	10.2	1.4
Thiamine	18.2	40.5	9.6	0.8
Riboflavin	6.1	12.9	2.5	0.2
Niacin	12.1	26.8	7.2	0.6
Ascorbic Acid	20.3	62.3	36.9	0.6

Approximately 50 percent of the diet records for infants 6–11 months of age showed intakes of less than 700 calories daily, and approximately 40 percent of the diets for infants 12 to 23 months of age showed average daily intakes under 900 calories, some as low as 600 to 700 calories daily.

Approximately 43 percent of the calories in infant diets were obtained from fats, 35 percent from carbohydrates and 22 percent from protein.

Imported foods, chiefly dairy and grain products, accounted for most of the calories in infant diets, while local foods—meat, fish and fruits—were of minor importance. Only minor seasonal variations were noted in the use of imported versus local food sources, and mixed foods, mostly tingugtluk and similar mixtures, were least important in infant diets in spring (Table 56).

Sugar, syrup and cereal were the first supplemental foods added to infant diets. Sugar or Karo syrup first appeared as a formula additive at two months of age. By three months they appeared on 12 percent of the records, decreasing to 8 percent at the

TABLE 55.—CALORIC INTAKES
282 Diets: Formula-Fed Infants <2 Years
All Seasons, By Age Level

Average Daily Calorie Intake	Number in Each Age Group				Total No. Records
	0–5 Mos.	6–11 Mos.	12–17 Mos.	18–23 Mos.	
300	2	.....	.....	.....	2
400	1	1	1	.....	3
500	5	6	.....	.....	11
600	8	13	4	3	28
700	6	17	11	6	40
800	3	14	18	11	46
900	2	7	15	10	34
1000	1	9	19	9	38
1100	1	.....	11	13	25
1200	.....	2	6	5	13
1300	.....	1	9	10	20
1400	.....	.....	4	6	10
1500 & over	.....	.....	1	11	12
Total No. Records	29	70	99	84	282

(Heavy line indicates the maximum NRC recommended allowance [4].)

4 to 7 month age level and then increasing to 21 percent at 19 to 23 months of age (Table 57).

Sugar was used only occasionally on cereals before infants were 7 months of age, but by 19 to 23 months of age about 60 percent of the diets included sugared cereal. Syrup was used infrequently on hotcakes before infants were 13 months old but from then on its use increased. Candy appeared on the diet record of one four month old infant, but in general, it was rarely reported until infants were a year old. Our records did not cover the periods of the "candy binges" which occur after the arrival of the supply boat, at Christmas time and other holidays.

Of the three common cereals used on infant diets oatmeal was the most popular. Cost limited the use of specially prepared infant cereals. In general, cereals were used infrequently until infants were 5 to 7 months of age. Breads, crackers and hotcakes, common items in the family dietary, were important supplemental foods from about 8 months of age on. Cakes, cookies and similar sweet breads were seldom used until infants were 13 to 18 months

of age. Sweet breads are luxury items in most villages, and are usually available only briefly after the arrival of the annual supply ship or during holidays (Table 57).

Fat as such was an unimportant source of calories in the young infants' diet. Whether used by itself or as an ingredient

TABLE 56.—SOURCE OF CALORIES
282 Diets: Formula-Fed Infants <2 Years
By Season

Food Source	Season			
	Fall	Winter	Spring	Summer
Local	105	85	98	102
Imported	746	765	793	715
Mixed	36	20	8	34
Pharmaceuticals	2	.....	.....	.....
Average Daily Caloric Intake	889	870	899	851

TABLE 57.—CARBOHYDRATE SUPPLEMENTS
Breast and Formula-Fed Infants <2 Years*
By Age, All Areas and Villages, All Seasons

Food Group	Age Level and Number Records				
	3 Mos.	4–7 Mos.	8–12 Mos.	13–18 Mos.	19–23 Mos.
Cereals					
Infant cereals	4	13	14	8	2
Oats	5	18	53	81	50
Rice	.....	5	27	34	28
Breads					
Pilot, Yeast, Sourdo	1	14	63	103	97
Hotcakes	.....	3	34	68	53
Cakes, Cookies	.....	1	14	24	27
Soups with					
Rice and Macaroni	2	16	51	66	59
Sugars & Syrups					
In Formula	11	12	16	12	23
On bread, cereal	2	9	48	74	66
On hotcakes	.....	.....	1	16	13
Candy	0	2	5	24	19
Total Records	86	94	132	136	107

* 555 Diet Records of 3 to 7 days each.

of agutuk, it was only occasionally fed to babies under 9 to 10 months of age, but from then on it was used more frequently (Table 49).

