A Study to Determine Causes of Decline in the National School Lunch Program in Alaska

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I. BACKGROUND AND INTRODUCTION

The following is a report of research directed toward analysis of the causes of declining participation in the National School Lunch Program (NSLP) in Alaska. This research was jointly funded by the U.S. Department of Agriculture, the Department of Education, and the State of Alaska Division of Social Services. While the fact sheet dated August 17, 1977 from USDA, (which was to be a guide for this research), focused almost exclusively upon the need for additional nutritional research, discussions with State of Alaska Agency personnel suggested that the State's research needs concerning NSLP lie in the problem of program participation decline. We determined to undertake what research was possible to fulfill both aspects of these programmatic needs, i.e. cause for declining participation and actual nutritional need for the program.

Faced with the impossibility, in light of resources available, of undertaking a full-fledged analysis of Alaskas nutritional needs,[1] the determination was made, in conjunction with the State of Alaska School Food Coordinator and the members of the Advisory Board, to focus substantially upon the causes for decline in program participation and to make fortuitous use of that information which existed concerning actual nutritional levels, insofar as such information could be developed.

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[1] Researchers and all persons associated with the Advisory Board assumed that Alaska's nutritional needs were probably great. However, this assumption was later to be questioned.

Though the initial proposal submitted to the State of Alaska reflected the USDA-based need, this adjustment in research priorities was felt to be a best compromise with the caliber of resources and the expressed need of the State.

The research approach included developing questionnaires on NSLP use, significance, and its perception by users. These questionnaires were administered to a selected representative sample of program managers, State administrators, school district principals, and school board members. The program focused on the Juneau and Fairbanks districts which had abandoned the program and on the Anchorage area where the program remains.

The data emerging from interviews was analyzed in conjunction with other administrative and economical analyses. These included participation rates and costs which themselves were related to socioeconomic data selected to clarify program structure and function.

Conterminously, information was found to be available through U.S. Public Health Service on a 24-hour recall study of the NSLP-aged school children from selected Dillingham area communities.[2] This information was intended to establish the level of nutrition among a block of children assumed to be more poorly nourished than most in the State. Nutritional levels in the urban areas of the state were assumed to be

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[2]Charlotte Stefanich, "Analysis of Nutrition for Eskimo Children in the Dillingham Area," (unpublished) 1972.

generally analogous to levels in the rest of the U.S. These levels were eventually available through the U.S. Health and Nutrition Education survey (HANES).

Findings emerged early in the study which altered some of its subsequent form and direction. The questionnaire survey responses seemed to show clearly that enough respondents questioned the actual value of the program to raise the issue of a more substantial analysis of its benefits. This finding occurred at the same time that the analysis of the 24-hour recall study of nutrition suggested that there were no average substantial nutritional deficiencies observably present among the school children in the Dillingham region, at least through the information so derived.

When compared to the HANES study, these findings seemed clearly to parallel equivalent findings for the U.S. in general. At this point, though such additional work would essentially have to be born by Institute funds, the staff decided that there was some validity in at least initially pursuing a better understanding of: (1) the basis upon which nutritional need decisions are made, and (2) the literature on the significance of school lunch in particular and nutrition in general as these bear upon school performance and children's well-being.

Our findings, within the limited scope we were able to undertake, were somewhat unexpected. The literature suggests that there are at least some questions on the meaning of nutrition, on what nutritional

needs are, and whether supplementing nutrition after the first few years of life, absent serious malnutrition, has any significant impact on school performance.

These findings suggested that there was a need to address more fundamental questions than simply that of why program participation was declining. We therefore have organized this report to provide: (1) a brief historical overview of the NSLP, (2) a brief analysis of the present state of knowledge of the relationship between nutrition and educational achievement, (3) the probable state of nutritional deficiencies among Alaska school children, and (4) an analysis of the economic and other factors which appear to have led to declining program participation in Alaska.

As we shall now show, some of the facts we uncovered either do not clearly support or may even possibly refute some of the common assumptions about (1) nutrition and education and (2) nutrition in Alaska.

We strongly stress here that our findings are not meant to be viewed as comprehensive or final, but are meant to suggest that there are some reasonable questions associated with many aspects of the program. We suggest that only further comprehensive research will clarify some of the issues raised, and we strongly urge that such research be done.

II. SUMMARY

This is a report on the Causes of Decline in the National School Lunch Program in Alaska, by Arthur E. Hippler, William Alves, and Patricia DeRoche, June 15, 1979. Prepared by the Institute of Social and Economic Research, University of Alaska for the Alaska Department of Education.

The National School Lunch Program is an outgrowth of historical concern over the nutrition of school-aged children. This is a subject which first received substantial expression through predominantly private charitable concern and increasingly came to be a focus of governmental intervention through the depression years of the 1930s, culminating in the 1949 NSLP Act. A basic belief of the program's initiation was that better, more-balanced meals for school-aged children would result in better educational attainment. To this end, the NSLP program has provided federal money to elementary and high schools across the U.S. to help pay the costs of serving hot lunches.

A basic underlying justification for the program (and one which emanated from the social conditions of the nineteenth century up through the U.S. depression) is that (1) American school children are undernourished, and that (2) such undernourishment detracts from educational attainment. An analysis of the scholarly research literature pertinent to the issue suggests that no relationship has been established between the NSLP program and increased educational achievement.

Further, the basic assumption that educational attainment is related to nutrition is a suspect assumption and appears to be poorly supported. The professional literature suggests (1) that it is infantile (first two years of life) nutritional deficiencies which, by school age, affect intellectural achievement, and that such deficiencies may not be remediable. In childhood, however, moderately poor nutrition (absent starvation, etc.) seems only mildly related to performance, and that relationship may reflect the "multi-problem" aspects of homes where children are poorly cared for rather than a specific deficiency such as nutrition.

In analysing the status of Alaska school children's nutrition, the researchers, using established and ongoing research findings, note that there is no evidence of substantial nutritional deficiency among even the supposedly poorest nourished group, Alaska Eskimos. This was determined using standard accepted measures developed by the U.S. Department of Health, Education, and Welfare. DHEW's standards are set at extremely high levels, even when based on U.S. expectations, some of which are much higher than international standards.

The Alaska condition was discovered to parallel the U.S. case in general. That is, the present evidence suggests that contrary to popular opinion, the U.S. population is well nourished, even according to the very "safe" levels used by the U.S. government. Only one deficiency of note (iron) appears throughout the entire population in the U.S. and Alaska, and there is some question as to the levels being currently accepted as inadequate.

This report therefore suggests that the nutritional basis of the program in Alaska is at least open to question and that specific research must be directed at this question to determine if a need for the NSLP program exists.

This study was aimed both at determining need for the program and reasons for decline in participation; therefore, we will also discuss the economics of the program, since further research may show a nutritional need for the program or find some other justification for it.

Almost all Alaska's city and borough schools have served lunches under this national program during the past decade. But since 1972, fewer and fewer Alaskan students have been eating these hot lunches. In June 1976, the Fairbanks and Juneau school districts, with the second and third largest enrollments in the state, dropped the federal lunch program altogether.

From the 1972-73 school year through the 1976-77 year, the number of students who ate hot lunches daily in Alaska's twenty-one major city and borough school districts declined from nearly 26,000 to less than 20,000, although enrollment in these schools increased about 10 percent during that period. So while about 43 percent of 60,000 students in borough and city schools ate hot lunches daily in 1972, only 30 percent of roughly 65,000 students in these schools ate hot lunches on an average day in the 1976-77 school year.

In looking for the economic and other causes of decline in participation, we analyzed statistical information prepared by the Alaska Department of Education on district lunch programs. We also analyzed regional income, employment, and wage figures developed by the Alaska Department of Labor and U.S. Department of Commerce's Bureau of Economic Analysis. We interviewed school district and lunch program administrators in Anchorage, Fairbanks, and Juneau; current and former school board members from these districts; and officials of the state Department of Education. Previous evaluations of food service programs in the state were also examined, as well as studies of nutrition among American school children.

In Alaska and most other states, the National School Lunch Program is paid for through a combination of federal and local school district money and through lunch sales; students from families with income below a designated level are eligible to receive free lunches. Some state governments also help subsidize the national lunch program. Federal lunch subsidies to school districts are revised twice annually, based on increases in the national Consumer Price Index, and Alaskan schools are paid the same per-lunch subsidy as other schools across the country.

Because costs are much higher in Alaska than elsewhere in the country, this federal lunch subsidy has historically covered a smaller part of total lunch program costs in Alaskan schools than in other American schools. During the 1975-76 school years, the average cost of

serving a hot lunch in borough and city schools was $1.37; the same year, schools in Kansas and Oklahoma served lunches for an average of 76 cents.

Most of the costs of the federal lunch program in Alaska are met through lunch sales and with school district money; the average price charged for lunches in borough and city schools during the 1975-76 year was nearly $1.00. Thus for each lunch sold in Alaskan schools that year, the federal government paid 13 cents, students paid about $1.00, and local districts paid about 25 cents. For each free lunch served, the federal government paid 71.5 cents and the local districts paid about 66 cents. These figures make it clear that even though the federal subsidy paid to schools for serving free lunches is considerably higher than that paid for lunches sold, it nevertheless costs Alaskan districts more to serve free lunches than to sell lunches.

The above discussion illustrates the main reason -- although there are other reasons which we also looked at -- why Alaskan students and entire schools districts have been turning away from the national lunch program: the hot lunches cost students and schools too much. Between 1972 and 1976, a period when construction of the trans-Alaska pipeline was boosting Alaskan wages and prices faster than prices and wages were growing nationally, overall costs of hot lunch programs in the state's borough and city schools jumped 60 percent. Faced with these greatly increased costs, school administrators increased lunch prices an average

50 percent during this four-year period, but the school districts themselves absorbed an increasing percentage of program costs not covered by federal revenues and lunch sales.

In analyzing the decline in the number of hot lunches served in Alaska's borough and city schools during the past few years, we looked separately at why fewer students ate lunches in schools with lunch programs, and why two of the state's largest districts stopped serving hot lunches altogether.

Looking first at why fewer individual students in Alaska's borough and city schools ate hot lunches daily in 1976 than in 1972, we found that both the percentage of students buying lunches and the percentage of students receiving free lunches had declined during the study period, but most of this total decline was due to fewer students buying lunches.

We found that price of lunches accounted for about one-third of the variation in the percentage of students buying lunches in various districts in the state. Looking at it in a slightly different way, we calculated that a price increase of 10 cents for hot lunches in Alaska's borough and city schools would cause about one in eight students who had been buying lunches to stop buying them.

We also found that regional differences in unemployment rates, average wages, and per capita incomes accounted for about 25 percent of the variation in the percentage of students buying lunches in districts

around the state. Finally, we found that about 40 percent of inter-district variation in students buying hot lunches was not attributable to any of the economic variables we analyzed. We assumed that Alaskan students in various districts also base their decisions about buying hot lunches on kinds of food offered, food quality, what other kinds of lunches are available, length of waiting time in the cafeteria required to get hot lunches, and other noneconomic factors. In analyzing just how important these noneconomic factors have been to the decline of the national lunch program in Alaska, we have gone beyond the scope of our report, but we believe these factors have certainly contributed to the decline and should be studied in the future.

Thus, we found that price increases between 1972 and 1976 were probably the single most important economic reason why an ever-declining number of students bought lunches.

We believe that most of this decline in students receiving free lunches during construction of the trans-Alaska pipeline meant that fast rising Alaska incomes simply left fewer students eligible to receive free lunches, due to federal income eligibility rules. During the study period, Alaskan incomes were rising faster than the national costs that the federal government uses to calculate eligible family income. Thus, fewer Alaskan students qualified for free lunches in 1976 than in 1972.

The report also notes that while the percentage of students taking free lunches in borough and city schools statewide did decline during the study period, this decline did not occur in all districts of the

state. Much of the income gain Alaskans saw in the mid-1970's was concentrated in urban areas, such as Fairbanks which were most heavily influenced by pipeline construction. Ninety percent of Alaskan students in borough and city schools live in urban areas. But in several rural Alaska districts, more than 75 percent of students who ate hot lunches in 1976 received those lunches free.

Thus we found that by 1976 only 20 percent of lunches served daily in borough and city schools statewide were served free, but in rural districts a much larger percentage of free lunches were served daily.

Turning to the question of why the Fairbanks and Juneau school districts stopped serving hot lunches at the close of the 1975-76 school year, we found it was primarily because the program was costing both districts increasingly more, but also because both the percentage of students buying lunches and the percentage taking free lunches were declining.

Total costs of Juneau's hot lunch program doubled in 3 years, as did the percentage of costs the school district paid. The number of students taking free lunches -- students who would be assumed to be most in need of the lunch program -- had dropped off sharply. Between 1974 and 1975, the number of free lunches served in Juneau's schools dropped from 50,000 to 40,000. Inefficient management of the lunch program had driven up costs of the program. Students who bought lunches or received free lunches wasted much of the food. Quality of the lunches was poor.

When parents were told the district was considering dropping the program, very few protested. Federal lunch money the district received did not justify paperwork involved in getting the money.

The Fairbanks district dropped the national lunch program because the number of students taking free lunches in the district had dropped off sharply between the 1973-74 and the 1974-75 school year. Wages of food service workers were rising rapidly, spurred by high wages paid food service workers working on the trans-Alaska pipeline, further driving up costs of the lunch program. A consultant's report found that the district could cut labor costs by as much as 15 percent by using a central kitchen to prepare lunches, but given the low percentage of students eating lunches, the district was unwilling to spend money to construct a central kitchen. Here also there were complaints that the quality of the food was poor, and federal requirements for obtaining lunch funds caused an administrative headache not justified by the size of the federal subsidy.

We believe the same rising costs that were major factors in causing the Juneau and Fairbanks schools to stop serving hot lunches could cause other Alaskan schools to drop the national lunch program. Such cost increases might be controlled in several ways:

1. More efficient program management and use of labor, for example, by hiring student help when feasible and planning menus that require less labor per serving.

2. Higher federal subsidies, based on the state's higher food and labor costs.

3. State subsidies -- preferably a per-lunch subsidy, rather than per food-service worker -- to encourage efficient use of labor.

Finally, in preparing this report, we felt that we could not stop at simply (1) analyzing the reasons why the national lunch program has lost popularity in Alaskan schools and (2) recommending ways of stopping the decline in the number of hot lunches being served in state schools. To do so would tacitly accept not only the assumption that the hot lunch program should be strengthened in Alaska, but also certain underlying assumptions on which the lunch program is built--namely, that the school lunch program provides necessary nutrition and thus enchances the academic performance of many Alaskan children, and that helping nourish school children is properly a government responsibility.

In addition, it seems that some of the pressures for continuing the NSLP program, even apart from the above assumptions, are related to vested interests in agency and food service employment and in political philosophical assumptions about government, which may benefit from airing.

We do not maintain that the school lunch program is not necessary in Alaska, or that the assumptions underlying it are not valid. But after examining the limited number of studies available of nutrition among U.S., particularly Alaskan, school children, we do not believe it has been proven that a significant percentage of Alaskan school children is undernourished today, or that the existing lunch program can effectively combat this malnutrition if it exists. Before attempting to bolster the national lunch program in Alaska, federal and state officials should take a close look at reasons for the lunch program and determine if the program is accomplishing its stated goals.

III. SCHOOL LUNCH PROGRAMS:

A. A Brief Historical Overview

The practice of feeding and sometimes clothing needy school children originated in Germany around 1790 and quickly spread throughout most of Europe. The earliest programs were operated much like soup kitchens, and financing was provided by private individuals, charitable organizations, and philanthropic societies. Program participation grew rapidly over time, and the need to establish a continuous, stable funding source gradually became apparent. Most urban areas eventually passed legislation that increased local support to schools to subsidize school lunch programs. "Eventually lunch programs were made available to all school children regardless of their ability to pay.[1] Those who could afford the lunches were charged a nominal fee to cover the cost of the food."[2]

B. Early U.S. History and Development

The practice of feeding school children in this country evolved in much the same way as it did in Europe. Sporadic attempts at providing school lunches were begun in the mid 1800's, but it was not until the turn of the century that significant organized programs began to be

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[1]Dennis H. Barrett, Food Service Manual, Anchorage School District, 1977.

[2]Gorden W. Gunderson, "The National School Lunch Program," F.N.S. 63, (Washington, D.C.: U.S. Department of Agriculture, 1971), p. 2.

established. The publication of Robert Hunter's book POVERTY in 1904,[3] and John Spargo's THE BITTER CRY OF CHILDREN in 1905[4] helped draw, public attention to the extent of poverty and malnutrition in this country, particularly the effect on children. Both of these books had such a widespread influence on educators that by 1920, urban school systems in New York City, Boston, Philadelphia, Milwaukee, Cleveland, Cincinnati, and St. Louis were all operating extensive lunch programs.

Urban school lunch programs continued to expand through the 1920's, with a more gradual growth in rural areas.

During the Depression years, school lunch participation declined significantly because children were unable to afford the cost of lunches. Unemployment was substantial, as was public concern over hunger and malnutrition. Local and state governments were unable to cover the costs of serving hot lunches without Federal assistance.

The earliest Federal support came in the form of small loans to states to help "cover the costs of labor employed in preparing and serving lunches."[5] Then in 1935, the Federal government created two public employment agencies: the Works Projects Administration (WPA), and the National Youth Administration (NYA). Both of these programs

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[3]Robert Hunter, "Poverty, Social Progress in the Progressive Era, (New York: Harper and Row, 1965).

[4]John Spargo: The Bitter Cry of Children (Chicago: Quadrangle Books, 1906).

[5]Gunderson, The National School Lunch Program, p. 11.

employed many individuals who provided valuable labor assistance to school lunch programs throughout the country. That same year Congress approved a Commodity Donation Program (Public Law 320) which enabled the Secretary of Agriculture to dispose of surplus agricultural commodities to school lunch programs.

For several years thereafter, school lunch programs continued to grow. Then, World War II brought about the close of the WPA and a drop in receipts of surplus commodities, which were being diverted to our Armed Forces in Europe. In July 1943, Congress enacted legislation authorizing the expenditure of Department of Agriculture funds to maintain school lunch programs during that fiscal year. During the following year additional legislative funds were approved and "by April of 1946, the (school lunch) program had expanded to include 45,119 schools serving 6.7 million children daily . . .".[6]

C. National School Lunch Act

A permanent legislative base was given to school lunch programs in 1946 with the passage of the National School Lunch Act. The Act assures the continuity of the program and directs how federal funds should be apportioned among states. Additional legislative support was given to the program with the passage of Section 416 of the Agricultural Act of 1949--which granted authority to donate commodities acquired from price support activities to various agencies in the following manner:

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[6]Ibid., p. 14.

"First, to school lunch programs and to the Bureau of Indian Affairs and Federal, State and local public welfare organizations for the assistance of needy Indians and other needy persons; second, to private welfare organizations for the assistance of needy persons within the United States; third, to private welfare organizations for the assistance of needy persons outside the United States."[7]

Thus, the National School Lunch Act of 1946, as promulgated in Public Law 396, has as its primary purpose "to make available to school children, lunches of maximum nutritional value at a minimum cost to the child."[8]

D. Amendments

The National School Lunch Act was first amended in 1952, changing the apportionment of school lunch funds to U.S. Territories. No further amendments were made until 1962 when Congress (1) equalized the basis by which funds were distributed to states and (2) provided for special cash reimbursements for meals served free or at substantially reduced prices.[9]

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[7] Ibid., p. 16.

[8] Marge Dawes, personal communication, 1978.

[9] Gunderson, National School Lunch Program, p. 18.

The first new revision rationed funds to states on the basis of the "participation rate" and the "need assistance rate." The former was defined as "ratio of a number equal to the number of lunches served in the preceding fiscal year, while the latter corresponds to the individual state's annual per capita income as compared to the annual per capita income for the entire country."[10] The section enabling special cash payments for free and reduced lunches was approved in 1962; however, funds to cover such payments were not appropriated until 1966. In 1962, Congress also passed a resolution creating a National School Lunch Week to be celebrated beginning on the second Sunday of October of each year.

In 1965, a section of the Food and Agriculture Act was amended to authorize the purchase of dairy products for school lunch programs if the existing supply proved to be insufficient.

The Child Nutrition Act[11] was created in 1966. The basic intent of the act was to expand food services to all children, but particularly to those from needy families. One important section of the act provided for the establishment of school breakfast programs and outlined specific program and nutritional requirements as well as eligibility criteria--all of which are much the same as those for the National School Lunch Program.

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[10] Ibid., p. 18.

[11] The Child Nutrition Act, p. 23, (1976).

Prior to the passage of the Child Nutrition Act, funds for feeding school children were provided by several different federal agencies. Section 13 of the Act consolidated the authority for all food service programs and funds under the U.S. Department of Agriculture. The Child Nutrition Act also contained several other important provisions, namely the establishment of Non-Food Assistance and Special Milk Programs.[12]

The Non-Food Assistance Program made federal funds available to pay up to three-fourths of the cost of new equipment for school kitchens. The Special Milk Program, which had operated under separate legislative funding since 1954, was made a part of the act and funds were authorized through 1970.

In 1968, the National School Lunch Act was again amended to establish a Special Food Service Program for Children. This program basically extended eligibility for program participation to private, nonprofit, and public service institutions where children were not in residence. This included service institutions with summer programs and programs for handicapped children.

Although school lunch programs continued to expand each year, several publications released in 1968 again focused the public's attention on the problems of poverty and malnutrition in this country.[13]

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[12] Ibid., pp. 23 and 26.

[13] Gunderson, The National School Lunch Program, p. 22.