Protein: Most infants eleven months of age and under met their protein requirements adequately but after 12 months of age about one-fourth of the records showed average daily intake values below the NRC recommended allowances. Imported foods, chiefly milk, were the principal source (Tables 58, 59).

Eggs did not contribute materially to the protein intake of infants as they were not generally available. Hooper Bay, Newtok, Point Hope and Shishmaref were the only study villages where significant quantities of wildfowl eggs were gathered and used. They were available only in late May and early June in southwestern Alaska, and in June and early July in the northern villages. But even in these villages they did not appear on the diets of infants under 7 months of age and from then on only rarely. According to Eskimo informants wildfowl eggs are not used as much as they were in former times. Hen's eggs were seldom available in the villages except for the Indian village of Huslia and even there they were not commonly used for infant feeding. Imported eggs were very costly and none of the villages had suitable storage facilities (Table 48).

TABLE 58.—PROTEIN INTAKES
282 Diets: Formula-Fed Infants <2 Years
By Age Level, All Seasons

Average Daily Intake Levels	Age Level				
	0–5 Mos.	6–11 Mos.	12–17 Mos.	18–23 Mos.	Totals
15 gms.	2	.....	.....	.....	2
20 gms.	2	1	1	1	5
25 gms.	4	5	2	1	12
30 gms.	8	14	12	7	41
35 gms.	5	14	13	11	43
40 gms.	4	20	18	4	46
45 gms.	3	5	11	8	27
50 gms.	.....	4	14	7	25
55 and over	1	7	28	45	81
Totals	29	70	99	84	282

(Dark line is NRC recommended level [4])

Meat, sometimes added as early as 5 months of age, did not appear on a significant number of diets until infants were 8 to 12 months of age. From then on its use gradually increased so that by 19 to 23 months of age it appeared on most of the diets. Animal livers appeared on only 8 of the 555 infant diet records, and these few records were for children over one year of age. Fresh livers were available only sporadically throughout the year.

Fish was introduced as early as four months of age, but appeared infrequently on diets until the infants were about 8 to 12 months of age. Fish livers appeared on only 22 of the 555 records collected, and none of these was for an infant under 8 months of age. Tingugtluk, a mixture containing fish livers, did not appear on diets until the infants were 9 to 10 months of age (Table 48).

Calcium: Calcium intakes were spread over an extremely wide range at all four age levels. Most diets for infants 11 months of age and younger met or exceeded the NRC recommended allowances, and the few that did not were close to it. Thirty-nine percent of the diets at the 12–17 month age level and 51 percent at the 18–23 month age level did not meet NRC recommendations. Many of these low intakes were borderline but a significant number of the diets showed quite low intakes. There was a significant number of high calcium intakes at all age levels (Tables 47, 60).

In general, low calcium intakes resulted when insufficient amounts of milk were included in the daily diet, especially after one year of age. High calcium intakes were generally the result of prolonged bottle feedings with insufficient use of supplemental

TABLE 59.—SOURCE OF PROTEIN
282 Diets: Formula-Fed Infants <2 Years
By Season
In Grams

Food Source	Season			
	Fall	Winter	Spring	Summer
Local	17.4	11.3	15.0	14.3
Imported	30.3	29.4	32.2	28.3
Mixed	2.1	1.6	1.1	2.3
Average Daily Intake	49.8	42.3	48.3	44.9

foods. Although both situations occur regardless of season, high intakes are more likely to occur in late winter and spring. At this time of the year both imported and local food supplies are usually low, especially in southwestern Alaska, and milk supplemented by

TABLE 60.—CALCIUM INTAKES
282 Diets: Formula-Fed Infants <2 Years
All Seasons, By Age Level