Public concerns in this area prompted the President to create the Food and Nutrition Service Agency under the Department of Agriculture. This agency was assigned the responsibility of administering all Federal food service programs.

In 1970, "the 91st Congress amended several sections of the National School Lunch Act." Section 9 of the act "established uniform guidelines and criteria in the determination of eligibility (for free and reduced meals), and set a maximum charge of $.20 for lunches served at a reduced price."[14] The new Section 11 revised appropriations to needy schools furnishing free or reduced lunches to needy families; also, it required that each state's educational agency submit a yearly operation plan to the USDA.[15]

Other revisions include: Section 3, which provides for the appropriation of federal funds a year in advance of their use; Section 6, which provides for training, education, and research; Section 7, which outlines federal matching requirements for states; and, Section 14, which established the thirteen-member National Advisory Council on Child Nutrition.[16]

In 1972, increased appropriations were approved in several program areas, reimbursement rates were elevated, and major changes in funding

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[14] Ibid., p. 26.

[15] Ibid., p. 27.

[16] The Child Nutrition Act, p. 22 (1976).

procedures were approved. These types of changes, as well as program extentions, have continued to be made by Congress almost yearly up to the present time.

E. Lunch Programs in Alaska

Dawes notes that as of the 1950's, no standardized lunch program existed in Alaska.[17] While individual Parent/Teacher Associations in the larger cities and boroughs and the Bureau of Indian Affairs both provided some forms of lunches for their respective clientele, those rural schools not supported by BIA did not have such lunch services.

The first mention of a federal school lunch program in Alaska is contained in the Report of the Commissioner of Education for the biennium ended June 30, 1950. That report states, "the Federal government, through the Department of Agriculture, makes funds available to public, private, and denominational schools for aid in the operation of a school lunch program. The program is administered by the Territorial Department of Education, although the Territory makes no direct financial contribution to the program." No description of program activity was provided, but the following table shows the distribution of federal funds for school years 1948-49 and 1949-50:

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[17] Marge Dawes, personal communication.

School	1948-49 Federal Aid	1949-50 Federal Aid
Anchorage	$ 1,825.71	$ 1,764.71
Fairbanks	591.86	-
Holy Cross	2,319.30	1,894.17
Immaculate Conception	236.40	254.06
Moravian Mission	501.84	377.16
Palmer	3,689.64	3,911.93
Sheldon Jackson	2,012.67	1,651.28
St. Mary's	-	1,150.91
Wasilla		679.78
Total	$ 11,177.42	$ 11,684.00
Total Federal Grant	$ 11,648.00	$ 11,684.00

During the 1950's and early 1960's, federal lunch programs continued to operate in Alaska, but not as we know them today. Most of the urban schools operated soup and sandwich type programs. Parent-Teacher Associations and other groups often worked on school lunch programs because of federal regulations requiring participating schools to have a "sponsoring agency" that would be responsible for operating the program and providing funds for lunch expenses not covered by federal money. The BIA also sponsored a limited number of lunch programs in rural areas with heavy Native populations. Rural schools not supported by the BIA had no lunch program.

In the 1950-1951 school year, a total of nine schools received federal funds for school lunch assistance; the following year (1951-52), the number of participating schools increased to ten. During that biennium (1950-52), the Territory served a total of 431,650 meals at a

cost of $164,984.34. Of that amount, the Federal government contributed $23,970.[18]

By the 1954-56 biennium, all Territorial schools, including private nonprofit schools, were eligible to participate in the lunch program. Nineteen schools participated during 1954-55, and twenty-four during 1955-56.

During this period, government commodities from the farmers' price support program first became available to the Territory, and free and reduced lunches were served to children who were unable to pay the full cost. The Special Milk Program was also extended to the Territory in October of 1956.

By the time the Commissioner of Education submitted his report for the biennium ending June 30, 1960, Alaska had become a state. As a state, Alaska did not provide any direct funding for the school lunch program, but did administer the program through the Department of Education. The federal formula for calculating reimbursement for meals also changed about the same time that Alaska achieved statehood, and Alaska's reimbursement rate dropped from its previous high of $.09 per meal. Additional funds needed to continue operating the program were obtained at the local level.

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[18]Alaska Department of Education, Report to the Commission of Education for the Biennium ended June 30, Juneau, 1950.

During the school year 1961-62, a total of fifty-five districts participated in the school lunch program. The average daily student participation was 8,940 and 1,453,696 meals were served. The total cost of program operations was $804,515. Federal reimbursement for that year amounted to $92,150.

In 1966, the State of Alaska began operating the "Snack Program" in the newly organized rural State-Operated Schools. The Snack Program served Type B lunches using Federal Government-donated commodities under the National School Lunch Act. Fifty-three schools were served during the first year of operation, but the program was so limited that vitamins were given as a supplement to the meals. About 1968, the State Department of Education purchased twelve to fourteen specially modified house trailers and transported them to various rural areas. Hot meals (Type B) were prepared inside of the trailers; at lunch time the sides were dropped to serve food to students. "Both the Snack Program and the hot lunches served from trailers were felt to be more beneficial to children than what they had been eating previously, but these programs were also helpful to the village economy because they provided a small amount of paid local labor." By the 1970-71 school year, most of the rural programs had been upgraded and were serving Type A [19] lunches that were eligible for federal reimbursement.

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[19] Type A lunches must consist one of each of the following five components: (a) protein foods, (b) vegetable and/or fruit, and (c) bread. The lunch must be adequate to meet one-third of the daily nutritional needs of the child. In Alaska, as elsewhere, the U.S. Department of Agriculture processes, packs and transports to selected points donated food which it acquires through Federal price support obligation and surplus removal programs or which it may specially purchase for the NSLP under Sections 6 and 709 of the NSLP Act.

(continued on next page)

By 1971, some of these programs had been upgraded to state-subsidized Type A lunches. July 1, 1976, the State-Operated School Program (SOS), a state-run operation, was changed into what are termed Regional Education Attendance Areas (REAA). These locally managed school districts now bear the responsibility for school lunch programs. Through this period BIA has continued its own lunch program independent of state operations.

Dawes indicates that lunch programs have never been placed high on the list of REAA responsibilities, since the program is an administrative challenge and burden, and since Federal subsidies for the program are inadequate to meet its cost.[20]

For these reasons, among others, some rural schools are not presently in the program. Also, by 1975, both the Juneau School District and the Fairbanks North Star Borough School District had abandoned the program.

However, The National School Lunch Program in Alaska has continued to grow. During the 1976-77 school year, thirty-four school districts participated in the program. A total of 4,320,584 lunches were served

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Footnote 19 continued:

These lunches are paid for either by a combination of sales revenue from the school child (the price charged varies, depending on actual costs and degree of subsidization), local subsidy, and federal aid. Federal aid is higher in districts where children of low-income families qualify for free or reduced price lunches or where districts qualify for nonfood (equipment) assistance. The school receiving such special non-food aid must pay 25 percent of the cost. All donations to the state must be matched by one state or local dollar for three federal ones.

Extensive information concerning these and other aspects of the program are available in Dawes, Alaska Food Service Handbook, 1975.

[20]Dawes, private communication.

to school children. Total program operating costs were $5,542,110 and federal reimbursement amounted to $1,001,070.

With this description of the program and its history we turn to a brief assessment of the need and justification for the program and an analysis of the program and its operation in Alaska.

IV. AN ANALYSIS OF SOME ASSUMPTIONS UNDERLYING THE NATIONAL SCHOOL LUNCH PROGRAM

A. Nutrition and Education

To understand the operation and significance of the NSLP in Alaska, it is necessary, at least briefly, to review the basic assumptions underlying the program in general. The most fundamental underlying assumption is that there is a direct positive relationship between nutrition levels and the well-being and scholastic achievement of school children.

Conventional wisdom holds that there is a strong relationship between nutritional well-being and scholastic performance. Neural matter is after all organic and thus subject to nutritional need.

In reality this so very obvious matter turns out to be not only not so obvious, but as stated above, it may be incorrect or at least dramatically misleading. Relevent literature suggests that basic research supporting the proposition that educational progress is enhanced by school feeding programs has been inconclusive, poorly done, or in fact counter-supportive. Beyond this, it would appear that the crucial period of life during which nutrition enhances intellectual potential is infancy and not during the school years.

It seems obvious that severe malnutrition or starvation would affect scholastic performance. Except for these extreme cases, however, there appears to be many possible alternative explanations for

relationships of performance to nutrition. Families in which children are poorly nurtured also often tend to be multi-problem families where general care is less than adequate and family relationships produce pathology. Moreover, providing lunches (and breakfasts) for such disadvantaged children may not only serve an organic, nutritional need, but also act to convince the child that "someone cares." The emotional support implied in this "caring" may be a substantial component of improved performance.

While many such questions require verification by additional research, the weight of evidence which we have seen concerning the present state of the art suggests an unclear relationship between nutrition and scholastic performance.

There is even some question whether any relationship exists between nutrition (not including that for marginally nourished children), and scholastic attainments. Lieberman, et. al., for example, in comparing ghetto schools in Los Angeles with a school breakfast program to those without one could find no statistically significant differences in scholastic attainment in the control and experimental group.[1] Interestingly, they also on pretest found no nutritional deficiencies, even though these were "ghetto" schools.

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[1]Harry M. Lieberman, et al., "Evaluation of a Ghetto School Lunch Program," Journal of American Dietary Association, 68, 2(1976):132-138.

Ellestan-Sayed, Haworth, and Medory in a nutrition survey in Winnipeg, also were unable to find nutritional deficiencies in the population at large, though 14 percent did not eat a breakfast.[2]

Paige et. al., (1976) did find both nutritionally related pretest deficiencies (hematocrit $\leq$ 33.9 percent), and changes in height and weight as well as school attendance after a "nutritional supplement" program for black children.[3] However, no mention is made of scholastic change, and the well-known positive benefits of being the subject of an experiment designed to assist one may have accounted for greater physical well-being.

The more closely one examines the literature on the relationship between well-being and nutrition in children, the clearer it becomes that it is infantile malnutrition which destroys later capacities, and that by school-age if the child is severely malnourished, the deficits created cannot easily be overcome at all. Coursin et al. note the crucial period is infancy.[4] However, even for nearly starved infants, the final degree (if any) of retardation is a function of social-familial factors. Moderately poor nutrition in childhood seems only mildly related to performance of any kind, and further, it is unclear whether its role is

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[2]J. Ellestan-Sayed, J.C. Haworth, and H. Medory, "Nutrition Survey of Children in Greater Winnepeg, "CMA Journal, 116(1976):490-497.

[3]David M. Paige et al., "Nutritional Supplementation of Disadvantaged Elementary School Children," Pediatrics 58, 5(1977):697-703.

[4]David B. Coursin et al., "Special Report: Present knowledge of the relationship of nutrition to brain development and behavior," Nutritional Review, 31, 8(1973):242-246.

even significant. When children are grossly malnourished, according to coursin et al, this occurs in a context (ordinarily) of other "unfortunate" social and environmental conditions.[5] No one has separated out these effects.

Finally Coursin et al. note that the effect of hunger on school performance has not been documented, nor has the effect of school feeding programs.[6] It seems finally to be a question of individual circumstances. Powers, for example, reports on relationships between levels of specific nutrients and behavioral responses.[7] Some behavioral responses can be moderated by nutrient level changes. These interventions, however, demand specific case history write-ups, physiochemical analyses, and specific individual oriented intervention.

Bakan suggests that the bulk of research in the area of nutrition related to learning shows that deficits occurring prenatally and in the first year of life are the most crucial in affecting capacities in later life.[8] Such deprivations cannot be made up. Additional nutritional enrichment of adequately nurtured children shows no effects. Cameron also supports the notion that early deficits are essentially difficult to overcome and that intervention needs to be on an individual basis.[9]

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[5] Ibid.

[6] Ibid., p. 245.

[7] Hugh W.S. Powers, jr., "Dietary Measures to Improve Behavior and Achievement," Academic Therapy, 9, 3(1973):203-214.

[8] Rita Bakan, "Malnutrition and Learning," Phi Delta Kappa, 51, 10 (1970):527-530.

[9] Janet L. Cameron, "How Nutrition Affects Learning and Behavior, "School Lunch Journal 24, 2(1970):29-30.

Much work such as that by Klein also suggests some degree of irreversibility in early nutritional deficits.[10]

Kellen, in a serious effort to untangle the sociological and biochemical aspects of malnutrition, winds up supporting the notion that malnourishment in the U.S. occurs in individuals and groups where it is far from the sole problem,[11] as do Coursin et al. Malnourished individuals tend to come from families which suffer from other emotional deprivations as well.

Smith, in analyzing actual pretest and post-test results geared to nutrient supplement, showed inconclusive findings which he admittedly could not "decontaminate" for non-nutritional factors.[12] It is nearly impossible to segregate nutritional from social and familial factors even in clear cases of malnutrition. According to Ricciuti, it is very unlikely that moderate malnourishment plays anything but a very minor role in scholastic and other performance deficits.[13]

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[10]Prina S. Klein et al., "Long-term Effects of Deficit Starvation on Learning Abilities," paper presented at annual meeting, Society of Pediatric Research, Washington, D.C., May 1974.

[11]David J. Kellen, "Malnutrition, Learning and Behavior," paper presented at American Sociological Association Meetings, New York, August 1973.

[12]Jack L. Smith, "Nutrient Supplementation and Learning," paper presented at the sixth annual meeting of the Society for Nutrition Education, 1973.

[13]Henry M. Ricciuti, "Malnutrition and Psychological Development," based on addresses to annual meetings of American Psychological Association and Association for Research in Nervous and Mental Diseases, 1972.

B. School Feeding Programs and Scholastic Achievement

In a 1978 overview of the research directed toward the relationship between school feeding programs and scholastic achievement, Pollitt, et al., argue that "as a whole the studies fail to provide a strong basis from which to make valid inferences regarding the long-term effects of the feeding program on school achievement and adaptation."[14]

In the process of their analysis, Pollit et al. point out that even so intuitively obvious a concept as "hunger" is impossible to quantify, and since it contains cultural, personality, historical and biological components and their complex interplay, one cannot claim "that it is a uniform psychobiological phenomenon across the human species." They stress that "whatever the effects of hunger on the behavior of school children may be, they are surely not mediated by changes in neural structure. Any behavioral effects are likely to be associated with short term metabolic and neurohumoral changes."[15]

In looking at the research on the effect of breakfast or its lack, they note that while the research is inconclusive there is at least a tendency to show that the omission of breakfast interferes with a child's "maximum work rate and output."[16] Research on different kinds of breakfast are inconclusive.

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[14] Ernesto Politt, et al., "Educational Benefits of the United States School Feeding Program: A Critical Review of the Literature," American Journal of Public Health 68, 5(1978):477-481.

[15] Ibid., p. 478.

[16] Ibid, p. 479.

Lininger (1933) reported positive changes due to school milk, but there was no double blind in the research, hence possible researcher emotional contamination of the results could not be controlled.[17] On the other hand, Kreitzman reported no effect of school breakfast on performance, but his data and methods were also presented poorly.[18] This kind of problem besets most of the research. Fellers, Tisdall et al., and Pinkus in widely separated studies find no effect on performance of breakfast or lunch programs,[19, 20, 21] but Pollitt et al find difficulties with each study.[22] In the only Alaska Study reported, Koonce attempted to determine the influence of breakfast and lunch vs. only lunch at school and could find a better "school disposition" on the part of children who were fed both breakfast and lunch.[23] The obvious question is, "what were the other differences in the children," but this was not answered.

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[17] F. Lininger, "Relation of the Use of Milk to Physical and Scholastic Progress of Undernourished School Children," Cameron Journal of Public Health 23 (1933):555-560.

[18] S.W. Krietzman, "Evaluation of the Croddock Breakfast Study," Atlanta School of Denistry, Emory University, 1973 (unpublished).

[19] S.A. Fellers, "A Study of the Effects of Breakfast on Scholastic Attainment, Dropout Rate and Knowledge of Nutrition" (Ph.D. dissertation, Boston University, 1967.

[20] F.F. Tisdall et al, "Canadian Red Cross School Meal Study," Canadian Medical Association Journal 64 (1951):477-489.

[21] M.S. Pinkus, "A Study of Pupil Breakfast Habits and Behavior Patterns in Certain Louisiana Elementary Schools following implementation of the National Breakfast Program," (M.A. Thesis, Lousiana State University 1970).

[22] E. Pollitt et al, "Educational Benefits of U.S. School Feeding Program," 1978.

[23] T.M. Koonce, "Does Breakfast Help?" School Food Service Journal 26 (1972):51-54.

It is neither within the scope of this study or the expertise available to us, to analyze depth, or determine the significance of these controversies within the field of nutrition studies.

Nonetheless, in the presence of such substantial uncertainty concerning the basics of nutrition, it seems at the very least that the basis of some of the assumptions underlying the NSLP have not been clearly and indisputably established.

Finally, the entire issue of nutrition even in its simplest form, that of energy needs, is extraordinarily fuzzy. Tracey quotes a prominent British nutritionist, I.C. Waterlow: "we believe that the energy requirements of man and his balance of intake and expenditure are not known." Tracey also quotes Professor Mark Hegsted, who upon reviewing a World Health Organization report on protein and energy needs, is reported as feeling that most standards are useless.[24]

Tracey quotes Widdowson (1947) as noting that individual variance (in need and tolerance, etc.) is great, and "unsatisfactorily explained." Even obesity is not simply and clearly related to amount of energy consumed, according to Tracey.[25] United Kingdom figures for 1965 show that lower-class children who ate less than middleclass children gained more weight.

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[24]Michael V. Tracey, "What We Don't Know About Nutrition," Across the Board 15, 5(1978):62-66.

[25]Ibid., p. 66.

Neither the scope of this study nor the expertise available to us have allowed us to analyze in depth or determine the significance of these controversies within the field of nutrition studies.

Nonetheless, the presence of such substantial uncertainty concerning the basics of nutrition would at the very least seem to demonstrate that the assumptions underlying the NSLP have not been clearly and indisputably established.

V. ALASKA SCHOOL CHILDREN AND THEIR NUTRITIONAL STATUS

Even if there is an unclear relationship between nutrition and education, and even if nutrition and hunger are hard to define, there is still the logical possibility that marginally nourished children might benefit nutritionally through NSLP and hence enhance their school performance, which is the major justification for the program. Such a possibility depends, at least in part, on whether malnourishment is indeed a problem which demands redress in Alaska.

This question is difficult to address without addressing related issues. For example, what is the history of nutritional needs in the U.S. in general?[1] How are nutritional standards derived? What relationship does the nutrition of Alaska Natives and non-Natives bear to national standards?

A. What are nutrition and malnourishment?

In the brief history of school lunch programs we have noted the general concern in earlier times with levels of nutrition in the U.S. Additionally, we note in the history of this concern that there are substantial nutritional deficiencies briefly reviewed in Barrett (1977) who traces the initiation of school food service to philanthropic organizations in the 1850's and shows that by 1894 in Boston and 1909 in

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[1] Information concerning R.D.A. standards was in part derived from discussions with Elizabeth Nobman, Nutritionist, U.S. Public Health Service, Native Service Hospital, Anchorage and Charlotte Stefanich.

Philadelphia, organized local government had begun to support school lunches. By 1910 in New York, educational deficiencies had begun to be associated with the ability of the child to function in school. The 1930's saw a vast expansion of this concept. As we have noted earlier, public law 320 passed in 1935 was the watershed federal involvement which mandated specific monies to support the buying of agricultural products for school lunches and also, at least in part, to assist the endangered agricultural sector of the economy.

Nutritional deficiencies were again spotlighted during World War II when the Director of Selective Service estimated that a third of the men rejected were rejected for physical reasons resulting in some way from nutritional deficiencies. However, as we noted in the previous section, the question of what precisely constitutes appropriate nutrition is, interestingly enough, far from clear. Substantial research has been and is still being undertaken to determine the answer to these complex questions. Some of the research and findings are summarized in (FN2) the Committee on Dietary Allowances, (CDA) Recommended Dietary Allowances.[2]

Recommended Dietary Allowances (RDA) are "the levels of intake of essential nutrients considered in the judgement of the Food and Nutrition Board on the basis of available scientific knowledge, to be adequate to meet the known nutritional needs of practically all healthy persons."[3]

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[2]Committee on Dietary Allowances, National Academy of Sciences, Recommended Dietary Allowances, Washington, D.C., 1974.

[3]Ibid., p. 2.

CDA fully recognizes that food has not only nutrients, but an emotional and psychological component as well. It also sees that nutrients are best provided from a variety of foods, since one is never sure all nutrient needs have been identified. Nonetheless, for the purposes of this study, we must limit ourselves to nutritional components per se.

Since, however, RDA's are recommended intakes, they must not be confused with requirements. To make sure that RDA's are safely derived, basic studies on nutrition tend to have built in a "safety factor" of varying degrees. Beyond that, at least in calories, U.S. RDA's are 25 percent higher than those of World Health Organization.[4] Finally, RDA's are set at levels adequate to the third standard deviation of need on the high side. To clarify, this means that RDA's are so set that .9987 of the population will have their needs met. This includes people whose nutritional needs are extraordinarily high by "normal" standards.

Additionally, RDA's are fixed for age-sex-weight groups since nutritional needs vary according to age and sex and by body weight as well. While all the above safety factors are built into RDA's, nutritionists are nonetheless adamant in observing that there is no validity in ignoring the safety factor and reducing RDA's to, say, two-thirds, because of the importance of individual variation.[5]

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[4] Ibid.

[5] Ibid., p. 14.