Average Daily Intake Levels	Number at Each Age Level				
	0–5 Mos.	6–11 Mos.	12–17 Mos.	18–23 Mos.	Totals
200 mg.	.....	.....	.....	2	2
300 mg.	.....	.....	.....	6	6
400 mg.	.....	.....	1	5	6
500 mg.	2	.....	1	1	4
600 mg.	.....	1	5	11	17
700 mg.	2	6	4	6	18
800 mg.	4	4	9	9	26
900 mg.	.....	10	19	3	32
1000 mg.	6	12	10	5	33
1100 mg.	5	6	15	8	34
1200 mg.	2	8	12	12	34
Over 1200 mg.	8	23	23	16	70
Total Each Age Category	29	70	99	84	282

(Dark line—NRC recommended level.[4])

TABLE 61.—SOURCE OF CALCIUM
282 Diets: Formula-Fed Infants <2 Years
By Season
In Milligrams

Food Source	Season			
	Fall	Winter	Spring	Summer
Local	11.5	12.8	14.8	15.1
Imported	942.6	968.2	1043.1	927.0
Mixed	1.9	2.0	1.1	1.9
Average Daily Intake	956	983	1059	944

bread or crackers may be the only foods available to the family in sufficient quantity for infant feeding.

Milk provided 91 percent of the calcium in infant diets. Sources other than milk were: grain products, principally pablum, and similar cereals especially designed for infant feeding; Pilot

TABLE 62.—IRON INTAKES
282 Diets: Formula-Fed Infants <2 Years
All Seasons, By Age Level

Average Daily Intake	Age Level				
	0–5 Mos.	6–11 Mos.	12–17 Mos.	18–23 Mos.	Totals
1 mg.	10	7	2	.....	19
2 mg.	15	28	9	5	57
3 mg.	.....	14	15	12	41
4 mg.	4	9	21	8	42
5 mg.	.....	4	17	11	32
6 mg.	.....	1	9	5	15
7 mg.	.....	3	9	6	18
8 mg.	.....	2	3	8	13
over 8 mg.	.....	2	14	29	45
Total No. Records	29	70	99	84	282

(Heavy Line indicates the NRC recommended level.[4])

TABLE 63.—SOURCE OF IRON
282 Diets: Formula-Fed Infants <2 Years
By Season
In Milligrams

Food Source	Season			
	Fall	Winter	Spring	Summer
Local	1.3	1.6	1.7	1.8
Imported	2.9	3.2	2.7	2.5
Mixed	0.4	0.3	0.1	0.5
Vitamins	0.6	0.01*	.....	.....
Average Daily Intake	5.2	5.1	4.5	4.8

* Negligible

Bread; Jersey Creams; and sourdough bread when made with baking powder containing calcium. These foods, important only in the diet of infants over 7 months of age, furnished 7 percent of the total calcium intake. The two fishes most likely to furnish significant amounts of calcium in Eskimo diets were needlefish and blackfish which are eaten whole. Their use is confined to the southwestern villages and they did not appear in infant diets until the twelfth month (Table 61).

Iron: Average daily iron intakes were generally low by NRC standards throughout infancy. Not a single one of the diet records for infants under 5 months of age met the recommended daily allowance of 5 mg. In fact, almost 90 percent showed an average intake of only 1 to 2 mg. of iron daily. Average daily intakes as low as 1 to 3 mg. were found in 70 percent of the diets for infants 6 to 11 months of age and in almost a fourth of those 12 to 23 months of age (Table 62).

The major sources of iron in the diets of infants under 24 months of age were grain products, meat and milk; these furnished 32, 30 and 20 percent of the total, respectively. Vitamin and mineral preparations, eggs, fish, fruits and vegetables contributed only negligible amounts. Cereals such as pablum and oatmeal were used infrequently until infants were 11 to 12 months of age or older. Animal and fish livers obtained locally, and infant canned

TABLE 64.—VITAMIN A INTAKES
282 Diets: Formula-Fed Infants <2 Years
By Age Level, All Seasons

Average Daily Intake Levels	Age Level				
	0–5 Mos.	6–11 Mos.	12–17 Mos.	18–23 Mos.	Totals
500 I. U.	.....	.....	.....	1	1
1000 I. U.	2	.....	1	4	7
1500 I. U.	6	11	15	12	44
2000 I. U.	3	22	26	11	62
2500 I. U.	5	16	13	25	59
3000 I. U.	1	3	12	10	26
3500 I. U.	.....	1	7	3	11
4000 I. U. & Over	12	17	25	18	72
Total No. Records	29	70	99	84	282

vegetable—meat preparations were only occasionally used throughout the infant-toddler period (Tables 48, 63).