Still, nutritionists generally appear in practice to recognize that on a population basis the RDA's are relatively safe measures, so far as any such measures can be said to be safe.

The impression one receives from CDA about the large safety factor built into RDA's seems strikingly borne out by actual surveys of dietary intakes throughout the U.S.[6]

The 1977 Health and Nutrition Examination Survey (HANES) provides a substantial analysis of nutritional intake in the U.S. Interestingly enough, the RDA standards used in HANES differ in some respects from those used by the CDA. Lower standards are used for calcium (for ages 10-12), iron, vitamin C, thiamine, and vitamin A. Higher standards are used for calcium (for other ages), protein, riboflavin and niacin. Further, calories and protein are figured on a standardized allowance based on median expected weight which tends to penalize the overweight (Nobman, personal communication).

Nonetheless, RDA's standards set for the HANES study reflect a continuing "state of the art" appreciation of nutritional needs and, as with previous estimates, contain a substantial "safety factor." Since our own attempt to analyze Alaska data are based on HANES standards, we reproduce the pertinent age group information here. (See Tables V-1,2,3,4,5,and 6 in Appendix B)

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[6] Ibid.

Perhaps the most interesting aspect of these findings is the apparent lack of deficiencies which it shows for the U.S. population. While popular opinion would seem to suggest that persons in the U.S. overeat, the mean caloric intakes are nonetheless below RDA's, which may imply that these RDA's are set substantially higher than necessary. An interesting issue is iron intake. While RDA's of iron suggest lower than necessary intake of iron, this may be a function of the level set and the safety margins, which is suggested in a study by Hard and Price.[7] It would be an interesting question for research, outside the scope of this report, to examine how iron can actually be nutritionally low in the presence of such high attainment of other nutritional standards. In this we are inclined to agree with Hard and Price. As the CDA suggests, the fact that habitual consumption of nutrients is below RDA does not necessarily mean that the amount of nutrients necessary are not being met.

At the very least, the HANES survey apparently does not suggest nutritional deficiencies for the school-aged children in the U.S., with which this study is concerned. Note especially that even for low-income nonwhite children, the intakes are substantial by RDA norms.[8]

These findings suggest a base from which the Alaska data may be viewed. However, we were unable to find adequate information on nutritional intakes of Alaska non-Native school children. In the absence of

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[7]Margaret M. Hard and David W. Price, "Evaluation of School Lunch and School Breakfact program in the State of Washington" (typewritten, N.D.).

[8]CDA, Recommended Dietary Allowances, 1974, p. 12.

such information, and with no reason to assume differently, we believe the HANES results are a good approximation of the nutritional intakes of Alaska non-Native school children as well. While this remains a question for investigation, the national evidence, even for nonwhite, low-income families (which should be the limiting case), at least seems to indicate that it is unlikely that the non-Native Alaska school child is malnourished. Additionally, we present here more recent data developed by Charlotte Stefanich concerning nutritional intakes in selected Eskimo villages. We present these as a potential "worst case" for the Alaska analysis.

B. Nutritional Intakes of Alaska Native School Children

One extremely important rationale for the existence of a National School Lunch Program is the assumption that it can provide a substantial proportion of needed food elements for school children who would otherwise not get them. This rationale has been especially strong for rural Alaska. Most observers, whether observing over long or short periods, have tended to assume that village nutrition levels for children are inadequate and poorly balanced, including an overabundance of sugars and carbohydrates.

The single best historical information available on general nutrition of rural Alaskans (who are overwhelmingly Athapascan, Tlingit-Haida, Tshimpshian, Eskimo, and Aleut) is Heller and Scott's Alaska Dietary

Survey.[9] This work, nearly two decades old, tends to confirm part of these observations but varies strikingly from others. Heller and Scott suggest that at the time of their work there had been a substantial increase in carbohydrate intake; however, general caloric intake tended to be lower than the U.S. average.

They usually found calcium, ascorbic acid, and protein in abundance. However, there was a vast range in intake of most dietary elements. It is of interest that the Heller and Scott study used differing measures of nutritional adequacy based on NRC standards of 1964. Their conclusions are thus not strictly comparable with those of later works. Additionally, they failed to present complete tabular material broken down by age and sex for all components and compared to then-established recommended allowances. Regardless of its adequacy, the study is seriously out of date. Further, work to update it would have to be of a different nature.

Furthermore, at the time of the Heller and Scott study it had been generally assumed that Alaska Native dietary intakes were distorted (through acculturation) and inadequate, compared to an assumed excellent aboriginal or precontact diet.

It would appear as though these assumptions were questionable 20 years previously, as well as today. A study of dietary intake in

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[9]Christine A. Heller and Edward M. Scott, The Alaska Dietary Survey, (Anchorage: Nutrition and Metabolic Disease Section, Arctic Health Research Center for the U.S. Department of Health, Education, and Welfare, 1976).

January 1974, in the Dillingham region shows very similar findings to those of the late 1950's.[10] Essentially, there is wide variance in intake; protein is high and calories are low. Interestingly, when the NSLP lunch is substituted for what the children normally receive at lunch there seems to be little substantial benefit and in some cases actual nutritional retrogression.

The Tables V-1 through V-23 (Appendix B) include the following: Tables V-1 through V-6 present data from the Health and Nutrition Education Survey. These tables, based on U.S. data, show the daily intake levels of selected nutrients both in absolute numbers and as a percentage of the standard set by the U.S. DHEW per kilogram of body weight, for ages 10 to 14, by sex, race, and income category. (Those age groups were selected to make them comparable to the Stefanich data).

In order to make the Stefanich data on Alaska Eskimos comparable, actual body weights were compared to appropriately mathematically weighted weight averages by age and sex as found in the HANES material (see Appendix B, Tables V-7, 8). The values so derived provided a basis from which to compute average Eskimo nutritional intakes as a percentage of recommended daily allowances. This nutritional recommendation is tabulated on Table V-9.

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[10] Charlotte Stefanich, Analysis of Nutrition for Eskimo Children in Dillingham area, 1972 (unpublished). Also, see Section VI and Tables V-22 and V-23 in Appendix B.

Using these bases, the HANES findings could then be compared to the Stefanich data (V-10), the effect of the home lunch component could then be computed (V-11, 12), as could the effect of the NSLP lunch (V-13).

Table V-14 in Appendix B shows growth curves for Eskimos (height and weight) compared from 1928 to 1967 by Heller, and V-15 gives weight data for the Stefanich sample. Using these figures and HANES calorie-need assumptions, we see that Eskimos manage to gain disproportionate weight on inadequate calories (V-16), a finding which calls into question the standards being used. Table V-17 attempts by using HANES RDA's to calculate the actual need levels of nutrients for the Stefanich sample. How well nutritional needs are being met is indicated by height-weight data through time from 1901 to 1930, in a general sense by Table V-18 V-19, and V-20.

In comparing of Eskimo to U.S. sample weights for children by age (V-21), we find that Eskimos seem quite comparable to other U.S. populations in weight.

Tables V-22, V-23 include Stefanich original data.

The findings of the (Stefanich) study are appended in tabular forms and may be so analyzed by the reader. What is most striking, however, is that they do not clearly confirm the need, even in rural Alaska (at least in the sampled area) of an NSLP. That is, even where there are expectably poor nutritional bases, these do not show up on our analysis

of actual nutritional intake. A simple comparison of the HANES intake data, Tables V-1 through V-6, with our own analysis, V-7 and V-22, shows that Eskimos do not seem to be substantially different from other U.S. populations on any crucial measure in nutritional levels.

On the other hand, Nobman has analyzed over 2,000 Alaska Natives for iron deficiency and found it to be substantial.[11] However, her recommended course of action was (in the case of a nonmedical dietary problem) the simple introduction of iron as a dietary supplement plus dietary counseling (See Appendix A). We also remind the reader that there is some reasonable question about how high iron intake levels have been set).

Overall then, it is less than clear that a substantial nutritional deficit need exists. It is also less than clear why this assumed deficit need necessarily be met by a national nutritional supplement program.

Lest it be assumed that this situation is unique to Alaska, the Dietary Intake Findings (1977) of the U.S. DHEW for the entire U.S. are strikingly similar.[12] Overall, it suggests that Americans get more of all dietary necessities than they need, except (at certain ages) iron, vitamin A, and calories. If these findings are as parallel to the

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[11] Elizabeth D. Nobman, "Iron Deficiency Amenia in Alaska - Summary of Studies, 1971-1976," Native Health Service, Anchorage, Alaska, 1976.

[12] U.S. Department of Health, Education, and Welfare, Dietary Intake Findings. U.S. 1971-1974, DHEW Publication No. (HRA) 77-1647. National Center for Health Statistics, Hyatville, Md.

Alaska village studies as they seem, then it would appear, in the absence of evidence to the contrary, that diet is not as much a problem as is generally assumed either nationally or in Alaska.

It is interesting that even though Eskimo children appear to lean toward overweight (see Tables V-7 and V-8, and Figure V-1) and appear to be heavier on the average than non-Eskimo children, they are not receiving the RDA allowances for calories. This seems to raise questions about the standards, which appear to be too high, even though standards for calories are not given the "safety factor" bulge which other nutritional elements receive apart from the 25 percent boost over World Health Organization (W.H.O.) norms. Iron does appear to be potentially deficient, though Nobman notes there is little clinical evidence of iron deficiency outside of retention rates.[13] Since these rates are influenced by the body's capacity to store iron, we cannot be certain that the iron deficiency is substantial.

It is possible, of course, to remedy iron deficiency by supplementary iron. Except as a medical necessity, nutritionists tend not to favor this procedure since they feel associated trace elements in natural foods are thereby lost. The iron deficiencies, if indeed they are deficiencies, appear to be of the same order as those reported in the HANES nationwide survey regardless of income level. Whether this means the entire population of females in the U.S. is on the average

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[13] E. Nobman, "Iron Deficiency Amenia in Alaska, 1976.

data on children, at least concerning body mass, can be compared with that collected by Stefanich.[20] (See Tables V-14 through V-21, and Figure V-1.

The overall findings suggest the following:

Traditional Eskimo stature was short by European standards, though body mass was greater per unit of height. The overall picture of a stocky, well-muscled, relatively short people would appear to be racially characteristic of the Eskimo.

In general, there has been through time an appreciable increase in weight and a tendency toward increased height for Eskimos. Eskimo children in the sample analyzed for this study, show average weights in excess of norms for the U.S. population, as recorded by the Food and Nutrition Board.[21]

An explanation for this phenonmena may be increased calcium intakes which permit greater long bone growth and hence greater body mass accumulation. This change appears to have substantially antedated the NSLP so it can apparently take no credit for contribution to the altered physical characteristics. It is possible, however, that this

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[20] C. Stefanich, "Analysis of Nutrition for Eskimo Children in Dillingham," 1972.

[21] Food and Nutrition Board, Committee on Dietary Allowances, Committee on Interpretation of the Recommended Dietary Allowance, Recommended Dietary Allowances, eighth revised edition, (Washington, D.C.: National Academy of Sciences, 1974).

increased size, if it is real and not an artifact of sampling, may be assisted in the future by NSLP milk. On the other hand, Stefanich has suggested research may be necessary to determine tolerance levels for the chemical components of bovine lactation in a population historically unused to such food.[22] Thus, even the utility of additional milk may be questionable.

The Stefanich study utilized the RDA standards found in the 1974 CDA report.[23] These findings are reproduced in their aggregate form as prepared by Stefanich (Tables V-22 and V-23). The Stefanich summary (Appendix B) also provides a base for analyzing the tabular material.

Overall, the data we have suggest that there is no clear evidence of malnourishment among Alaska Native children in the six villages under study. Since we assumed that small villages such as these would probably present a "worst case," the findings strongly suggest that on the average there are no easily identifiable nutritional deficiencies.

These findings while clearly only preliminary and suggestive do seem to agree with more substantial work which came to our attention at the conclusion of the study. Draper, for example, finds Eskimo diet to

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[22] Charlotte Stefanich, personal communication, 1978.

[23] Committee on Dietary Allowances, Recommended Dietary Allowances, (Washington, D.C.: National Academy of Sciences, 1974).

be similar in its adequacy to that found in economically and socially similar groups in the U.S. (which tends to confirm our use of the HANES survey material as appropriate), a finding with which we had independently agreed.[24]

Bell and Heller in comparing northern and southern Alaska Eskimos in the 1960s and the late 1970s concluded that for the calcium-phosphorus balance, there seemed to be little evidence of malnourishment among Eskimos.[25] Bergan and Bell in reporting the results of the biochemical analysis used to determine the nutritional status of Eskimos from Wainwright, Point Hope, Kasigluk and Nunapichuk find adequacy of nutrition in all elements except for iron (the element in which the entire U.S. population is assumedly low).[26] Finally, Colbert, Mann, and Hursk in an analysis of the populations of Wainwright, Point Hope, Kasigluk, and Nunapickuk state that there are "no clinical entities specifically due to nutritional deficiencies."[27]

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[24]H.H. Draper, "Nutrition Studies: The Aboriginal Eskimos' Diet - A Modern Perspective," in Paul Jamison, Stephen Zegura, and Frederick A. Milan (eds), Eskimos of Northwestern Alaska, (Straudsburg: Dowden, Hutchinson and Ross Co., 1978), pp. 139-144.

[25]Raines Bell and Christine Heller, "Nutrition Studies: An Appraisal of the Modern North Alaskan Eskimo Diet," in Paul Jamison, Stephen Zegura and Frederick A. Milan (eds.) Eskimos of Northwestern Alaska. (Straudsburg: Dowden, Hutchinson and Ross Co.:1978)145-157.

[26]J.G. Bergan and R. Raines Bell, "Nutrition Studies: Clinical Observations on Nutritional Health," in Paul Jamison, Stephen Zegura, and Frederick A. Milan (eds.). Eskimos of Northwestern Alaska (Straudsburg: Dowden, Hutchinson and Ross Co., 1978), pp. 157-161.

[27]M.J. Colbert, G.V. Mann, and L.M. Hursk, "Nutrition Studies: Clinical Observations on Nutritional Health" in Paul Jamison, Stephen Zegura and Frederick A. Milan (eds.) Eskimos of Northwestern Alaska (Straudsburg: Dowden, Hutchinson and Ross Co., 1978), pp. 162-173.

Overall then, the most pertinent data we can find supports or at least strongly suggests the conclusion that there is no nutritional deficiency among Alaska Native school children (who might be expected to provide the lower limit of adequate nutrition cases in Alaska).

Even more significant than the nutritional status averages (which may obscure individual cases) is the fact that Colbert et al found no cases at all of clinical problems caused by malnutrition.[28] This does not mean no such cases exist in the state nor does it mean that no infants are nutritionally deprived. But it does mean the burden of proof shifts to those who assert that the deficiency exists.

If we turn once again to the Stefanich work, using a more cautious approach, we may say that even though averages of nutritional intakes are high, we do find wide standard deviations from the mean in all nutrient intakes. Theoretically the 24-hour recall approach allows these variants to "wash out." That is, children high on one nutrient today may be low tomorrow, and vice versa. The average of a given day is therefore assumed to reflect a reasonable daily group average. In this case the "average" diet appears adequate. Still, it is possible that some children are basically malnourished. As we have seen from previous work cited in earlier chapters, this is probably a function of multiple-problem family situations and not easily ameliorated by NSLP. Still, this is a question to be answered by further research and not by speculation.

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[28] Ibid.

C. Program Persistence

If these observations are correct, one has some reason to wonder, apart from ignorance of the subject, why the program continues and is pushed harder and harder by its supporters.

In this case, we have suggested that the fundamental need to which the program is assumedly addressed is at least a questionable one. In that event, the general governmental responsibility to meet it might seem to be moot, in the absence of other reasons to continue it.

Governmental programs, however, often have their own dynamics, generally based in part upon ideological assumptions and/or some degree of vested self interest. For example, further decline in the program participation might well endanger those jobs connected with the program. In addition, there are those who are convinced that governmental action is warranted in many aspects of human life.

Nothing seems clearer, however, than the power of governmental programs to continue regardless of consensually defined social need. We have seen that the HANES survey shows substantial nutritional levels in the U.S. If this represents a decline, it would be interesting to see from what levels this decline has occurred. If this represents, as it well may, an appreciating level of human nutrition in the U.S., then the continued pressure for the school lunch program becomes somewhat enigmatic. It would appear that at the same time nutritional levels are apparently becoming more adequate, pressure for governmental intervention to

overcome what passes in the conventional wisdom for inadequate nutrition, is increasing.

The American School Food Service Association is presently pressing for subsidized food service to every child nationally and hopes to reach a goal of meeting 50 percent of the child's nutritional needs "without cost to the individual."[29] If there is any objective justification for this beyond increasing the size of the agency staffs which administer such programs and the number of food service employees hired by such programs, it is not clearly evident from the results of the HANES survey. Nor is it clear in the Alaska case, from our own admittedly limited research. In addition, "without cost to the individual" seems to be a phrase of art which obscures the fact that somewhere, someone is paying.

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[29]Dennis H. Barrett, Food Service Manual, Anchorage School District, 1977.

VI. ECONOMIC ANALYSIS OF THE NATIONAL SCHOOL LUNCH PROGRAM IN ALASKA

Part of our findings seem to suggest that there is some considerable doubt about the need for the NSLP for nutritional supplement purposes. However, coterminous with the work reported in the first part of this report, we undertook an analysis of the reasons for the decline in participation in the program. This part of the work focuses principally upon economic reasons for lowered participation (although some structural and political reasons existed as well), and suggests how these factors may influence the future of the NSLP in Alaska.

We have also analyzed the cost of district NSLP programs in order to (1) generate cost guidelines for program administrators, (2) help furnish allocation guidelines for state administrators should the program be continued, and (3) identify areas where further research is needed.

A. History of Recent National School Lunch Program Performance in Alaska

Alaskan school children's patronage of the NSLP has been declining since at least 1972, the earliest school year for which we were able to obtain detailed data on program performance at the district level. In the 1972 school year, almost five and one half million lunches were served. By the 1976 school year, the total had declined to just under

four million. That this decline occurred at a time when Alaska's population and school enrollment were growing rapidly underscores the severity of the program's weakness in Alaska.

We have limited our analysis of program performance to borough and municipal districts, omitting Rural Education Attendance Areas (REAA's) for two reasons:

First, because we were unable to assemble reliable historical data on the NSLP in the REAA's (formerly State-Operated Schools) back to 1972, we could not test the same hypotheses used for the borough and municipal districts. Second, the conditions under which the REAA NSLP's are administered and financed differ significantly from those in boroughs and municipalities, as do the causes of decline.

In Borough and Municipal districts, lunches served to students declined from 4.7 million in the 1972 school year to 3.8 million in the 1976 school year--about 18.5 percent--while enrollment climbed almost 10 percent. The combined effect was that while 43 percent of those attending these schools purchased lunches on an average day in 1972, slightly under 30 percent did so in 1976.

Our data reveals two distinct phases of NSLP decline. Through the 1975 school year, declining program participation is almost totally attributable to falling patronage in schools with established programs.

While some districts joined the program and others dropped, these were few and their enrollments small. Throughout the four school years ending in June 1976, 97 percent of borough and city school district students attended schools with NSLP programs.[1] Virtually every student had the opportunity to participate. In 1972, 43 percent chose to do so. This fraction declined steadily to 34 percent in the 1975 school year. Figure VI-A depicts these trends.

The 1975 school year marked the advent of the second phase of NSLP decline. For the first time, program discontinuation by a school district became the major factor in declining participation. Fairbanks and Juneau, districts with the state's second and third largest enrollments, respectively, dropped out of the program at the end of the school year.

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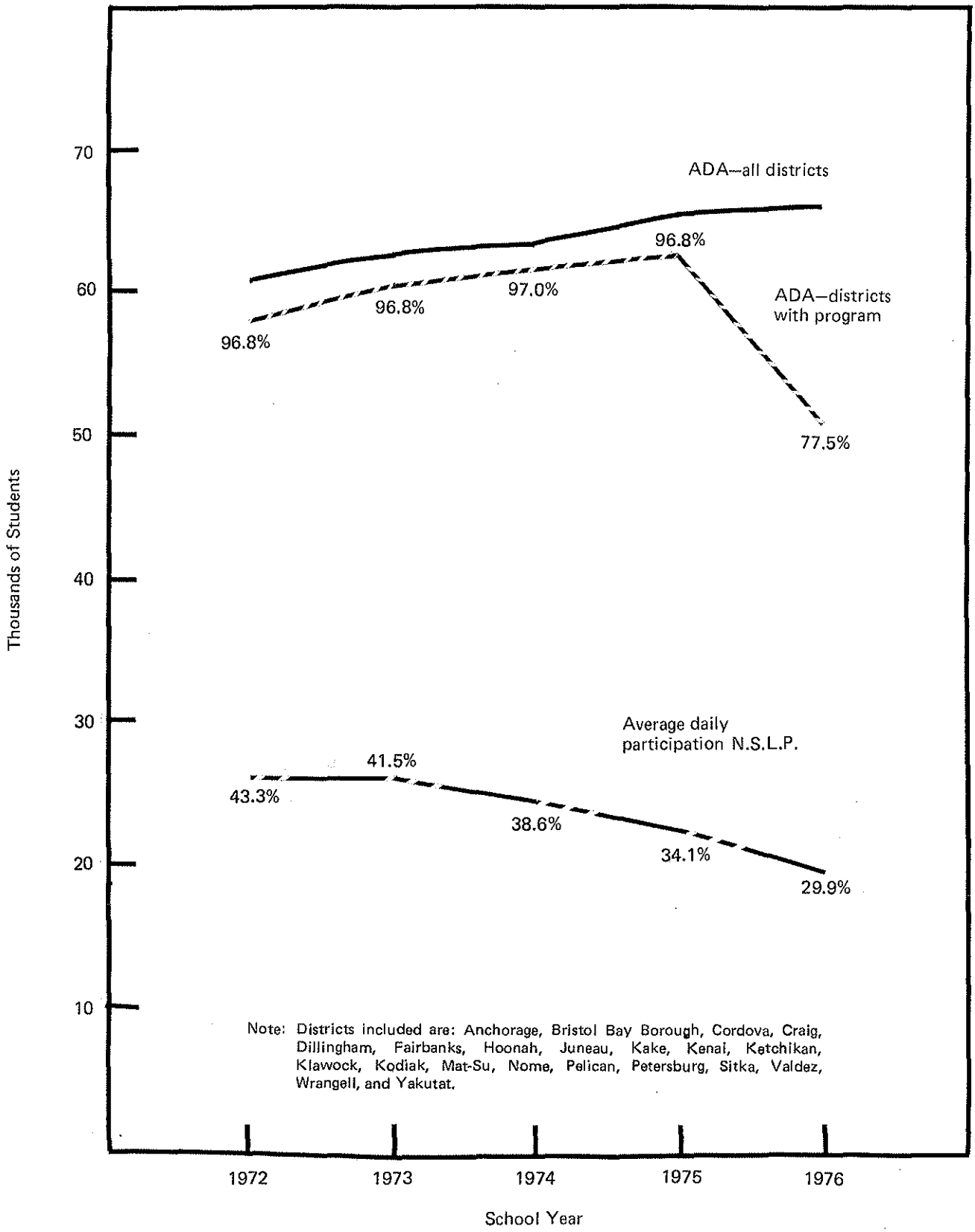
[1] Unless otherwise noted, these and following figures are based on a subsample of twenty-one districts for which complete and consistent data could be assembed back to 1972. Nine other districts with a combined average daily attendance (ADA) of 2,504 in 1976 and a combined average daily NSLP particpation (ADP) in 1976 of 1,206 were omitted because of missing or inconsistent data. Those omitted were:

Galena City	1976 ADA	1976 ADP
Galena City	134	119
Haines	442	0
Hydaburg	97	86
King Cove	115	36
Nenana	170	28
North Slope	1,115	764
St. Marys	145	115
Skagway	121	0
Unalaska	115	59
Total	2,504	1,206

Figure VI-A History of N.S.L.P. in 21 Large Borough and Municipal School Districts*—1972 through 1976



Program exposure (i.e., the percent of average daily attendance in participating districts) dropped from 97 percent to 78 percent, and NSLP average daily participation went from 22.3 to 19.7 thousand, virtually all because of program discontinuation in Fairbanks and Juneau.

Program decline is attributable to two factors: (1) students in schools with a lunch program who choose not to take lunches, and (2) school districts discontinuing the lunch program. To estimate the importance of loss of student patronage to program decline from 1972 to 1976, we calculated the number of lunches that would have been served in 1976 if (1) no districts had dropped or joined the program between 1972 and 1976, and (2) the same proportion of the student body had taken a lunch in 1976 that had taken one in 1972. In the latter year, actual program (average daily participation) was about 6,000 less than our "baseline" calculation. Of this, 60 percent of the difference was attributable to declining student patronage in districts keeping the program and the remaining 40 percent to districts dropping the program (primarily Juneau and Fairbanks).

B. Methodology and Data Sources for Assessing Economic Factors Contributing to NSLP Decline in Alaska

We separated our analysis into two parts: (1) why student patronage in borough and municipal districts with programs has been decreasing, and (2) why districts chose to drop the program.

1. Student participation

To identify some factors underlying the decline of student patronage, we initially considered surveying students and parents. Such a survey would have directly provided information needed to understand program performance. For example:

- How and by whom is the decision made within the family to purchase a school lunch?

- How do parents perceive the cost, nutritional value, and taste appeal of a school lunch compared to alternatives, and how does this relate to program use?

- How do students perceive the lunch?

- How sensitive is student patronage to lunchroom atmosphere, waiting line time, and menu variety?

- What other factors condition program patronage, e.g., family economic status, distance from home to school, whether or not both parents are working?

At the proposal development stage, ISER decided, with the concurrence of the Alaska Department of Education, that time and funding constraints would preclude the use of such a survey. Instead, we found

it necessary to rely on cross-sectional analysis of secondary data sources and interviews with selected district personnel. We attempted to relate the percentage of student body patronizing a district's NSLP in a given school year to price charged for a lunch and also, to such aggregate socioeconomic variables as per capita income, unemployment rate, and workforce participation in the district. Participation rates varied widely among districts from a low of less than 10 percent to about 70 percent. By looking at factors which strongly correlate with low district participation at a point in time using stepwise multiple regression analysis, we hoped to gain insight into the causes of program decline over time. This analysis was supplemented by looking at the correlation between (1) changes in participation from one year to the next and (2) changes in price and the socioeconomic variables given above.

An understanding of the factors which are or have been associated with program participation level also has obvious value for forecasting how future program usership would change as socioeconomic conditions in the district changed or as price changed.

Data on program participation within districts by class of user (full price, reduced price, or free-lunch consumers), the price charged, and information on the presence of other school food programs for the 1972-1976 school years were supplied by the Alaska Department of Education.

District enrollment data for the same years were taken from Alaska Department of Education annual reports. Most socioeconomic data such as population, number in the labor force, and number of unemployed were taken from various Alaska Department of Labor Statistical Quarterlies. Income figures by place of residence for 1972-1975 come from Local Area Personal Income - 1970-1975, Vol. 9, Far West Region, including Alaska and Hawaii, by the U.S. Department of Commerce's Bureau of Economic Analysis. 1976 incomes were unavailable from this source. We assumed that 1976 incomes bear the same relationship to 1975 incomes as 1976 wage and salary payments bear to 1975 wage and salary payments (both these are available from the Statistical Quarterlies).

2. District Participation

Our analysis of (1) why districts have chosen to drop out and (2) what pressure may force others to do so in the future draws heavily on about thirty in-depth interviews. We conducted these with district and program administrators in the Juneau, Fairbanks, and Anchorage districts; with past and present School Board members; and with State Department of Education officials. We also analyzed boards-of-education meeting minutes, committee reports, and food service consultant reports and outside agency reports evaluating food service programs in these three districts. As explained previously, those we interviewed were carefully selected to represent a diversity of interests and perspectives on the NSLP. Principals, for instance, were selected to cover elementary,

intermediate, and secondary schools in as full a range of socioeconomic settings as the district encompassed.

As a check on conclusions drawn from these interviews, minutes, and reports, we used a statistical procedure called discriminant analysis to probe factors underlying the decision to drop out of the NSLP. In addition to the program cost and participation and district socioeconomic data that we used to investigate student participation by district, we examined the relationship between total school district expenses per student, property tax effort in the district, and size of district subsidy to the lunch program. District budgets and district subsidies came from audited district income and expenditure accounts provided by the State Department of Education. Property tax revenues were derived from the Alaska Department of Community and Regional Affairs annual Alaska Taxable. Property tax revenues excluding those derived from oil and gas properties (since we are primarily interested in those falling on residential properties) were divided by a measure of the aggregate personal income to generate a property tax effort index.

C. Analysis of National School Lunch Program Decline in Borough and Municipal School Districts

1. Why Students Drop Out

Potential program users can be divided into two classes - those who meet the family income eligibility criteria for a free or reduced lunch and those who do not.

a. Full-Price Lunch Participation

About two-thirds of the decline in participation in districts remaining in the program throughout the 1972-1976 period came from a declining portion of students making full-price purchases.

In an attempt to assess the relative importance of the many factors which might discourage students from purchasing a full price NSLP lunch, we used regression analysis to find a linear equation that best related full-price participation to such factors as price charged, income, unemployment rate, and percent of the district's population in the work force, and the presence or absence of other Federal school food programs, such as the Special Milk and Breakfast programs. We found that price alone accounted for about a third of the variation in full-price participation among districts, indicating the importance of program economics to success. Another 25 percent of the variation was associated with income, unemployment rate, and percentage of population in the work force. Whether or not other food programs were operating in the district seemed to make little difference; however, because only a few schools in a district may have had these programs, our test for association was a weak one.

Our analysis indicates a $.10 increase in the cost of a lunch is associated with an decrease of 3.7 percentage points in full-price participation and vice-versa. Since full-price participation in 1976

averaged 29.1 percent of those eligible, we can infer that a $.10 rise in price charged (17.2 percent of the average $.58 price) would depress full-price program patronage by an estimated 12.7 percent. This is in very close agreement with price sensitivity found among small Washington state districts' participants in 1970-71. (Our price elasticity of demand is 0.74, their's was 0.77).

Approximately 40 percent of the variation in full-price participation was unrelated to the variables entered into the statistical analysis and is presumably related to those qualitative factors we did not investigate. These include the quality and appeal of food, the time allotted for lunch, waiting line time, the atmosphere in the eating area, menu variety, and as alternatives to the type A lunch (such as snack bar meals, vending machines, commercial establishments located near "open campus" schools), which will also affect NSLP participation. As explained before, we didn't analyze these for the wide range of districts included in the statistical analysis, because to do so would have required a school-level data base rather than the district-level base we assembled. Such a study would also require program-user interviews, which are beyond the scope of this project.

Our interviews with Alaska district and school personnel did corroborate the implication of the statistical analysis that these qualitative factors are important. Program and school administrators interviewed mentioned disturbingly high rates of per plate food waste in some districts. This may indicate that one major cause of student

nonparticipation is the failure of programs to accommodate changing student tastes while serving a nutritious, quality lunch. The few West Coast food service directors we spoke with were unanimous in their opinions that sensitivity to students' desires is critical to a successful program, although they each favored different types of programs as best responding to student needs.

b. Free and Reduced-Price Lunch Participation

The other one-third drop in existing program participation can be traced to a declining percentage of student bodies taking free or reduced-price lunches. Certainly, the same noneconomic factors that affect participation of full-price purchasers will have some influence on the fraction of those eligible for free or reduced-price lunches. Likely, a more important cause of decline in free and reduced-price lunches is simply that with Alaskan wages (spurred by the pipeline construction) rising faster than those national costs used by USDA to determine free and reduced-price income eligibility, progressively fewer Alaskan families were qualifying for free and reduced-price meals. Native corporation payments to members is another factor in declining free and reduced-price lunch eligiblity. The influence of these factors is clearly seen in movements in the number of free and reduced-price lunches served in communities such as Fairbanks, which were most directly impacted by pipeline construction, and in some predominantly Native settlements. In one year at the height of the pipeline boom in Fairbanks, the number of free and reduced-price lunches dropped from 73 thousand to 46 thousand.

This pattern was repeated in less emphatic fashion in many other communities throughout the state.[2] The number of free and reduced-price lunches slipped significantly from 1973 to 1975 in the face of growing enrollments and then turned up again in 1976-77 as the pipeline boom waned. Indications are that the trend continued through the 1977 school year. Figure VI-B shows the percentage of lunches in the organized school districts that were free or reduced in price from 1972 through 1976. Figure VI-C illustrates the changing relationship of Alaskan incomes to the U.S. Department of Agriculture's family income cutoff for free-lunch eligibility.[3]

c. Summary

In conclusion, we found that community economic conditions and lunch price charged are very important to program patronage. These alone accounted for about 60 percent of the interdistrict variation in the fraction of the student body not eligible for a free or reduced-price lunch that purchased a full-priced one. This indicates that the State could substantially influence program patronage by subsidizing

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[2]For example, in Anchorage, Bristol Bay, Galena, Craig, Hoonah and Ketchikan.

[3]Note that per capita income rising faster than USDA income cutoffs for free or reduced lunches does not alone guarantee that the portion of families eligible for free or reduced-price lunches will decline. One must make a further assumption about the distribution of income change among economic classes - that lower income groups are substantially benefitting. Analysis of income change in Fairbanks between 1973 and 1976 supports this assumption.

Figure VI-B. Percentage of Free and Reduced-Price Lunches in Alaska's Borough and Municipal School Districts—1972 through 1976

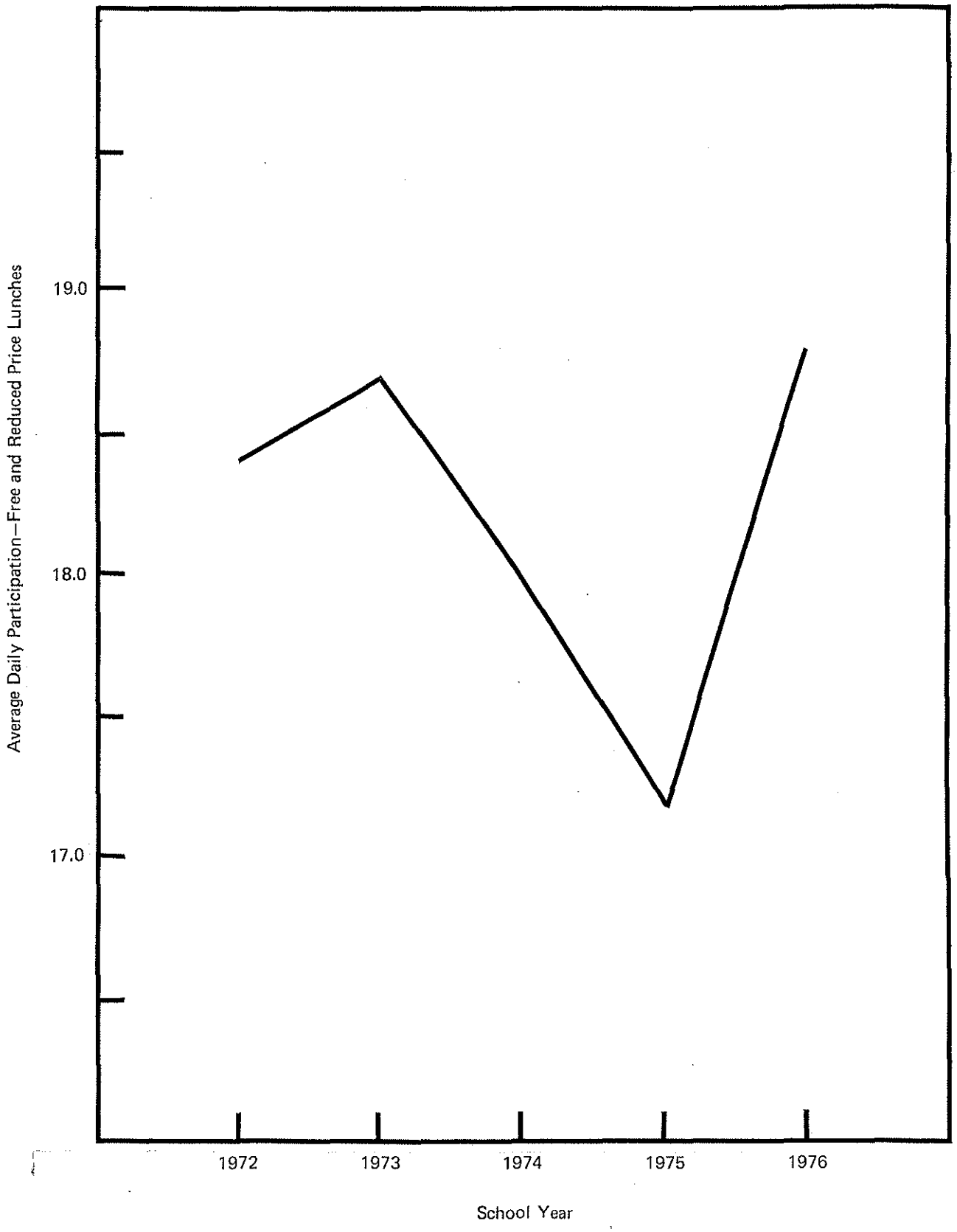
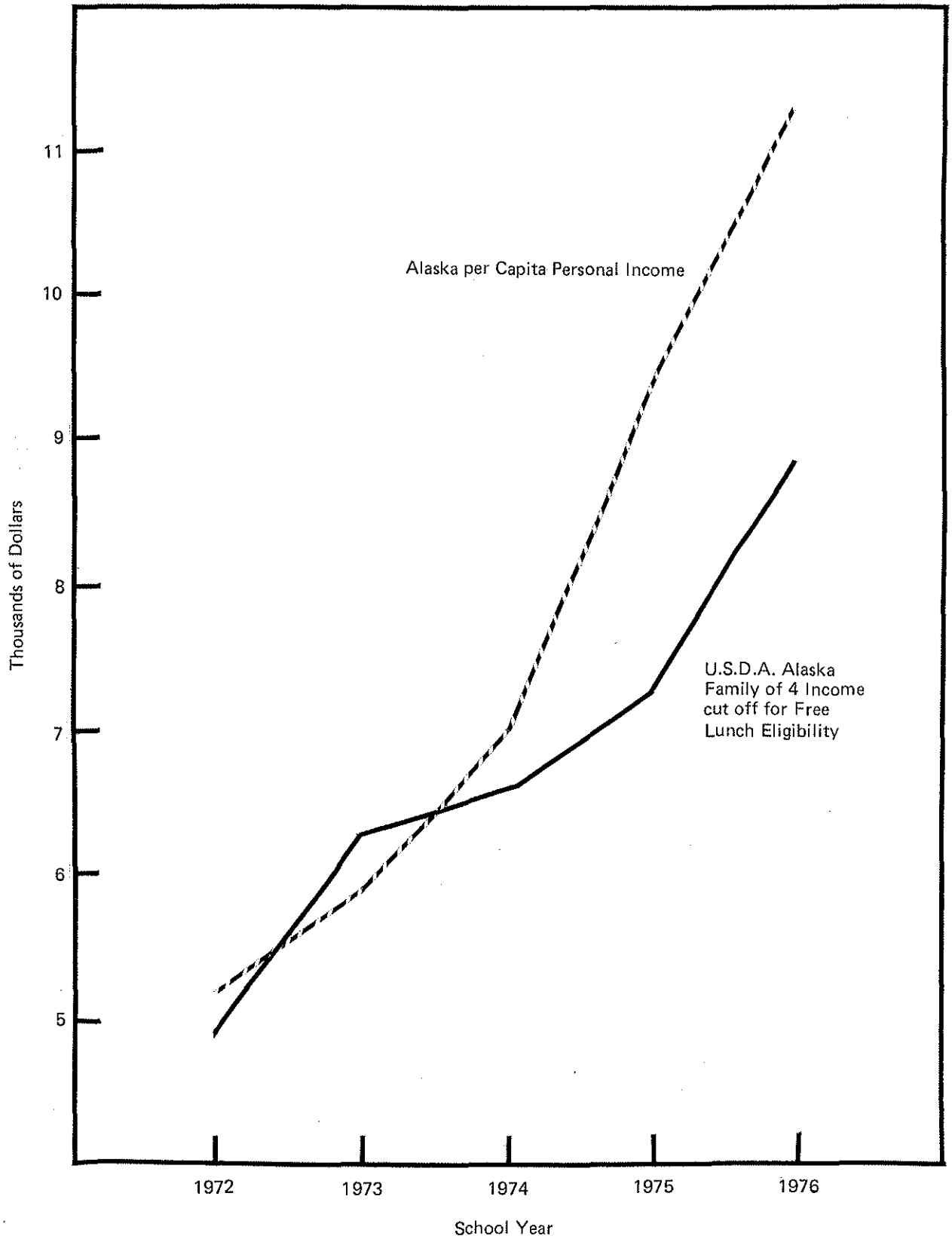


Figure VI-C Family Income Criterion for Free N.S.L.P. Lunch versus Alaskan per Capita Income—1972 through 1976



district programs in a way that passes the subsidy on to users in the form of a lower-priced meal. There is strong evidence that the decline in free and reduced-price lunches results largely from the rapid rise in Alaskan incomes in the 1970's and the consequent decline in eligiblity for special user status.

Finally, both the statistical data and interview-generated data point to the conclusion that qualitative program factors are very important to program success and that program responsiveness to changing student tastes is critical. While an in-depth consideration of these factors is not within the scope of work here, we recommend that the state undertake a study of their effect on program participation as part of any effort to aid the NSLP in Alaska.

2. Why Schools Drop the Program

As noted previously, 40 percent of the decline in lunches produced is attributable to districts chosing to discontinue the Type-A NSLP lunch. Thus far, only two major districts--Juneau and Anchorage--have chosen this course, but as we will show, economic forces are likely to prompt other districts to re-examine their participation in the near future.

Incentatives for district administrators to continue in the program can be grouped into three classes:

a. Program Need

Included here are considerations of available alternatives to the Type A lunch. How easily can students go home for lunch? Are there commercial establishments serving attractive and competitively-priced fare nearby? Does the program provide a means by which the federal government can assist a significant needy fraction of the community to purchase a federally-subsidized free or reduced-price lunch?

b. Program Means

Questions here include: how much does the program cost and what portion of this must come from the district general fund (putting the program in competition with others)? What resources can the district draw upon to meet program deficits? How burdensome is the existing local property and sale tax structure? Considering this and the communities' attitude toward subsidization, how feasible is it to draw more revenue from residents?

c. Program Support

What groups--such as recipient families of free and reduced-price lunches--have both the incentive and organization requisite to press their demands for program continuation?

The following sections discuss the evolution of conditions which would tend to encourage or discourage borough and municipal school district participation in the National School Lunch Program. After that, we will turn our attention to an analysis of causes that precipitated program discontinuation in Juneau and Fairbanks.

a. Program Need

One of the justifications for the NSLP has been as a vehicle to provide nutritious meals to children, especially those that might not otherwise be able to afford them.