Over half of the iron in these diets was from imported foods, chiefly grain products and milk. Approximately one-third came from local sources, including that from mixed foods made from local food products such as—fish livers, meat, berries and greens. Vitamin preparations containing iron were a significant source in the fall but in only two of the study villages. Their use was fortuitous and temporary (Table 63).

Vitamin A: The average daily intake of vitamin A of nearly all infants under 12 months of age met or exceeded the NRC recommended allowance; the majority of the deficiencies which appeared on records for infants 12–23 months of age were borderline. The average daily intake of vitamin A was lowest in summer.

More than half of the vitamin A in these diets came from imported foods chiefly milk and about one-fourth of it from vitamin supplements. The latter were a significant source on fall and winter diets only (Table 64, 65).

Meat and fish, including seal and fish livers, were unimportant sources of vitamin A until infants were 9 to 11 months of age. Fats, such as butter, margarine, seal oil, seal blubber, and agutuk containing seal oil, all of which contain varying amounts of vitamin A, were not important in the diet until infants were 11 to 12 months of age (Tables 48 and 49).

Seal and other sea mammal oils properly stored so as to retain their vitamin content, and fed so as to avoid aspiration of oil particles into the lungs, could be used more frequently than they

TABLE 65.—SOURCE OF VITAMIN A
282 Diets: Formula-Fed Infants <2 Years
By Season
In International Units

Food Source	Season			
	Fall	Winter	Spring	Summer
Local	426	404	526	418
Imported	1757	1849	1747	1336
Mixed	106	47	10	78
Vitamins	735	1068	259	25
Average Daily Intake	3024	3368	2542	1857

are, especially for older infants. Tests at the Arctic Health Research Center show that the oil from the beluga contains 2310 I. U. of Vitamin A per 100 grams; from ugruk (bearded seal) 5020 I. U.; from walrus 2600 I. U.; and that from the baleen whale, 2810 I. U. Carter et al[32] found that the blubber oil from hair seals also contained 20–100 I.U. Vitamin D per gram.

Thiamine: Average daily intakes of thiamine below the NRC recommended allowances occurred in significant numbers at all age levels (Table 66).

The chief sources of thiamine in the infant dietary were dairy products, grains and vitamin supplements. Although milk is not a rich source of this nutrient, it was important because of its daily use. Vitamin supplementation was not a common practice although it was used to some extent in fall and winter. The feeding of grain products, whether as cereals, breads or crackers, did not become a daily practice until infants approached the 8 to 10 month age level (Tables 45, 53, 57, 67).

Meat and fish products contributed very little to the total thiamine intake as they were seldom used before infants reached 8 to 9 months of age (Table 48).

TABLE 66.—THIAMINE INTAKES
282 Diets: Formula-Fed Infants <2 Years
By Age, All Seasons

Average Daily Intake Levels	Age Categories				
	0–5 Mos.	6–11 Mos.	12–17 Mos.	18–23 Mos.	Totals
.200 mg.	12	13	2	1	28
.400 mg.	6	35	39	23	103
.600 mg.	2	11	28	28	69
.800 mg.	1	3	15	17	36
1.000 mg.	.....	1	5	4	10
1.200 mg.	2	1	1	4	8
1.400 mg.	3	4	1	.....	8
1.600 mg. & Over	3	2	8	7	20
Total No. of Records	29	70	99	84	282

(Heavy line indicates NRC recommended level.[4])

TABLE 67.—SOURCE OF THIAMINE
282 Diets: Formula-Fed Infants <2 Years
By Season
In Milligrams

Food Source	Season			
	Fall	Winter	Spring	Summer
Local	.083	.050	.069	.052
Imported	.357	.358	.345	.323
Mixed	.024	.011	.007	.040
Vitamins	.103	.286	.045	.003
Average Daily Intake	.567	.705	.466	.418

Riboflavin: Average daily intakes of riboflavin generally equalled or exceeded NRC recommendations until infants were 18 to 23 months of age, and even then only a small number showed deficiency (Table 68).