But as pointed out earlier in discussing decline in patronage of existing programs, rising real incomes[4] in the state means fewer qualify for free or reduced-price lunches. This point is not lost on district administrators searching for means to bring burgeoning budgets into balance. In 1976, fewer than 20 percent[5] of program patrons were needy enough to qualify for free or reduced-price lunches--far below the national average.

A more basic question of need is whether the program nutritionally benefits users, needy or otherwise. District administrators pouring money into deficit-ridden lunch programs are likely to question the

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[4]Incomes that are adjusted for rising costs of living.

[5]However, this ranges up to 88 percent in some small, Native bush communities and down to 8 percent in urban Alaska.

wisdom of continuing to do so if significant plate waste casts doubt on the program's nutritional effectiveness. Food in the garbage can represents a significant cost to the district, with no nutritional payoff to students.

Finally, the need for a school lunch program may be reduced as alternative sources of meals (in addition to the brown bag lunch) increase. Many secondary school children in Alaska's urban areas now can purchase lunches at nearby commercial establishments. The trend toward greater availability of these lunches will probably continue for two reasons. One is the continuing concentration of the State's population in large, urban school districts where market volumes allow location of commercial eating establishments near schools. The second factor is the shift in student taste from the traditional style lunch to pre-prepared fast food. These fast foods require very little on-site preparation, allowing vendors to market them from delivery trucks near "open campus" secondary schools.

In light of these considerations, justification of additional public support of the NSLP at the state and local levels rests on the validity of two contentions:

(1) The absence of a NSLP can be linked to nutritional deficiency or other costs to the children or adults of the community.

(2) The NSLP provides districts with a valuable opportunity to guide as well as respond to the eating habits of children through the integration of the program into a nutrition education curriculum.

b. Program Means

District administrators would not closely question the need for the NSLP if it were self-supporting. However, few if any type-A lunch programs in Alaska are self-supporting. The three revenue sources for programs are lunch sales, federal payments, and a local subsidy. The federal reimbursement schedule, based as it is on nationwide food preparation costs, has never adequately compensated for high Alaskan costs. Our data give some indication of the aggravation of this situation. Figure VI-D shows the erosion of federal reimbursement as a program revenue source. Reasons for this will be discussed later in the program economics section. For our discussion here, it suffices to point out that declining federal support leaves a larger fraction of program costs to be met by some combination of a higher price lunch and bigger local subsidy.

Whether intentional or not, most district and program administrators have increasingly placed the burden of rising program costs on local subsidization. Tables VI-1 and VI-2 show that organized district lunch prices have not risen as fast as the cost of producing a Type-A lunch. The average cost in Alaska, to serve a Type-A lunch in 1976 was $1.40, or about 60 percent higher than in 1972. The average charge for a full-

Figure VI-D Fraction of Organized Alaskan District N.S.L.P. Cost Met by Federal Government—1972 through 1976

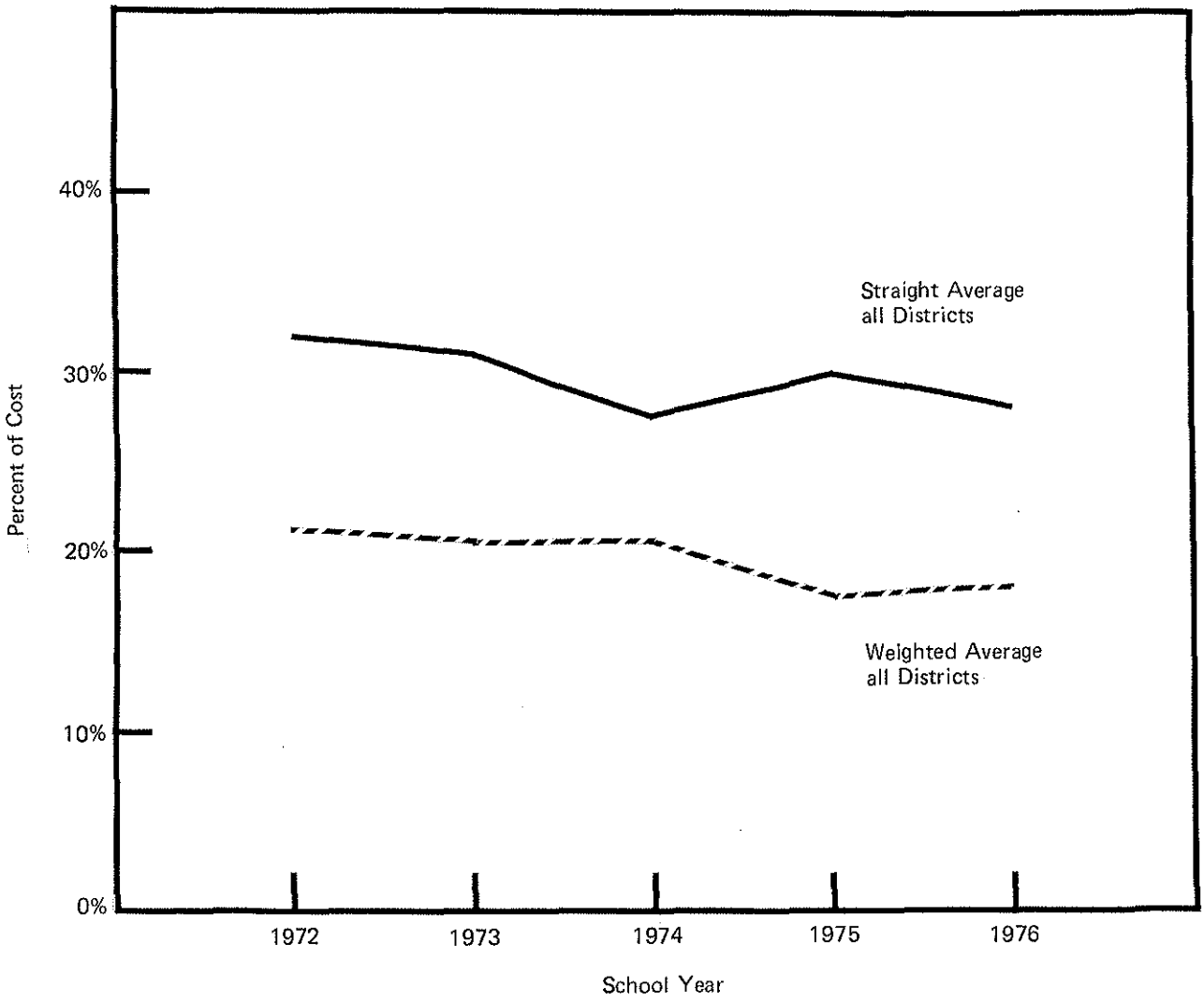

Table VI-1

Cost of Type A National School Lunch Program Lunch in Alaska and the Price Charged, 1972-1976

Year	Cost Per Lunch			Full Price Charged	
	straight average all districts	Index—straight average all districts (type A lunch cost divided by cost of food at home)	weighted average all districts	straight average all districts	weighted average all districts
	1	2	3	4	5
1976	$1.57	$1.07	$1.40	$0.58	$1.00
1975	1.43	0.98	1.37	0.58	
1974	1.34	1.25	1.20	0.47	0.93
1973	1.18	1.03	1.12	0.47	0.80
1972	0.89	0.89	0.88	0.45	0.67

Table VI-2

Percentage of Alaskan National School Lunch Program Costs Met by Lunch Sales and Local Subsidy, 1972-1976

Year	Sales		Local Subsidy		
	straight average all districts	weighted average all districts	straight average all districts	weighted average all districts	Local Subsidy Per Full-Priced Lunch - straight average*
1976	33.1%	57.9%	39.0%	23.9%	74¢
1975	35.5	58.7	36.4	22.7	63¢
1974	32.6	63.6	37.1	15.8	65¢
1973	34.9	56.8	37.1	22.5	47¢
1972	42.0	62.1	27.0	16.6	25¢

* 1975 and 1976 Figures are raised by North Slope School District which provides all lunches free, absorbing a loss of almost $4.00 per lunch in 1976.

price lunch rose only 50 percent to $1.00 over the same period. The growing gap between program cost on the one hand and sales and federal subsidy on the other must, of course, be met with local district funds.

Column 3 of Table VI-1 hints at one plausible hypothesis regarding administrators' reluctance to raise prices as fast as costs. The column entries show the weighted average per lunch cost for a given year divided by a cost of "food at home" index for the relevant community in that year. This time series then gives the price of a Type A lunch relative to its chief competition--the brown bag lunch. If the cost of a brown bag lunch rose more quickly than that of a Type A lunch, giving the latter a competitive edge, this index would decline. As can be seen, the general trend has been up, indicating NSLP lunch costs are rising faster than brown bag lunch costs.[6] In fact, "food at home" costs in Anchorage rose 51.6 percent between 1972 and 1976, compared to a cost increase for a Type-A lunch of 60 percent. Program administrators, who have raised lunch prices by only 50.4 percent over the same period, may be mindful of the cost of alternatives and unwilling to risk massive program defection and the concomitant higher per-lunch fixed costs that might ensue with greater price increases.

Two other observations warrant discussion. The straight average cost and full-price figures of Table VI-1, of course, emphasize the economics of the state's small organized districts. The table shows

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[6]While "food at home" costs are a reasonable measure of brown bag lunch costs, they ignore labor costs which may be very important to single parents or two-wage-earner families.

costs in the small districts are rising faster and prices charged rising more slowly than in large districts. The resulting financial crunch could cause many small districts to re-evaluate program participation in the near future. On the other hand, many may be willing to bear with program deficits as long as the number of free and reduced-price beneficiaries, which are concentrated in small, rural districts, remains high. On balance, we cannot say without further study which of these factors will predominate.

The second important finding is that administrators have failed to react quickly enough to rising program costs. Costs skyrocketed between 1972 and 1973, but in many districts, huge deficits were allowed to develop over a year or two before prices were raised. In Anchorage, for instance, the NSLP deficit more than doubled to $600,000 in a single year, before being trimmed by sharp price increases. Table VI-2 illustrates how the NSLP burden on local tax revenues was allowed to grow before being checked. The district burden went from an average of under $.15 per lunch in 1972, to $.27 per lunch in 1975.

c. Program Support

Our interviews with district and school administrators reveal that program support is weak. Few school officials accord the program high priority and some frankly state that federal reporting regulations are not worth the shrinking federal reimbursement. Effective working relationships between superintendents, district business managers, and

food service directors has been lacking in some important cases, undermining program support from within the district. Some who we interviewed went so far as to say that the food service organization in their district was a bureaucracy unto itself and not responsive to suggestions from others. (See section on Fairbanks nonparticipation).

Few administrators feel the program is nutritionally necessary, which seems to support our findings on nutrition in Alaska and the U.S. They feel that students eat, or would eat, adequately in the absence of a school food program. They report little support in the community for the program except from harried parents, mostly middleclass and above, who would like to preserve the option of being able to buy out of the responsibility for making bag lunches for their children each morning.

It is not surprising that our respondents did not feel those eligible for free and reduced-price meals constitute an effective source of program support. In the larger Alaskan cities where we interviewed, recipients of free and reduced-price lunches account for only a small fraction of all lunches sold. Furthermore, recipients are not organized to make themselves heard. Finally, there is some evidence that as few as one-half of those whose applications for free and reduced-price lunches that have been approved regularly exercise their privilege. Evidently, even among those receiving special consideration, the program is not highly valued.

In any event in Alaska those programs which serve disproportionately large numbers of free and reduced-price lunches place an especially heavy burden on district budgets. It is a quirk of NSLP economics in Alaska that schools lose more on the average free lunch produced than they do on full-price lunches, even though they receive an extra 58.5 cents per lunch federal reimbursement for every free lunch produced in 1976. The additional reimbursement leaves an average shortfall of 41.5 cents in sales revenue foregone on each free lunch. In essence, the federal reimbursement schedule imposes on each Alaskan community the responsibility to match a significant portion of federal subsidy to the community's poor as a condition for program participation, quite contrary to the intent of the U.S. Child Nutrition Act.

Because each free and reduced-price lunch produced places an additional burden on district food service programs, any attempt to bolster program participation in the short run by supporting higher free and reduced-price income eligibility criteria may be counterproductive in the long run if not accompanied by greater reimbursement for free and reduced-price lunches served. Without such additional reimbursement, rising average daily participation, based on more free and reduced-price lunches will place a heavy burden on local subsidization, discouraging district participation.

3. Two Case Studies of District Discontinuation of The National School Lunch Program

a. Juneau

The Juneau School District ceased participating in the NSLP after the 1975-76 school year, according to the district superintendent, John Coffee and business manager, William Hogan, due to high program-operation costs. The school district (1975-76 school year) expended $100,000 of local money on the program. Furthermore, general operating expenses in the school district were to substantially increase the next year because of an aggregate $1,000,000 salary increase for teachers. Increases in salaries for food service employees were commensurately great, and associated costs were appreciated by general inflation. The board was faced with a district budget some $800,000 out of balance. Rather than trim programs across the board, it chose to cut several weak programs in order to preserve the strong ones.[7]

Faced with these circumstances, the school board cut the NSLP, swimming, driver education, and environmental education programs. According to Superintendent Coffee there was substantial public exposure to the issue, as well as discussion in numerous school board meetings,

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[7] Interview with John Coffee, Superintendent of School; William Hogan, School District Business Manager; January 17, 1978.

but there was very little protest from principals, teachers or members of the community in general to the decision.[8]

The NSLP was not an unlikely choice for cutting. In just four years, the cost of the food service program had more than doubled from $188,000 to $406,000 with little change in the number of lunches served. The price charged was increased from $.60 to $.80 in this period. This response to rising costs left a larger and larger share of program expense to be met by local subsidy. From $36,000 in 1972, the local funds to pay program costs not covered by sales and federal reimbursement increased fourfold to $143,000 in 1975. This amounted to a $34 subsidy each year for each student in the district, and only about one in four ate a school lunch on the average day.

Immediately prior to this decision to cut the program, a USDA survey team had evaluated the Juneau NSLP and found that part of the unusual costs were related to high turnover rates in all positions in the program. Especially significant was the instability at the managerial level: five food service directors in 4 years. The superintendent concurs that management was a problem. And, the school board felt there was substantial plate waste of unnecessarily costly foods.

Overall waste, costs, inefficiency, and student lack of interest in the food all seem to have been substantial factors. Marge Dawes (former State Food Service Coordinator and long-time Juneau resident), however,

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[8] Ibid.

does not completely concur. She believes that though management was inept, there had always been a general lack of interest in the program by district administrators. However, this seems merely to have reflected public opinion.[9]

Interviews with Juneau principals support the idea that there was limited interest in the program. Furthermore, principals found the program to be "a headache" due to the paperwork and confirmed that children did not seem to care for the food. Most principals supported dropping the program and apparently encountered little real public opposition.[10]

The majority of those we interviewed agreed that food quality had been low and the menu unimaginative and monotonous until shortly before program termination. Many characterized the amount of plate waste as appalling. The poor quality of the food and the rapidly rising prices (which increased until per-lunch costs far exceeded of those in comparable districts)[11] indicate poor program management. With five managers in four years, continuity was difficult. Some mentioned that district-level administrators never regarded the food service program

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[9] Interview with Marge Dawes, Juneau, January 1978.

[10] From interview with three Juneau principals, Juneau, January 1978.

[11] In the same year, nearby Ketchikan served more lunches for less than half what the Juneau program cost. Labor cost was 58 percent lower!

highly enough to budget adequately for a professional food service manager. No prestige was accorded the job of Food Service Manager. It was a general support function rather than a professional position. Partly as a result of the low salary and low prestige accorded the position, the district had a succession of managers who exercised poor purchasing and inventory controls, poor labor planning, and weak portion control.

When the time came to balance the district budget, few spoke out in favor of retaining a program that cost so much and delivered so little. The new food service manager had made some significant improvements and felt that, given another year, she could make substantial cuts in the deficit. But after years of mismanagement, time had run out.

The Juneau case raises useful questions. If the program was perceived as difficult to manage, top-heavy with paperwork, and expensive, what goals could have made such costs bearable? If a goal was to provide a necessary nutritional supplement, why were the lunches wasted so often and ignored by the students? Further, if, as one principal states, the only complaints about dropping the program were from a few parents who felt they did not have time to pack a child's lunch, where was the nutritional concern?[12]

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[12] Juneau principals, 1978.

In the absence of contrary evidence, we assume that the program was dropped because its attainable objectives were seen locally as available only at excessive cost and effort.

b. Fairbanks

The symptoms of program distress in Fairbanks were similar to those in Juneau, although the circumstances giving rise to them differed somewhat. Like Juneau, the percentage of students taking a hot lunch had declined steadily from 1972 until 1974 when only 31.6 percent of those not eligible for a free or reduced-price lunch participated in the program on an average day. The only major district with lower participation was Juneau. Also, as in Juneau, it was difficult to convincingly argue for the nutritional necessity of the program. Plate waste was high and reduced-price recipients (whom one might assume to be most in need of a nutritional supplement) represented a very low 10 percent of the district's average daily attendance. Pipeline period wages in boomtown Fairbanks left few eligible for special consideration in the National School Lunch Program.

The last, and perhaps most important, similarity between the Fairbanks and Juneau programs was the program deficit. While the Fairbanks program's demands on the district budget had not grown as Juneau's had, it had been a persistent and substantial drain on school district revenues for years. Although the North Star Borough School District's accounting practice of carrying over deficits from year to

year makes it almost impossible to say with certainty what the deficit was in a given year, it appears to have averaged about $100,000 a year for the four years, 1972 through 1976.

According to Gary Swart, the Fairbanks School District Business Manager and Coordinator for the food services program for the school district, had originally participated in NSLP with the hot Type- "A" lunch with some "pre-plated" lunches for satellite rural schools.[13] They shifted entirely to pre-plated lunches flown in from outside the state in 1975, and dropped the program in 1976 (after the 1975-1976 school year). During their participation, the Fairbanks North Star Borough School District attempted a "multiple selection" approach at the secondary school level (hamburger basket with french fried potatoes) and initiated snack bars. These options were so popular that the Class "A" lunch was being ignored, thus creating a problem of waste and extra costs.

Swart pointed to the high cost of labor (competition with the Trans-Alaska Oil Pipeline for cooks, at wages which could not be met locally), general high costs of preparation, and low participation (20-35 percent), as deciding factors in the school board's decision to abandon the program. The attempt at "pre-plating" (preparing and plating food prior to serving) was a move to avoid high costs. But sales slumped further, reportedly because of the poor quality of the food.[14]

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[13] Interview with Gary Swart, Fairbanks.

[14] Ibid.

Interestingly, with the shift to "brown bag" lunches necessitated by discontinuation of the school hot lunch, the school district found a decrease in milk sales and an increase in soda pop sales until the price of milk was reduced to $.15 per 1/2 pint. Still, only about 37 to 40 percent of the students presently buy milk.

James Movius, the School Board President, concurs in this general assessment.[15] In an attempt to make NSLP self-sustaining, the 1974 price was set at $1.50 per lunch. This resulted in a further decline in participation. Going to pre-plated lunches and reducing the price to $1.00 did not arrest the decline. He himself knew of no strong community opposition to dropping the program. Movius adds that obtaining meal tickets was viewed as burdensome by parents and students and this may have further reduced interest.

Marguerite Stetson, former Food Service Manager in Fairbanks, felt that management problems were central in the earlier (late 1960's) program.[16] After implementing recommendations from a 1969 management study, services improved and the program began to show a profit. Later managers, she felt, had insufficient business experience to make the program work. This coupled with very high labor costs, the charging of true indirect costs to the program, and a general lack of program support, she believed, caused the abandonment of the program.

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[15] Interview with James Movius, Fairbanks, February 23, 1978.

[16] Interview with Marguerite Stetson, Fairbanks, February 22, 1978.

The school board members who actually voted to cut the program did so, according to their statements, because of its costs and because federal money always "comes with strings." In addition, they felt the food tended to be of poor quality, and that children learned more about nutrition from eating brown bag lunches in their room with the teacher.[17]

Some of the federal "strings" become clearer in discussions with school principals.[18] One principal noted that much waste in elementary schools was a function of the large helping size, which was mandated by law. Other principals felt that too many reporting requirements existed at the local school level. Also, some of the principals believed that home-packed lunches were more creatively prepared and nutritious than the NSLP type. Principals noted that they were not aware of a decline in nutritional standards as a result of eliminating the NSLP. Among their comments were: "education should not try to provide everything," "federal programs mean federal control," "private commercial establishments can do it better," "kids eat more and better foods when they bring them from home," "most support for NSLP comes from special interest groups," and "food service in schools tends to build a bureaucracy."[19]

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[17] Interview with school board members Mary K. Barsdale and Carn Carlson, Fairbanks, February 22, 1978.

[18] Interviews with Fairbanks school principals, Fairbanks, February 1978.

[19] Ibid.

Overall, the responses from those we interviewed in Fairbanks do not differ fundamentally from those in Juneau. Again, in answering the same questions we posed to the Juneau case, it seems clear why the Fairbanks North Star Borough discontinued the program.

Beyond these similarities, however, there were three significant differences in the Fairbanks program environment that would have made it more difficult to nurture the program through hard times there. These were (1) the difficulty of hiring and keeping good food service workers at reasonable wages in boomtown Fairbanks, (2) the inefficient food preparation facilities with which the district was saddled, and (3) the distinctive Fairbanks political climate. These are dealt with in turn below.

Many we interviewed, especially those familiar with program economics, pointed to rising labor costs as the single most important factor contributing to the program's demise. The school district was forced to compete with the pipeline for good workers. So intense was this competition among employers that average monthly wages for Fairbanks eating and drinking establishment workers (S.I.C. 58) rose 86 percent[20] between the second quarter of 1972 and 1976, compared to a statewide average of only 52 percent.

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[20]Data from Alaska Department of Labor, Research and Analysis Section, Statistical Quarterly for 1972 and 1976.

Because about one-half of NSLP expenses were for labor, the impact of rising wages was severe. Food service administrators could attempt to cut labor costs by more careful task control but were hindered in doing so by an outmoded, labor-intensive system of kitchens in each school. A district of Fairbanks' size and density might have realized significant savings by using central kitchens to service elementary and, perhaps, junior high schools. In fact, all the other large Alaskan districts already used central kitchens. Fairbanks had over ten times the enrollment of the next largest district that depended on an onsite system of kitchens--Cordova. A consultant's report estimated that Fairbanks could have cut labor costs by 15 percent by going to a central kitchen with an output of 3,500 meals per day. Another 5 percent could have been saved on food. However, this would have required a substantial capital investment in a program that served few, and the return was uncertain. At its height, the Fairbanks NSLP had not reached an average daily participation (ADP) rate of 3,500. If this volume were not reached, per-lunch labor costs would be higher than calculated. During the 1974 school year, the board decided not to risk investing in a central kitchen and contracted with a caterer in the Los Angeles area for pre-plated lunches. The resulting high price and low quality of the food drove program participation down 30 percent in a single year. After the unsuccessful experiment with pre-plated lunches, few protested program termination at the end of the 1975 school year.

The third factor working against the NSLP in Fairbanks was the political climate there. Many were unwilling to make investments in turning around an ailing program structured so that it compromised local control in areas such as deciding the size portions to serve and setting prices for all program users. Fairbanks citizens resented having to serve what many considered wastefully large portions of food to qualify for federal reimbursement. More felt that to make paying customers subsidize free meals on which the district lost money was an unacceptable capitulation to a federal bureaucracy. One person seemed to sum the Fairbanks attitude when he said: "There are too many strings attached to this federal money to make it worth our taking it."

4. Statistical Analysis of Factors in National School Lunch Program Withdrawal in Alaska

In order to test more rigorously some of our perceptions of what factors were associated with the decision to withdraw from the NSLP, we subjected district level program and demographic data to discriminant analysis. Discriminant analysis is a statistical procedure that investigates which variables can be successfully used to discriminate between two or more classes of objects. Here our "objects" were Alaska's eight largest (by enrollment) school districts--Anchorage, Fairbanks, Juneau,

Kenai, Matanuska-Susitna, Ketchikan, Kodiak, and Sitka.[21] The two classes are those districts that dropped the NSLP in 1975 (Fairbanks and Juneau) and those that did not (all the rest). The variables we chose to "explain" the decision to continue or drop from the NSLP are of two types--level variables and trend variables. The level variable describes a district's population or lunch program as it was in the year the decision was made. Trend variables describe changes in variables over the preceding year. Not all those variables that one would expect to impinge on the decision were included, because (1) some were highly correlated with others, or (2) variable values of the districts dropping the program did not differ significantly from those staying in the program. That is, our sample was inadequate to test the importance of that particular variable. Table VI-3 shows the variables that entered our analysis.

The analysis seeks to find a linear function of these variables so that the difference in the values each group is assigned using the function is maximized. The resulting function can then be tested to the extent to which it does, in fact, correctly classify the objects. Normally, one would take the universe of objects and divide it into two parts--one to be used to find the discriminant function and the other to

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[21] We excluded the smaller school districts from our analysis for two reasons. First, in many instances, we were unable to get reliable demographic and program financial data for these districts. Second, we thought determinants of a small district's decision to join, drop the program, or maintain the status quo would be highly individual (for example, finding a reliable person willing to cook lunches) and not particularly amenable to generalization through statistical analysis.

Table VI-3
Variables Used in the Discriminant Analysis
of District National School Lunch Program Participation Changes

Factor Type	Variable Type	
	level	trend
Need:		
• program participation	x	nsd
• income	x	nsd
• unemployment	x	x
• percent of all lunches that are free	nsd	x
Means for Program Support:		
• site of local program subsidy per Average Daily Participation tax effort	x	x
• property tax revenues ÷ (ADA * INCOME)	nsd	nsd
• school budget per Average Daily Attendence	nsd	nsd

Key:

x = included in analysis
nsd = no significant difference between classes

test it. With only eight school districts, we could not do this. Since we used the same eight districts to find and test our discriminant function, our test is not as stringent as it should be. Nevertheless, the function derived was able to correctly classify all eight districts.

The standardized discriminant function coefficients[22] found are given in Table VI-4.

One need not become immersed in the mathematics of discriminant analysis to appreciate the message. The larger the standardized coefficient (whether positive or negative), the more sensitive districts apparently are to this variable in deciding whether or not to continue in the NSLP. The F value associated with each coefficient indicates how much the discriminating power of the function has been enhanced by the inclusion of that particular variable. High variables with positive coefficients are associated with a propensity to drop the NSLP and vice versa.

An examination of the coefficients in Table VI-4 shows that districts are very sensitive to changes in free and reduced-price participation. As patronage by this group declines, it becomes more likely the school

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[22] The standardized discriminant function uses standardized variable values in place of the raw value. The standardized value of variable for the ith object is:

$$\hat{a}_i = (\bar{a} - a_i)/\sigma_a$$

where $\bar{a}$ is the mean value of a

σ_a is the standard deviation of a

Table VI-4
Standardized Discriminant Function Variable Coefficient

Variable	Coefficient	F to Enter or Remove
Change in fraction of all lunches sold that are free or reduced price.	-1.12	2.2
Change in percent of work force unemployed	+0.81	4.0
Local subsidy per lunch	+0.78	2.9
Fraction of those not eligible for free or reduced price lunch participating in NSLP	-0.48	4.1

will discontinue the program. Low full-price patronage, as well as heavy local program subsidy discourages program continuation. The statistical analysis corroborates the conclusions we drew from our interviews.

D. Nature of NSLP Costs in Alaska

1. Purpose of Program Analysis

Because program costs have been shown to be at the root of many of the NSLP's ills in Alaska, we attempted to develop some guidelines for program cost. We felt such guidelines would be useful to district administrators as an index of program cost effectiveness and could be used by Alaska Department of Education officials as a basis for allocating any state NSLP aid on the basis of cost or documentation for requests to USDA to revise upward the Alaskan reimbursement schedule to reflect higher costs in the state.

2. Description of Program Costs in 1976 by Delivery System, Region, and Average Daily Participation

Per lunch program costs should depend on three factors:

a) Region of the state and isolation of the community (i.e., how easily accessible by highway or ferry).

b) Type of delivery system (on-site preparation, central kitchens, mixed on-site/central kitchen, or outside contract pre-plated).

c) Program volume (ADP).

We began by analyzing per lunch program costs among the state's National School Lunch Programs for the 1976 school year in attempting to assess the effect of each of these factors. Cost data were taken from audited revenue and expenditure accounts of borough and city district School Food Service Funds.[23] The number of lunches came from data provided by the Alaska Department of Education.

Ideally, one would categorize programs using the first three variables, that is assign each program to the appropriate cell in a three-dimensional program type array and then, within each cell, study the range of unit program costs. The range should primarily reflect the efficiency with which the various programs of a common region/delivery system/Average Daily Participation classification are managed. Unfortunately, the number of districts in the state is too small to allow such an approach. We felt we needed eight regions, four delivery-system

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[23] For some districts, we were unable to separate lunch program costs from other food service program (breakfast, milk) costs. This introduces some error in our figures. The error should not be large, since lunch programs account for almost all food service program expenditures in the state.

types, and eight program volume classes to adequately describe programs. This produces 8 x 4 x 8 = 256 possible program types. We had data on only about twenty actual programs.

Instead, we analyzed the effect of each variable on program costs separately. We began with a breakdown of per-lunch costs by region for the borough and city school districts. (We did not have reliable cost data for the REAA's.) The cost of almost any enterprise is higher in small, isolated communities. Food and material which must be shipped in low volumes carry with it high freight costs, unreliable delivery schedules, and force stocking of extra inventory. In addition, utilities and business services are more expensive.

With but eighteen districts in our data base, we used only three regions: (1) the easily accessible communities of Southeast, South-central, and Interior Alaska, (2) the small, isolated communities of Southeastern, and (3) the remainder of the state, or "bush." Table VI-5 shows which districts with type A-programs fell in each region. The average per-lunch costs were $1.20, $1.62, and $2.02, respectively. However, there was a considerable range within each region, no doubt partially due to our inability to control for program delivery type or size as well as the rather gross nature of the regions used. However, there is enough variation between similar programs to warrant the conclusion that some programs are poorly run. The consequent higher costs jeopardize programs by increasing the program's burden on district budgets or passing on higher costs to students and discouraging sales.

Table VI-5

Regional Classification of Alaskan
National School Lunch Participants in 1976

Region	Districts	Program Type	ADP
Southeast, Southcentral, and Interior - Accessible	Anchorage	Combination involving use of central kitchen	12,634
	Kenai		2,010
	Ketchikan		1,193
	Sitka		590
	Mat-Su		1,277
	Kodiak		684
	Cordova	on-site preparation	184
	Nenana	outside contract, pre-plated	28
	Petersburg		97
Isolated Southeast	Craig	on-site preparation	84
	Hoonah		205
	Yakutat		104
	Kake	information missing	150
Bush	Bristol Bay	on-site preparation	140
	Galena		119
	North Slope		764
	King Cove	central kitchens	36
	Nome	outside contract, pre-plated	370
	Unalaska		59
	St. Mary's	information missing	111

Note that almost all programs in the first region have large numbers of participants and make use of central kitchens. There, the lower per-unit costs may be less attributable to the lower cost of doing business in the region than to the economies realized from larger-scale operations using central kitchens.

Next, we analyzed unit program costs by delivery system. Table VI-6 presents our findings. Again, it is impossible to attribute unit cost differences between on-site and central kitchen operation wholly to the economics of the delivery system. Most on-site programs are located in costly, remote southeastern or bush communities, while central kitchens are located in lower-cost population centers of southcentral and southeastern Alaska.

Finally, we sought a relationship between lunch costs and program volume controlling for program type and region. We felt that there were economies in running larger programs. For instance, unit labor costs would be cut because the cost of program administration and management would be spread over more lunches. Volume buying could reduce food costs, and more efficient food processing equipment could be used.

The only delivery system/region grouping with enough cases to allow analysis were central kitchen programs in accessible centers of Southeastern and Southcentral Alaska. However, this grouping accounted for over 90 percent of all meals served in municipal and borough district programs in 1976. We could find no significant relationship between

Table VI-6
Organized District Lunch Cost
by Delivery System

Delivery System	Number of Districts	1976 Per-Lunch Cost	Approximate Average ADA	Approximate Total ADA Served
On-site preparation	8	$2.11 (1.03, 2.92)[a]	350	2,700
Central kitchen	2	$1.17	1,500	3,000
Central kitchen/ on-site	5	(.85, 1.49)	10,000	45,000
Outside contract, pre-plated	4	$1.45 (1.22, 1.56)	400	1,600
Information missing	2	---	125	250
No program	9	---	1,500[b]	15,000[b]
	30			67,000

[a]Numbers in parentheses are minima and maxima.

[b]Mean size from 1972 to 1975 before Fairbanks and Juneau dropped out was only 250 to 400. Total ADA was 2,000 to 2,500.

program cost per lunch and program size. There are two possible explanations for this. One is that the variable quality of program management overwhelms whatever effect program size has on cost. The other is that the fixed program costs (such as capital equipment and utilities), which should be the single cost component most amenable to scale economies, are often not charged to food service budgets at all.

3. Analysis of Program Costs in Alaska

The discussion in the preceding section makes it obvious that food service budget data alone are not sufficient to construct unit (per lunch) program cost guidelines for program administrators and state policymakers. A further weakness of the foregoing classification of program costs is that it doesn't indicate how program costs might change in the future as component costs such as foodstuffs, labor, and utilities change.

For these reasons, we resorted to another, less direct approach to constructing program cost indices. The steps in this approach are as follows:

1) Use food service expenditure accounts to calculate only the proportion of cost attributable to input factors (labor, food, etc.) for delivery system/size program-type classification.

2) Use Alaska Department of Labor regional price, wage, and salary indices to convert all proportions to a common base - those that would result if measured in Anchorage prices.

3) Use the Alaska Department of Education's Food Service Manual information of labor requirement versus program size to correlate how unit costs would vary as program size changes.

4) Use Alaska Department of Labor price, wage, and salary indices to calculate how program costs change with region.

Details of our analysis follow:

Lack of detail in food service expenditure accounts made it possible to break out only two cost categories - commodities (primarily food) and labor. Inconsistencies in the accounts of many districts necessitated narrowing the universe of districts included in the analysis to only eight of the borough and city districts participating in the program in 1976 and the REAA's taken together. We grouped these into four delivery system/size types:

1) A very large central kitchen/on-site program (Anchorage).

2) Four other large operations using central kitchens (Ketchikan, Sitka, Juneau, and Kenai).

3) Three on-site programs (Hoonah, Craig, and Cordova).

4) The REAA's.

Because of the limitations of our data, the results presented in this section should be used with caution.

Table VI-7 shows our findings. Based on Anchorage prices, our data indicates that for each $100 spent in 1976 by the five central kitchen operations that we examined, about $51 went for labor, $42 for food and materials (mostly food), and the remaining $7 for "other."[24] Since we have no idea what constitutes "other," we cannot use it in calculating inter-regional program cost differentials. Ignoring this category, program costs are about 55 percent labor and 45 percent food. In a similar fashion, we calculated that onsite program costs (for ADP's averaging about 150) is far more labor intensive--65 percent labor and 35 percent food, again using Anchorage prices.

Because labor can be used more economically in large operations, per-lunch labor costs fall rapidly as ADP rises up to about 400. Using the labor requirements found in the Alaska Food Service Handbook (shown in Figure VI-E), we calculated that the division between labor and food and the relative cost per lunch (large kitchen facilities = 1.00) as a

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[24] Often, the only categories were personnel, food materials, and an unexplained "other."

Table VI-7
National School Lunch Program Cost Components
of Selected Districts, FY 1976

	Salary, %	Food, %	Other, %
• Anchorage	54	37	9
• Four large, central kitchen operations[a]	44 (48)[c]	51 (47)	5 (5)
• Three on-site programs[b]	57 (64)	40 (33)	3 (2)
• AUBSD	50 (64)	43 (29)	7 (7)

[a] Ketchikan, Sitka, Juneau, and Kenai

[b] Hoonah, Craig, and Cordova

[c] Numbers in parentheses are relative costs if Anchorage prices are assumed.

Price deflators used are as follows:

District	Food	Labor	Other
Anchorage	174.3	670	1
Ketchikan	170.9	614	1
Sitka	170.9	613	1
Juneau	166.7	534	1
Kenai	186.8	582	1
Hoonah	170.9	75% of Anchorage	1
Craig	170.9	"	1
Cordova	196.0	"	1
AUBSD	140% of Anchorage	"	1

Food index for Anchorage is U.S. Department of Labor cost of food at home index, Oct. 1967 = 100.0. Food indices for other cities are Anchorage figures for that year adjusted by ratio of University of Alaska Cooperative Extension Service market basket food survey cost in Anchorage to that district. Labor costs are mean monthly wage and salary earnings for "eating and drinking places" (or if this isn't available, for "retail trade") in the second quarter of 1977.

function of ADP served by a single food preparation facility to be as follows:

Table VI-8. NSLP Components in 1976 by Program Site and Type

ADP	Labor Coefficient (Fraction of total cost that is labor)	Food Coefficient (Fraction of total costs that is food)	Scale Factor (Relative per-lunch cost)
0-99	.82	.18	2.33*
100-199	.65	.35	1.20
200-299	.61	.39	1.08
300-399	.59	.41	1.02
400-499	.58	.42	1.00
500 +	.55	.45	1.00

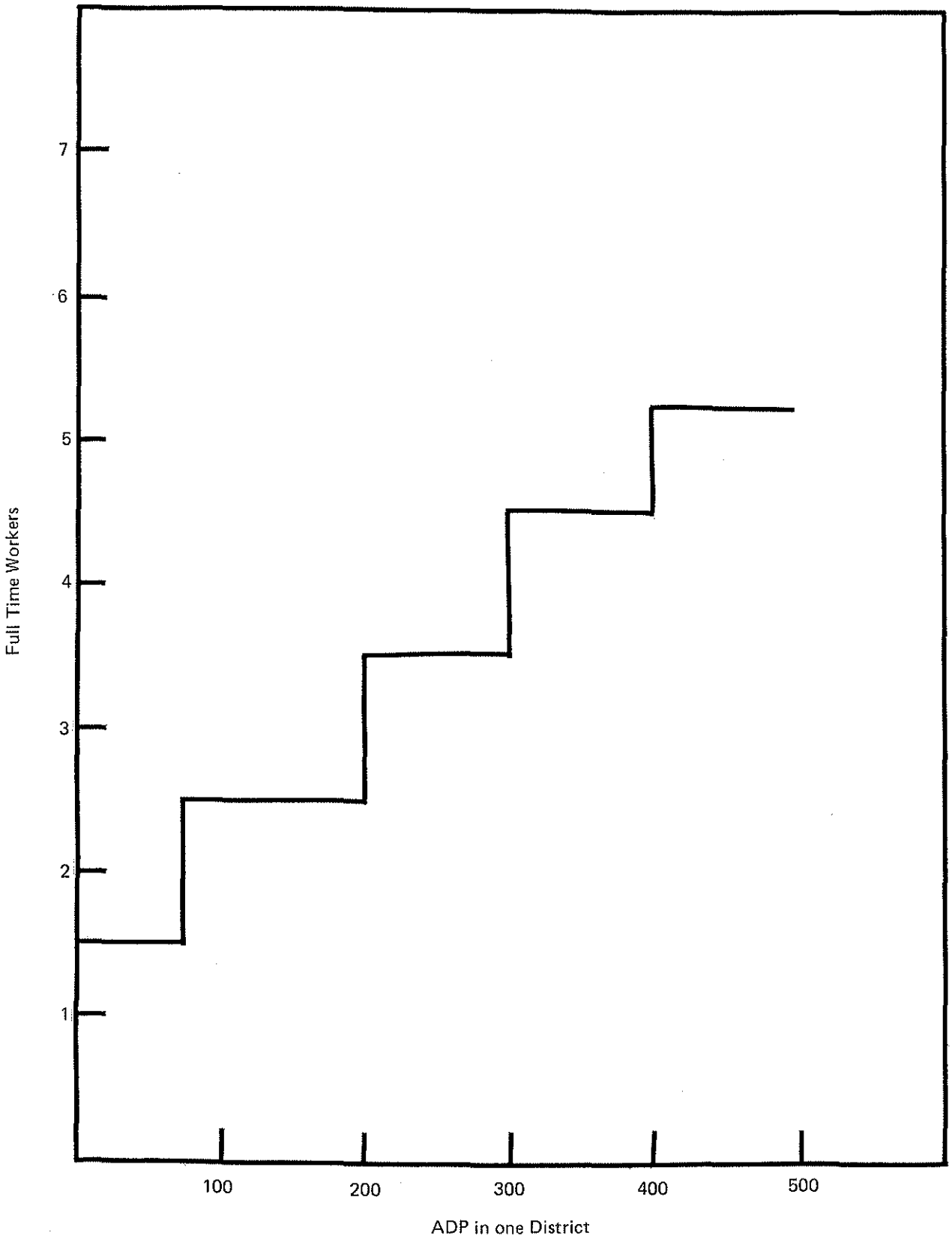
*Seems anomalously high. Perhaps, labor requirements indicated in Figure VI-E are in error for very small programs.

These figures allow us to define an NSLP relative cost equation which takes into account the effect of program ADP and region. The equation is:

$$\text{Program Cost Index} = \text{Scale Factor} \times (\text{Appropriate Labor Coefficient}) \times \frac{\text{Unit Labor Cost in District}}{\text{Unit Labor Cost in Anchorage}}$$

$$+ \text{Appropriate Food Coefficient} \times \frac{\text{Unit Food Cost in District}}{\text{Unit Food Cost in Anchorage}}$$

Figure VI-E Requirements for On-Site Type A Lunch Program (Source: *Alaska Food Service Manual*)



Anchorage's program cost index will equal 1 (See Table VI-9). That, for all other districts, will give estimated per-lunch costs relative to Anchorage's. Unit labor costs are available from the Alaska Department of Labor's Statistical Quarterly. This publication gives average monthly wage by industry for each census division. In calculating the program cost index for districts in larger census divisions, one could use average monthly wage in "eating and drinking places," the type of enterprise whose labor requirements should be most similar to that of school food programs. For smaller census divisions, this is not broken out. In its place, one must use the wage in the more general "retail trade."

We attempted to investigate another possible cause of rising per-lunch costs--declining ADP. When facilities are not used to capacity, inefficiency results. Some food service directors told us they could turn out far more lunches with no new equipment and very little additional labor, supporting our hunch that falling ADP's had left slack in the delivery systems. Yet, we could find no relationship between change in ADP and price between 1973 and 1976. One plausible reason for this that emerged from our interviews is that several fixed program costs[25] are often not charged to food service programs at all. Thus, such

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[25] Costs such as capital equipment charges, utilities, and program administration do not decline as the number of lunches served diminishes.