Almost three-fourths of the riboflavin came from dairy products. Meat, grain products, fish and vitamin preparations were minor sources until infants were 8 to 9 months of age and older (Tables 45 and 69).

TABLE 68.—RIBOFLAVIN INTAKES
282 Diets: Formula-Fed Infants <2 Years
By Age, All Seasons

Average Daily Intake Levels	Age Categories				
	0–5 Mos.	6–11 Mos.	12–17 Mos.	18–23 Mos.	Totals
.500 mg					
.750 mg	2			6	8
1.000 mg	2	2	4	10	18
1.250 mg	4	6	11	9	30
1.500 mg	5	19	17	6	47
1.750 mg	3	12	22	15	52
2.000 mg. & over	13	31	45	38	127
Total No. of Records	29	70	99	84	282

(Dark line represents NRC recommendation.[4])

TABLE 69.—SOURCE OF RIBOFLAVIN
282 Diets: Formula-Fed Infants <2 Years
By Season
In Milligrams

Food Source	Season			
	Fall	Winter	Spring	Summer
Local	.175	.158	.204	.205
Imported	1.409	1.403	1.622	1.327
Mixed	.043	.027	.020	.054
Vitamins	.106	.234	.047	.003
Average Daily Intake	1.733	1.822	1.893	1.589

TABLE 70.—NIACIN INTAKES
282 Diets: Formula-Fed Infants <2 Years
By Age, All Seasons

Average Daily Intake Levels	Age Categories				
	0–5 Mos.	6–11 Mos.	12–17 Mos.	18–23 Mos.	Totals
2 mg.	20	39	8	5	72
4 mg.	1	12	31	13	57
6 mg.	1	6	20	16	43
8 mg.	1	3	15	14	33
10 mg.	.....	3	7	9	19
12 mg. & over	6	7	18	27	58
Total No. Records	29	70	99	84	282

(Dark line indicates NRC recommended level.[4])

Niacin: Macy et al[29] state that it is difficult for either breast or artificially fed infants to meet the NRC recommended daily allowance for niacin. This appeared to be true for formula-fed Alaskan infants, for more than half of the diets for infants up to 11 months of age showed daily intakes of 2 mg. or less. Less than one-fourth had intakes equal to or above the NRC recommended allowances.

Intakes were based on the content of niacin as such in foods. However, protein foods such as milk, eggs, meat and fish

are all rich in tryptophane, which can be converted in the body to niacin. Infants receiving adequate amounts of milk supplemented by other protein foods should have no difficulty in meeting the niacin requirement. Yet, a significant number of infants, particularly between 12 and 23 months of age, did not receive either adequate amounts of milk nor adequate protein supplementation (Table 45, 48, 70).

Local meat and fish sources, including that used in mixed food preparations, contributed about one-half of the niacin in these diets in all seasons except winter. Vitamins were an important source during winter but only in the northern Athapascan village of Allakaket where they were dispensed and their use encouraged by a resident missionary nurse (Tables 53 and 71).

TABLE 71.—SOURCE OF NIACIN
282 Diets: Formula-Fed Infants <2 Years
By Season
In Milligrams

Food Source	Season			
	Fall	Winter	Spring	Summer
Local	2.9	2.1	3.0	3.3
Imported	2.5	2.4	2.5	2.2
Mixed	0.4	0.2	0.2	0.4
Vitamins	0.8	1.7	0.4	<0.1
Average Daily Intake	6.6	6.4	6.1	5.9

Ascorbic Acid: A high proportion of infant diets showed ascorbic acid intakes below NRC recommended allowances. One-third of the diets appeared to be devoid of ascorbic acid, while an additional one-fourth of them showed average intake values of only 1 to 5 mg. In spite of these seemingly low intakes, to the knowledge of the investigator, none of the infants showed overt signs of scurvy (Table 72).

Foods that would have provided at least minimal intakes of ascorbic acid, such as local meats, fishes, berries, and greens, were seldom included in the diets for infants under 10 months of age. These foods appeared only sporadically or seasonally in the diets of older infants (Tables 48 and 50).