Table VI-9
Hypothetical Per Lunch Program Costs in 1976
by District With ADP 7100

District or REAA	Unit Food Cost	Unit Labor Cost	ADP	Scale Factor	Program Cost Index
Anchorage	174.3	670	12034	1.0	1.00
Bristol Bay	255.0	*	140	1.2	1.31
Cordova	196.0	*	184	1.2	1.01
Galena	203.6	*	119	1.2	1.36
Hoonah	170.9	*	205	1.08	0.79
Kake	168.5	*	150	1.2	0.87
Kenai	186.8	583	2010	1.0	0.93
Ketchikan	170.9	614	1193	1.0	0.90
Kodiak	179.9	677	684	1.0	1.09
Mat-Su	171.9	578	1277	1.0	0.85
Nome	263.6	*	370	1.02	1.16
Sitka	170.9	613	590	1.0	0.89
St. Mary's	255.0	*	114	1.2	1.31
Yakutat	166.7	*	1104	1.2	0.86

* Assumes labor cost of 75% of Anchorage's.

expenses are not reflected in per-lunch costs. Even if capital costs were charged to a program, they would not likely be amortized over the life of equipment. Thus, year-to-year costs would necessarily reflect true costs.

E. Summary

1. The major reasons for districts dropping the NSLP are rising NSLP costs (which are imposing an increasingly large burden on district budgets) and declining numbers of children eligible for free and reduced price lunches.

2. A national reimbursement schedule which does not adequately compensate Alaskan districts for higher program costs here means that the local burden has historically been higher in Alaska than in almost any other part of the nation.

3. The most important factor in rising program cost is labor.

4. Poor management of some Alaska district NSLP's is also a factor in rising costs. The major problem is hiring well-trained food service directors.

5. Program support among district administrators, principals, and the community at large is weak. High plate waste, low participation, and heavy program demand on district budgets are all factors.

6. Student participation is very sensitive to price charged as well as to socioeconomic conditions in the community. One implication is that any state aid which would act to reduce the price of a lunch could significantly bolster participation.

7. There are many qualitative program factors which we have not examined in detail but which our analysis leads us to believe are important. These require further study if program managers are to be responsive to changing student needs and taste.

VII. CONCLUSIONS AND RECOMMENDATIONS

The conclusions of this study are of two kinds-those directed toward the need and utility of the program, and those directed toward the economic and other causes for decline in participation in the program in Alaska.

Recommendations are also of two kinds, flowing from conclusions concerning need and utility of the program, and those assuming the continued program, but flowing from the analysis of reasons for decline in participation.

We direct a basic caveat at the reader. The levels of funding supporting this study did not permit as thorough an analysis as we would have liked to undertake. Our foremost recommendation, therefore, is that these conclusions be received as suggestive and not final till substantive investigation at the needed level is accomplished. Nonetheless, these findings are as close to the truth as we are able to get at this point.

A. On the need and utility of the program

Conclusions

1. There is at presently no clear and unambigious evidence that there is a substantial need for the National School Lunch Program in Alaska to overcome nutritional deficencies.

2. There is at present no clear and unambigious evidence that the National School Lunch Program assists educational attainment by enhancing nutrition anywhere in the United States.

3. The present status of knowledge about the relationship between educational attainment and nutrition suggests that (1) there is little relationship between the two in the school years, and (2) what relationship can be shown statistically may reflect families with multiple problems rather than simply nutritional ones.

4. Because (1) the best information we have on those groups in Alaska that are popularly supposed to be most poorly nourished fails to confirm that they are poorly nourished, (2) the research evidence such as it is suggests that even if malnourishment exists for school-age children it would likely not significantly affect school performance, and (3) the United States and Alaska populations by the most conservative measures are well nourished, there seems little justification for a program geared to assist educational attainment through nutrition.

5. Finally, since our data suggest that home lunches (in villages) tend to be as good or better than NSLP ones, the teaching value of NSLP may be less relevant than sometimes supposed.

Recommendations

Based on the information that we have acquired, we recommend some method other than large-scale school lunch programs to overcome nutritional deficits in what appears to be a small number of children, and/or to assist in continuing nutrition education.

We recommend that a substantial study be initiated to determine whether a real nutritional deficiency exists among Alaska school-aged populations, before further support for this program, based an assumptions about its nutritional value, is undertaken.

B. On the reasons for decline in participation in the program

Conclusions

1. Districts see the program as costing too much for the number of urban children who use it, in part because of (1) a lack of economics of scale, (2) high labor costs and (3) federal reimbursements are too low for Alaska costs.

2. Food quality, or perceived lack of is, and hence increased plate waste is a continuing problem.

3. Changes in Alaska incomes reduce the number of students who qualify for free or reduced-price lunches, since criteria are based on "lower 48" income levels.

4. Administrators see the program as a costly and time-consuming administrative burden, as well as a cause of cost deficits.

5. Since compensation to districts with high numbers of free or reduced-price lunch participants is not enough to truly reimburse the district for expenses, then those districts with many poverty-level families may be discouraged from participation. This seems contrary to the desires of the program.

6. Students often prefer "fast food" lunches, or home lunches to the school lunch.

7. Few administrators feel the program is nutritionally necessary.

8. There is some evidence of a growing antagonism to government programs both as a basic philosophical objection to government "intrusion" and also irritation with the "strings" attached to such programs.

9. Finally, it is increasingly difficult for many school administrators and school board members to understand why they should keep the program when they are faced with (1) the program's questionable

nutritional value (quite apart from any findings of this report), (2) its heavy administrative burden and direct costs, and (3) the fact that fewer and fewer people are interested in participating, both for economic and noneconomic reasons.

Recommendations

If the program is to be maintained, it cannot easily be done on the basis of mutritional need. If a basis for continuing the program is found, the State Department of Education should make program management quidelines available which would detail methods of cost control.

The State might press USDA to reimburse Alaska districts at a rate more suitable to Alaska costs. The State itself might offer financial aid to districts. If so, payments should be made on a per-lunch basis and not a per worker basis. Cost differentials by districts should be taken into account. Such aid, perhaps aimed at disadvantaged students might set reimbursement rates for free and reduced-price lunches so that local districts bear no costs for serving these.

The State might further encourage a rebate of such aid to the individuals in the form of lowered costs of lunch to the student; or aid might be linked to a per-lunch local effort.

Finally we strongly recommend that a serious study be undertaken to determine the cost effectiveness of the program. If our analysis is correct and there is (1) limited nutritional need for the program, (2) no proof that it does any educational good even if there is a nutritional need, and (3) is a costly, cumbersome program to administer and (4) if decreasing numbers of students wish to use it due to costs, changes in taste and very substantial "other factors," then it is hard to justify the program.

If there is a clear nutritional need in some parts of the state or among certain populations or even for certain individuals, this does not clearly justify a large-scale program. We suggest alternative assistance methods be sought, if they are found necessary, to achieve the goal of nutritional adequacy for the state children. Further, till there is some better proof of a direct relationship, the concept of nutritional need should be untied from the concept of educational need.

APPENDICES

Appendix A.

Iron Deficiency Anemia in Alaska

Summary of Studies
1971 - 1976

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June 25, 1976

SUMMARY

Hemoglobin and hematocrit levels taken over the last five years from 2,234 Alaska Natives are summarized and reveal the following incidence of anemia:

Age	Number of Subjects	Percent Anemic
Children under 6 years	674	19%
(Babies under 1 year	72	35%)
Children 6-18 years	1,176	7%
Those 16 years and over	89	21%

Similar rates have been reported in Alaska for 20 years. They are worse than 4 out of 5 other states with which they are compared and Alaska children's values compare with the lowest socioeconomic level children studied in the lower 48.

This report urges action based on the potential results of mild anemia. Increased frequency of and susceptability to illness, reduced body weight and reduced learning ability may be associated with low hemoglobins and/or hematocrits.

Alternatives for prevention and treatment are suggested and diet counseling is recommended as a way to improve the intake of all nutrients, the total health of the individual and provide for optimum red blood cell production. Therapeutic iron plus diet couseling is appropriate treatment when the biochemical tests reflect low levels of iron and other causes have been ruled out.

The report is intended as a basis for an action plan. The implementation and development of a plan must involve the many providers as well as the recipients if anemia is to be significantly reduced.

IRON DEFICIENCY ANEMIA IN ALASKA
SUMMARY OF STUDIES
1971-1976

Many health workers have been concerned about the incidence of iron deficiency anemia in Alaska. It is considered a very important problem by IHS staff members and practically all questioned agree that more effort should be directed towards anemia. (1) Several workers have tested small groups of people for hemoglobin levels and have noted their findings in routine reports. This summary report is a synthesis of studies done since 1971 and represents hemoglobin or hematocrit determinations of 2,234 individuals. Table I shows the number of subjects among those tested who exhibited low hemoglobin levels by age group. (See pg. 5)

Since authorities use differing standards to define anemia, the number and percent of children within each hemoglobin level is reported in Table I in order to compare our figures with other studies.

Additionally, hematocrit levels were reported on 295 children in two other recent studies.

Table II. Children Defined as Anemic Using Hematocrit

	N	Ages	Criteria	Anemic N	Anemic %
Chevak	146	6 mo. -15 yrs.	6 mo.- 8 yrs.< 33% 9 yrs-12 yrs.< 35% 13 yrs-15 yrs.< 37%	38	26%
Kake	149	3 yrs.-13 yrs.	3 yrs-13 yrs. <35%	10	7.3%
	(61)	(3-6 yrs.)		(4)	(6.5%)
Total	295			48	16%

The overall rate of low hemoglobin or hematocrit level was 13%, or 311 of the 2,234 individuals tested. Low level was defined as hemoglobin levels less than 11gm/dl for children under 6, and values less than 12 gm/dl were counted as low for all others. These cut-off points are consistent with the majority of the definitions of anemia considering the facts that these reports did not specify the sex of older children, nor did most report values to any degree of accuracy past 1 gm. of Hgb. Hematocrit levels were not reported, only the percent of children below the author's defined cut-off points.

Using the same criteria as the Center for Disease Control's ongoing Nutrition Surveillance (2) it was found that 20% of the Alaska Native Children tested had a low hemoglobin rate compared to 16% of the Children from five other states who were tested during the third quarter of 1975. (Table III, pg. 6)

In comparing Alaska data for preschool children with that of Owen (3) (Table IV, pg. 7) percentages of children with low hemoglobin are comparable to the lowest socioeconomic level in the contiguous 48 states.

Bethel Service Unit

Since many of the subjects are from the Bethel Service Unit, the rates for Bethel can be compared with the rates for the entire sample. The overall Bethel rate is 10% while the overall sample rate was 13% low hemoglobins. There are some variations as Table V indicates; however, they do not appear to be large variations.

The Bethel population represents more than 50% of the entire sample, hence the figures are fairly similar. The procedure will be applied to each Service Unit as additional data becomes available.

Table V. Number and percent of subjects with low hemoglobins by age in Bethel and in the total sample.

	Bethel		Total Sample	
	N low	%	N low	%
< 6 yrs.	58	21%	139	19%
School Children	78	5%	104	7%
Over 16	20	22%	20	21%
Overall Rate	156	10%	263	13%

Comparison with Earlier Studies

Comparison of these findings with earlier Alaska studies is difficult since earlier studies were often reported as a mean hemoglobin or hematocrit and/or as a percent falling below the author's cut-off point for anemia. However, a few studies are listed in Table VI, (pg. 8) for comparison.

Discussion

The data indicates that we have a considerable number of Alaska Natives with low hemoglobins.

We have a higher percent of low hemoglobins when compared to the average of 5 other states who record data with CDC. The problem has been documented for 23 years and still exists.

While debate continues over the significance of marginally low hemoglobin, and presumably low iron levels, studies have been published linking low levels with increased frequency of serious illness, (5,6) increased susceptibility to infections, below expected body weight in children, decreased attentiveness, and learning ability. (8) In a study on rats the cytochrome concentration in cells was reduced in the iron deficient animals. (8) What effect this has on oxidative processes has not been defined.

Until these associations have been substantiated or disproven, it seems appropriate to accept the premise that they may be correct and take action to minimize the occurrence of mild anemia, at the same time we are minimizing the possibility of developing severe anemia with the associated significant adverse effects on the circulatory system.

Treatment

Of the 13 reports cited, six do not mention implementing any type of treatment once anemia was identified. Of the others, five mentioned that medicinal oral iron was prescribed for those defined as anemic. In addition, one prescribed parenteral iron. Two reports prescribe nutritious food as a treatment through the issuance of WIC coupons for supplemental foods.

Some enlightening comments from the doctors reporting include, "suspected dietary deficiencies," "a nutritional education program for the Nome area is wanting," "plenty of room for teaching nutrition to our population," "a surprising number of mothers frankly admitted ignoring the prescription or forgetting about it shortly after issue."

Recently a more formalized assessment of the process of anemia detection and follow-up was conducted in the geographic areas covered by the Tanana and Mt. Edgecumbe Service Units. (9)

In the medical record review, the only treatment assessed was the prescription of oral iron therapy within one month of the diagnosis. Of the 173 records of 6-24 month old children reviewed, 36% received a hemoglobin or hematocrit test. Of those with abnormal levels, 75% were placed on iron therapy with one month of diagnosis but only 15% of those children had follow-up hemoglobin or hematocrit taken within 3-6 weeks after therapy. The authors point out that the importance of follow-up is inversely proportional to the specificity of the process outcome relationship. Since there is the question whether a low hemoglobin or hematocrit is caused by lack of iron, it would beem that follow-up is especially necessary. The results of such follow-up would indicate the success of the iron therapy or the need for other types of treatment.

Alternatives

As Helmick, McClure, and Mitchell elaborate, the clinical success rate, i.e. curing anemia, can be improved significantly through improved performance of any of the following procedures; screening, diagnostic work-up, treatment, follow-up, or a combination of any of these.

Alternately, greater emphasis could be placed on prevention of anemia in the first place. Providing adequate oral iron in the diet with or without additional ferrous salts is the suggested procedure in the primary prevention process outlined by Helmick and others. (9) While this procedure will address the majority of anemias caused by iron deficiency, there are other anemias not corrected by a strict emphasis on iron. Low intakes of Folic acid, Vitamin B-12, copper and ascorbic acid have also been implicated in the etiology of anemia. Assuring a varied diet in sufficient quantities would address these potential deficiencies in the erythropoietic process as well.

In order to provide an adequate intake of nutrients various alternatives can be considered and implemented.

--Fortify existing foods with nutrients necessary for erythropoiesis.
--Ship food high in nutrients to villages.
--Encourage competitive prices for nutritious foods, higher prices for foods with little nutritive value.
--Educate people to buy and consume nutritious foods.
--Provide "high risk" people with medicinal iron and vitamin supplements.
--Provide diet counseling for those with low and borderline hemoglobin levels.

When questioned as to the best form of treatment once a mild anemia was diagnosed, practically all staff members identified oral iron plus diet counseling over either alone and over parenteral iron. (1) This approach has merit based on the possibility that the anemia is an indicator of suboptimal nutritional status. In that case, addition of medicinal iron alone would not solve the basic problem of faulty dietary intake.

The prevention and treatment of anemia are major issues requiring considerable analysis and discussion of the problems with the present system and ways to improve on that system. The many people involved must decide on the appropriate courses of action, identify those health workers who should take action and implement the plans. This report is intended to summarize the available knowledge, offer alternative solutions and stimulate action.

Conclusion

Alaskan studies in which all subjects have been tested for hemoglobin or hematocrit levels, are summarized and reveal a rate of 13% anemic in the 2,234 people tested. The results are reported by age group and reveal the highest rate to be among those 16 years and over (21%), and children under six (19%). Of the younger children, those under 1 year had the highest rate of low hemoglobins, 35%. When grouped, those under 2 had a rate of 31%.

This report is a summary of reports and published articles. It is intended as a data base to which additional information will be added in order to compare the incidence, plan prevention and treatment programs and evaluate the effectiveness of these programs. Some alternative solutions are presented.

Table 1. Number and Percent of Subjects with Low Hemoglobin Levels of 1,939 Subjects Tested

			<9 gm/dl		9-9.9		10-10.9		11-11.9		Cumulative %
			N	%	N	%	N	%	N	%	
Children under 6 yrs.		674	4	(0%)	19	(2%)	116	(17%)	-	-**	19%
Children*	< 1 yr.	72	1	(1%)	6	(8%)	19	(26%)	-	-	35%
	1-1.9 yrs.	38	1	(2%)	0	-	7	(18%)	-	-	20%
	2-2.9 yrs.	42	1	(2%)	1	(2%)	5	(11%)	7	(16%)	31%
	3-3.9 yrs.	54	1	(1%)	0	-	5	(9%)	6	(11%)	21%
	4-4.9 yrs.	52	0	-	0	-	3	(5%)	9	(17%)	22%
	5-5.9 yrs.	34	0	-	1	(2%)	1	(2%)	5	(14%)	18%
Children 6-18+ yrs.		1,176	3	(0%)	5	(0%)	52	(4%)	44	(3%)	7%
Children*	6-11 yrs.	114	0	-	0	-	14	(12%)	35	(30%)	42%
Young Teens*	11-15 yrs.	43	0	-	1	(2%)	1	(2%)	6	(13%)	17%
16 yrs. and Over		89	1	(1%)	1	(1%)	4	(4%)	14	(15%)	21%

* Includes only those whose age was identified.

** - Indicates values not reported by specific hemoglobin level and are therefore omitted from the summary.

Table III. Hemoglobin Data Compared with Other States* by Age

Criteria	Age	Alaska N Examined	Alaska % low	Alaska N low	CDC Nutrition Surveillance(2) Age	CDC N Examined**	CDC % low	CDC N low
6 mo. -23 mo. <10 gm.	<1 yr.	72	9%	7		560	11%	65
	1-1.9 yrs.	38	2%	1		772	15%	118
2 yrs. - 5 yrs.<11 gm.	2-5 yrs.	298	17%	51		1750	15%	278
6 -14 yrs.<12 gm.	6-11 yrs.	115	42%	49	6-9 yrs.	956	19%	183
					10-12 yrs.	635	17%	110
	11-15 yrs.	43	17%	8	13-17 yrs.	931	16%	156
	Total	566	20%	116		5604	16%	910

* Arizona (13.5% low for all under 18 yrs.), Kentucky (13.5% low), Louisiana (20.3% low), Tennessee (6.1% low and Washington (10.2% low).

** July - September, 1975.

Table IV. Percentage Distribution by Hemoglobin Values of Age (and Warner Rank)* of Alaska Children and Preschool Nutrition Survey Children**

Age and Warner Rank*	Hemoglobin Values: Less than 10	10.0 thru 10.9	11.0 thru 11.9	12.0 thru 12.9	13.0 thru 13.9	14.0 and Above	N
12-23 Months							
Alaska	3	18	34	39	3	3	(38)
I	14	13	23	27	15	7	(69)
II	8	9	27	37	11	9	(148)
III	1	6	21	30	21	12	(101)
IV	0	3	12	55	23	6	(31)
24-35 Months							
Alaska	4	11	16	-	-	-	(42)
I	4	6	28	31	20	11	(81)
II	0	7	21	49	16	8	(159)
III	1	2	22	42	23	9	(142)
IV	0	0	12	59	17	12	(42)
36-47 Months							
Alaska	1	9	11	-	-	-	(54)
I	2	6	22	43	22	4	(94)
II	1	5	22	44	21	7	(196)
III	0	0	19	40	30	10	(130)
IV	0	0	14	30	45	10	(49)
48-59 Months							
Alaska	0	5	17	-	-	-	(52)
I	0	9	24	35	23	8	(77)
II	0	4	17	40	29	10	(177)
III	1	3	16	42	26	13	(143)
IV	0	2	20	35	35	9	(46)
60-71 Months							
Alaska	2	2	14	-	-	-	(34)
I	0	6	23	38	23	11	(83)
II	1	3	22	37	29	9	(179)
III	1	3	12	45	29	10	(134)
IV	0	3	8	41	29	17	(58)

* Socioeconomic Stratifications, I = lower lower, II= upper lower, III= lower middle, IV = upper middle.