The broth from cooked meat and fish, usually with rice

and/or macaroni added, was commonly fed to infants from about 8 months of age; it occasionally appeared on the diets of infants three months of age. When made with fresh meat this broth or soup probably contains some ascorbic acid due to the leaching of the vitamin into the cooking water.

Although fruit and fruit juices appeared on the diets of infants as young as one month of age, they were used very infrequently until 7 months of age. These were usually canned fruits and fruit juices specially prepared for infants although occasionally the heavy syrup from ordinary canned fruit products was used. The use of prepared infant food preparations was limited by cost (Table 50).

Local wild berries did not appear in the diet before the infants were 7 months of age. It should be noted, however, that diet records were not collected at the scattered summer and fall berry camps when the fresh berries were available. Mixtures containing berries—agutuk and tingugtluk—were more likely to appear on infant diets in the southwestern Eskimo villages. Among the local berries, the cloudberry has the highest ascorbic acid content, containing more than 178 mg. per 100 grams when fresh and 158 mg. and more when properly stored [33] (Tables 49 and 50).

Ascorbic acid from vitamin preparations was highest at the Indian village of Allakaket thanks to the encouragement of the missionary nurse.

TABLE 72.—ASCORBIC ACID INTAKES
282 Diets: Formula-Fed Infants <2 Years
By Age, All Seasons

Average Daily Intake Levels	Age Categories				
	0–5 Mos.	6–11 Mos.	12–17 Mos.	18–23 Mos.	Totals
0 mg.	14	34	27	18	93
1-5 mg.	3	17	28	26	74
Up to 10 mg.	1	7	9	7	24
Up to 15 mg.	1	3	3	6	13
Up to 20 mg.	.....	.....	4	4	8
Up to 25 mg.	1	.....	5	2	8
Up to 30 mg.	1	.....	3	2	6
Up to 35 mg.	1	.....	.....	.....	1
Over 35 mg.	7	9	20	19	55
Total No. Records	29	70	99	84	282

(Dark line indicates NRC recommended level.[4])

Vegetables did not contribute materially to the total intake of any of the 11 nutrients studied. They appeared much less frequently in infant diets than did fruits. Vegetables were not commonly used in adult diets either, except seasonally in those Eskimo villages located where wild edible greens are available in quantity. Residents of Shishmaref and Hooper Bay gather significant quantities of these greens. The people of Hooper Bay, Noatak, and Shungnak gather considerable quantities of edible roots and other underground plant parts but they are not generally given to infants (Table 50).

TABLE 73.—SOURCE OF ASCORBIC ACID
282 Diets: Formula-Fed Infants <2 Years
By Area, All Seasons
In Milligrams

Food Source	Geographic Area		
	Southwestern Eskimo	Northern Eskimo	N. Central Athapascan
Local	4.4	2.4	1.2
Mixed	2.2*	0.3	0.2
Imported	3.4	5.6	13.2
Vitamin Preparations	5.8	7.2	16.9
Average Daily Intake	15.8	15.5	31.5

* Mostly from local foods.

TABLE 74.—SOURCE OF ASCORBIC ACID
282 Diets: Formula-Fed Infants <2 Years
By Season
In Milligrams

Food Source	Season			
	Fall	Winter	Spring	Summer
Local	7	3	1	17
Imported	9	2	3	3
Mixed*	5	<1	1	3
Vitamins	5	11	3	1
Average Daily Intake	26	16	8	24

* Mostly from Local Foods.

Of all the nutrients, the intake of ascorbic acid showed the greatest seasonal variation. Local food products provided the highest percentage in summer, chiefly through the increased use of berries, particularly cloudberries which are gathered in July and August, especially at Hooper Bay and Kasigluk (Table 74).

Intakes of ascorbic acid in summer and fall often approached the NRC recommended allowance in some villages because of the use of local berries and greens. Intakes were lowest in May and early June, when both stored food supplies and cash are generally low and hunting activities often curtailed. The few families who still went to traditional spring camps seemed to fare the best, for these camp sites were usually located where fresh fish, wildfowl, wildfowl eggs and sometimes wild edible greens were obtainable (Table 74).

In the overall yearly diet, local food sources and vitamin preparations accounted for about one-third each and imported foods about one-fourth of the total ascorbic acid intake (Table 74).