** Owen, G. M. data (3).

Table VI. Present Sample Compared to Earlier Studies

	Year Subjects Tested	Age	Total N	Average Hgb.	% "low" Hgb.	Definition of low
Present Sample	1971-76	0- 3 yr	152		31%	< 11 gm/dl
Wainwright (4)	1969	< 2 yr	14		35%	10 gm/dl
Kodiak (5)	1966	0- 3 yr	78	10.3	41%	10.5 gm/dl
Bethel Area (6)	1960-62	6-17 mo	320	10.7		11 gm
Bethel Area	1969-70	7- 9 yr	320	12.4		7-8 yr. 11 gm/dl 9 yr. 11.8 gm/dl
Kalskag, Bethel (7)	1953	12 yr	27	11.2		

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Village	Service Unit	N Tested	Date Tested	Tester	Method	Reporter
Headstart Cont.						
Stebbins	Bethel	20	12-74	?	Hgb?	Charlotte Stefanich
Mekoryuk	"	13	"	?	Hgb?	"
St. Paul (Headstart)	Anchorage	19	12-74	?	Hgb?	"
Old Harbor (Headstart)	Anchorage	13	"	?	Hgb?	"
New Stuyahok	Kanakanak	21	3-73	Same	Hgb	Massa Gumlickpuk, Health Aide
Togiak (Headstart)	"	18	4-74	?	Hgb?	Charlotte Stefanich
Kake	Mt. Edgecumbe	149	6-72	Same	finger stick microcapillary method Hct	Robert McGrath, M.D. Costep
Kaltag (Headstart)	Tanana	13	12-74	?	Hgb?	Charlotte Stefanich
Barrow	Barrow	158	5-74	?	Hgb	Charlotte Stefanich
Wainwritht	"	5	5-74	?	Hgb	"
Nome	Kotzebue	15	1-71	?	Hgb?	A. L. Ball, M.D.
Brevig Mission	"	57	"	?	Hgb?	"
Pt. Hope (Headstart)	"	16	12-74	?	Hgb?	Charlotte Stefanich
Selawik (Headstart)	"	14	"	?	Hgb?	"
Savoonga	"	20	12-74	?	Hgb?	"

SOURCES OF SAMPLE

Village	Service Unit	N Tested	Date Tested	Tester	Method	Reporter
Alakanuk	Bethel	165	11-73	Francis Damian Health Aide	Hgb?	George Brenneman, M.D.
Hooper Bay	"	62	10-73	Robert Hurwitz	hemoglobin-ometer	Robert Hurwitz, M.D.
Bethel	"	980	Winter 1972	?	finger stick hemoglobin-ometer	Robert Hurwitz, M.D.
Emmonak	"	116	Jan 76	?	EDTA Cyanomethemo-globin	Quentin Fisher, M.D.
Chevak	"	146	Jan 74	?	micro-Hct Std. Techniques	John Burks, M.D., et al
Pilot Station	"	112	11-73	?	Hgb?	George Brenneman, M.D.
Headstart-Nunapitchuk	"	21	12-74	?	Hgb?	Charlotte Stefanich
Alakanuk	"	31	"	?	Hgb?	"
Mt. Village	"	22	"	?	Hgb?	"
Hooper Bay	"	30	"	?	Hgb?	"
Fortuna Ledge	"	18	"	?	Hgb?	"

Village	Service Unit	N Tested	Date Tested	Tester	Method	Reporter
Noorvik	Kotzebue	29	12-74	?	Hgb?	Charlotte Stefanich
Kiana	"	19	"	?	"	"
Gambell	"	10	"	?	"	"
Noatak	"	17	"	?	"	"

Appendix B.

Rural Participation

in the

National School Lunch Program

RURAL PARTICIPATION IN THE NATIONAL SCHOOL LUNCH PROGRAM

OBJECTIVE

The study was initiated in 1973 to determine the eating habits and nutrient intakes of selected individuals in a rural area of Alaska. The data was analyzed to help determine the role of the National School Lunch Program (N.S.L.P.) in students' total food consumption.

METHODS

The 24-hour recall method was used in interviews conducted during January of 1974. Sixth graders in the villages of Togiak, Kaliganek, New Stuyakok, Dillingham, Naknek and South Naknek participated. Forty-one girls and fifty-five boys completed records. The records were explained during the recording of the lunch meal, and the children took them home and recorded the evening meal, breakfast, and snacks. They returned them the following day at school. The interviewer reviewed them with the children for completeness and accuracy.

The school lunch was observed in each school. The nutrient composition of the meal served on the day of record was calculated.

The records were analyzed for intakes of the following nutrients: calories, protein, fat, carbohydrate, calcium, iron, vitamin A, thiamine, riboflavin, niacin, and ascorbic acid. The average intake, standard deviation, and per cent of the recommended daily allowance (R.D.A.) was calculated for these nutrients under various situations: (1) the total day's consumption using figures of the N.S.L.P. meal as eaten; (2) the

total day's consumption using the calculated N.S.L.P. meal as if the child had eaten all of the food served; (3) the total days consumption using a theoretical home lunch instead of the N.S.L.P. meal.

Eleven students had eaten lunch at home or carried lunch to school. They all lived in the two largest villages studied. The average intake of these lunches was used as the theoretical home lunch. This was to prevent introducing interviewer bias. (See procedures Table 3-7).

RESULTS

The results indicate the wide variation of intakes among the student population. In the four smaller villages all students interviewed participate in the N.S.L.P. meal. In none of the three calculations did the intakes meet the R.D.A. for calories. The protein intakes were nearly double the R.D.A. in all cases. The similarity of the three results indicates that most students did consume the entire school lunch and that the Theoretical Home Lunch and N.S.L.P. meals were similar in nutrient composition. The Theoretical Home Lunch intake was lower in calcium as the children did not usually have milk as a beverage. (See Tables 3-7, through 3-14).

Stefanich Procedures

I. Total Day's Intake With School Lunch As Eaten

A. Compile total intakes as calculated. Substitute appropriate school lunch for those who had home lunch.

II. Total Day's Intake With N.S.L.P. If They Had Eaten All Of It

A. Villages 1, 4, 5, and 6

Substitute N.S.L.P. in cases where home lunch used.

Home intake + Potential School Lunch = Total

B. Villages 2 and 3

School Breakfast + Potential N.S.L.P. + Home Intake = Total

III. Total Day's Intake If Theoretical Home Lunch Used

A. Theoretical Home Lunch

Average the home lunches eaten for all villages. This average will be used.

B. Home Intake + Theoretical Home Lunch = Total Intake (1, 4, 5 and 6)

C. School Breakfast + Theoretical Home Lunch + Home Intake = Total Intake (2 and 3)

Table V-1
HANES - U.S. D.H.E.W., 1977
Dietary Intake Findings - P.# 25

Table 7. Intake of selected nutrients for persons aged 10-11 years by race and sex for income levels: number of persons, mean, median, and mean nutrient intake as a percent of standard and per kilogram of body weight: United States, 1971-74

Sex and nutrients	Total[1]	White	Negro	Total[1]	White	Negro	Total[1]	White	Negro
BOTH SEXES	All income			Income below poverty level[2]			Income above poverty level[2]		
Number of examined persons	725	550	166	156	71	84	551	469	75
Estimated population in thousands	8,852	7,540	1,186	1,390	817	561	7,229	6,547	582
Calories									
Mean	2,143	2,174	1,928	1,953	2,058	1,801	2,181	2,187	2,069
Median	2,006	2,038	1,870	1,864	1,930	1,808	2,041	2,045	1,938
Mean nutrient intake:									
Percent of standard[3]	90	92	77	83	91	73	92	93	81
Per kilogram of body weight	58.05	59.17	50.58	54.40	58.40	49.36	58.85	59.22	52.79
Protein (gm)									
Mean	78.68	79.80	71.58	73.16	77.84	67.01	79.83	79.95	77.25
Median	74.15	76.11	61.76	63.87	71.89	59.11	75.79	76.12	66.46
Mean nutrient intake:									
Percent of standard[3]	182	186	155	171	188	148	185	186	155
Per kilogram of body weight	2.13	2.17	1.88	2.04	2.21	1.84	2.15	2.16	1.97
Calcium (mg)									
Mean	1,143	1,195	809	917	1,033	762	1,188	1,214	876
Median	1,049	1,102	773	812	966	703	1,093	1,117	834
Mean nutrient intake:									
Percent of standard	177	185	127	141	159	117	184	187	140
Per kilogram of body weight	30.96	32.53	21.22	25.53	29.29	20.89	32.06	32.86	22.35
Iron (mg)									
Mean	11.51	11.57	10.95	11.45	12.37	10.15	11.54	11.48	11.31
Median	10.48	10.61	9.83	10.09	11.12	8.68	10.52	10.51	10.78
Mean nutrient intake:									
Percent of standard	92	93	84	88	95	77	94	93	92
Per kilogram of body weight	0.31	0.31	0.29	0.32	0.35	0.28	0.31	0.31	0.30
Vitamin A (IU)									
Mean	4,614	4,759	3,764	4,043	4,401	3,608	4,660	4,713	4,053
Median	3,544	3,632	2,522	2 890	3,134	2,375	3,675	3,691	2,608
Median nutrient intake:									
Percent of standard	142	145	111	121	129	96	145	146	121
Mean nutrient intake:									
Percent of standard	184	190	149	162	176	144	186	189	159
Per kilogram of body weight	124.99	129 51	98.72	112.61	124.87	98.91	125.72	127.56	103.40
Vitamin C (mg)									
Mean	86.17	86.85	75.96	64.34	63.08	67.07	89.44	89.06	80.09
Median	56.27	57.65	39.35	35.02	30.44	36.01	61.66	62.00	50.21
Mean nutrient intake:									
Percent of standard	215	217	188	161	158	168	223	223	196
Per kilogram of body weight	2.33	2.36	1.99	1.79	1.79	1.84	2.41	2.41	2.04
Thiamine (mg)									
Mean	1.38	1.39	1.30	1.32	1.39	1.23	1.38	1.38	1.39
Median	1.26	1.26	1.15	1.07	1.14	1.06	1.26	1.27	1.30
Mean nutrient intake:									
Percent of standard	160	160	168	170	170	170	158	158	168
Per kilogram of body weight	0.04	0.04	0.03	0.04	0.04	0.03	0.04	0.04	0.04
Riboflavin (mg)									
Mean	2.23	2.31	1.73	1.86	2.04	1.63	2.30	2.33	1.86
Median	2.08	2.16	1.61	1.73	1.97	1.53	2.15	2.17	1.76
Mean nutrient intake:									
Percent of standard	189	193	164	173	180	164	191	193	164
Per kilogram of body weight	0.06	0.06	0.05	0.05	0.06	0.04	0.06	0.06	0.05
Preformed niacin (mg)									
Mean	14.69	14.79	13.98	13.82	14.45	12.91	14.90	14.84	15.24
Median	12.83	12.92	11.59	12.18	12.48	10.83	12.99	12.97	13.15
Per kilogram of body weight	0.40	0.40	0.37	0.38	0.41	0.35	0.40	0.40	0.39

[1]Total includes all races.
[2]Excludes persons with unknown income.
[3]Based on body weight for age, sex, and height.

Table 7. Intake of selected nutrients for persons aged 10-11 years by race and sex for income levels: number of persons, mean, median, and mean nutrient intake as a percent of standard and per kilogram of body weight: United States, 1971-74--Con.

Sex and nutrients	Total[1]	White	Negro	Total[1]	White	Negro	Total[1]	White	Negro
MALE	All income			Income below poverty level[2]			Income above poverty level[2]		
Number of examined persons	362	280	76	77	38	38	276	236	36
Estimated population in thousands	4,446	3,823	541	652	367	273	3,676	3,358	262
Calories									
Mean	2,261	2,297	1,963	1,936	2,077	1,748	2,317	2,317	2,186
Median	2,155	2,180	1,877	1,873	1,958	1,859	2,193	2,189	2,119
Mean nutrient intake:									
Percent of standard[3]	92	94	75	79	87	68	95	95	82
Per kilogram of body weight	61.92	63.11	52.79	53.97	59.71	47.85	63.16	63.23	57.83
Protein (gm)									
Mean	83.91	85.39	73.41	72.00	80.38	62.11	86.08	85.85	85.35
Median	79.51	81.03	62.29	62.61	75.42	54.74	81.05	81.06	79.24
Mean nutrient intake:									
Percent of standard[3]	193	199	157	166	192	135	199	200	179
Per kilogram of body weight	2.30	2.35	1.97	2.01	2.31	1.70	2.35	2.34	2.26
Calcium (mg)									
Mean	1,194	1,244	850	1,004	1,222	748	1,228	1,244	961
Median	1,119	1,166	817	806	1,040	599	1,155	1,172	900
Mean nutrient intake:									
Percent of standard	185	192	136	155	189	115	190	192	158
Per kilogram of body weight	32.70	34.16	22.85	28.02	35.13	20.47	33.49	33.96	25.41
Iron (mg)									
Mean	12.66	12.79	11.31	11.43	13.01	9.39	12.89	12.75	13.32
Median	11.72	11.96	9.43	8.67	10.32	8.49	12.11	12.04	12.35
Mean nutrient intake:									
Percent of standard	127	128	113	114	130	94	129	128	133
Per kilogram of body weight	0.35	0.35	0.30	0.32	0.37	0.26	0.35	0.35	0.35
Vitamin A (IU)									
Mean	5,190	5,325	4,391	3,927	4,166	3,780	5,260	5,286	5,077
Median	3,874	3,878	3,293	2,909	3,145	2,066	3,991	3,921	5,137
Median nutrient intake:									
Percent of standard	152	154	131	118	132	92	157	155	157
Mean nutrient intake:									
Percent of standard	207	213	172	157	167	151	210	211	196
Per kilogram of body weight	142.10	146.25	118.09	109.50	119.79	103.46	143.39	143.72	134.30
Vitamin C (mg)									
Mean	89.32	91.65	61.54	50.04	53.03	47.22	93.62	92.83	76.14
Median	58.29	63.73	36.43	25.70	25.18	30.12	66.33	65.91	53.21
Mean nutrient intake:									
Percent of standard	223	229	149	125	133	118	233	232	180
Per kilogram of body weight	2.45	2.52	1.66	1.40	1.52	1.29	2.55	2.53	2.01
Thiamine (mg)									
Mean	1.49	1.52	1.28	1.31	1.45	1.15	1.51	1.51	1.42
Median	1.33	1.36	1.05	1.04	1.12	0.95	1.37	1.37	1.36
Mean nutrient intake:									
Percent of standard	165	165	163	170	175	165	163	163	163
Per kilogram of body weight	0.04	0.04	0.03	0.04	0.04	0.03	0.04	0.04	0.04
Riboflavin (mg)									
Mean	2.39	2.47	1.79	1.94	2.24	1.58	2.45	2.47	2.01
Median	2.27	2.34	1.62	1.68	1.96	1.42	2.37	2.41	1.74
Mean nutrient intake:									
Percent of standard	191	195	176	181	196	164	193	195	167
Per kilogram of body weight	0.07	0.07	0.05	0.05	0.06	0.04	0.07	0.07	0.05
Preformed niacin (mg)									
Mean	15.95	16.18	14.07	12.50	13.47	11.16	16.56	16.45	17.12
Median	13.94	14.50	11.85	11.39	12.50	9.67	14.86	14.73	15.07
Per kilogram of body weight	0.44	0.44	0.38	0.35	0.39	0.31	0.45	0.45	0.45

[1]Total includes all races.
[2]Excludes persons with unknown income.
[3]Based on body weight for age, sex, and height.

Table 7. Intake of selected nutrients for persons aged 10-11 years by race and sex for income levels: number of persons, mean, median, and mean nutrient intake as a percent of standard and per kilogram of body weight: United States, 1971-74--Con.

Sex and nutrients	Total[1]	White	Negro	Total[1]	White	Negro	Total[1]	White	Negro
FEMALE	All income			Income below poverty level[2]			Income above poverty level[2]		
Number of examined persons	363	270	90	79	33	46	275	233	39
Estimated population in thousands	4,407	3,717	645	738	451	287	3,554	3,188	321
Calories									
Mean	2,023	2,047	1,900	1,968	2,043	1,851	2,041	2,051	1,974
Median	1,875	1,885	1,846	1,798	1,919	1,767	1,887	1,884	1,914
Mean nutrient intake:									
Percent of standard[3]	89	90	78	88	94	78	89	90	81
Per kilogram of body weight	54.23	55.19	48.81	54.77	57.35	50.81	54.48	55.08	48.93
Protein (gm)									
Mean	73.40	74.06	70.04	74.18	75.77	71.68	73.37	73.73	70.64
Median	69.11	69.95	60.34	68.55	71.80	59.53	69.11	69.41	63.30
Mean nutrient intake:									
Percent of standard[3]	171	174	154	176	185	131	170	172	154
Per kilogram of body weight	1.97	2.00	1.80	2.06	2.13	1.37	1.96	1.98	1.75
Calcium (mg)									
Mean	1,091	1,145	775	838	879	775	1,147	1,181	807
Median	961	1,023	750	812	914	771	1,004	1,033	771
Mean nutrient intake:									
Percent of standard	169	177	119	129	135	119	178	183	124
Per kilogram of body weight	29.23	30.88	19.91	23.33	24.66	21.28	30.61	31.72	20.01
Iron (mg)									
Mean	10.34	10.32	10.65	11.48	11.86	10.88	10.13	10.13	10.57
Median	9.55	9.51	10.19	11.18	11.56	10.40	9.33	9.33	9.82
Mean nutrient intake:									
Percent of standard	58	58	59	64	66	61	57	57	59
Per kilogram of body weight	0.28	0.28	0.27	0.32	0.33	0.30	0.27	0.27	0.26
Vitamin A (IU)									
Mean	4,033	4,177	3,238	4,145	4,592	3,444	4,039	4,129	3,217
Median	3,169	3,264	2,458	2,379	2,876	3,101	3,201	3,294	2,499
Median nutrient intake:									
Percent of standard	129	134	101	123	123	125	130	134	107
Mean nutrient intake:									
Percent of standard	161	167	130	166	184	138	162	165	129
Per kilogram of body weight	108.11	112.62	83.20	115.35	128.90	94.56	107.84	110.87	79.74
Vitamin C (mg)									
Mean	82.99	81.91	88.04	76.98	71.25	85.95	85.12	85.09	83.32
Median	52.92	53.09	51.73	44.93	42.43	71.83	57.33	58.16	29.34
Mean nutrient intake:									
Percent of standard	208	205	220	192	178	215	213	213	208
Per kilogram of body weight	2.22	2.21	2.26	2.14	2.00	2.36	2.27	2.28	2.07
Thiamine (mg)									
Mean	1.27	1.26	1.32	1.33	1.35	1.30	1.25	1.24	1.36
Median	1.18	1.17	1.28	1.15	1.15	1.17	1.18	1.17	1.28
Mean nutrient intake:									
Percent of standard	158	152	173	170	165	175	152	150	173
Per kilogram of body weight	0.03	0.03	0.03	0.04	0.04	0.04	0.03	0.03	0.03
Riboflavin (mg)									
Mean	2.08	2.14	1.68	1.80	1.88	1.67	2.14	2.18	1.74
Median	1.92	1.98	1.58	1.74	2.00	1.57	1.96	1.98	1.79
Mean nutrient intake:									
Percent of standard	187	191	160	165	167	164	191	193	160
Per kilogram of body weight	0.06	0.06	0.04	0.05	0.05	0.05	0.06	0.06	0.04
Preformed niacin (mg)									
Mean	13.43	13.37	13.90	14.99	15.25	14.57	13.17	13.14	13.70
Median	11.89	11.98	10.96	12.40	12.47	12.21	11.76	11.82	11.44
Per kilogram of body weight	0.36	0.36	0.36	0.42	0.43	0.40	0.35	0.35	0.34

[1]Total includes all races.
[2]Excludes persons with unknown income.
[3]Based on body weight for age, sex, and height.

Table V-4
HANES - U.S. D.H.E.W., 1977
Dietary Intake Findings - P.#28

Table 8. Intake of selected nutrients for persons aged 12-14 years by race and sex for income levels: number of persons, mean, median, and mean nutrient intake as a percent of standard and per kilogram of body weight: United States, 1971-74

Sex and nutrients	Total[1]	White	Negro	Total[1]	White	Negro	Total[1]	White	Negro
BOTH SEXES	All income			Income below poverty level[2]			Income above poverty level[2]		
Number of examined persons	1,107	828	272	266	115	150	797	680	112
Estimated population in thousands	12,916	11,004	1,805	2,124	1,196	926	10,189	9,321	786
Calories									
Mean	2,226	2,244	2,109	2,060	2,122	1,981	2,251	2,254	2,214
Median	2,114	2,121	1,999	1,899	1,900	1,898	2,146	2,144	2,156
Mean nutrient intake:									
Percent of standard[3]	75	75	71	72	73	70	75	76	71
Per kilogram of body weight	44.07	44.13	42.94	42.18	43.84	40.12	44.17	44.00	45.09
Protein (gm)									
Mean	82.90	84.24	74.43	75.54	80.35	69.40	84.10	84.65	77.51
Median	78.17	79.00	68.43	68.90	72.47	64.92	79.53	79.71	73.62
Mean nutrient intake:									
Percent of standard[3]	139	141	126	132	142	118	140	141	130
Per kilogram of body weight	1.64	1.66	1.52	1.55	1.66	1.41	1.65	1.66	1.58
Calcium (mg)									
Mean	1,124	1,178	805	931	1,052	774	1,157	1,189	807
Median	1,027	1,095	762	854	1,062	670	1,066	1,100	841
Mean nutrient intake:									
Percent of standard	173	182	124	145	164	119	178	183	124
Per kilogram of body weight	22.24	23.17	16.39	19.06	21.75	15.67	22.70	23.21	16.44
Iron (mg)									
Mean	12.01	11.96	12.14	12.33	12.31	12.37	11.94	11.94	11.69
Median	10.84	10.83	10.67	10.54	10.56	10.50	10.89	10.87	10.74
Mean nutrient intake:									
Percent of standard	77	77	77	80	82	77	77	77	76
Per kilogram of body weight	0.24	0.24	0.25	0.25	0.25	0.25	0.23	0.23	0.24
Vitamin A (IU)									
Mean	4,302	4,361	3,909	4,479	4,234	4,767	4,259	4,357	2,968
Median	3,034	3,152	2,181	2,653	2,857	2,596	3,089	3,156	2,113
Median nutrient intake:									
Percent of standard	98	101	75	87	94	81	99	101	73
Mean nutrient intake:									
Percent of standard	140	143	124	146	146	147	138	141	98
Per kilogram of body weight	85.14	85.73	79.58	91.73	87.49	96.55	83.55	85.04	60.44
Vitamin C (mg)									
Mean	84.72	84.30	86.50	73.35	67.48	80.27	87.64	86.45	100.36
Median	55.10	55.75	48.90	40.32	39.06	47.67	57.53	57.63	55.07
Mean nutrient intake:									
Percent of standard	185	184	188	161	152	172	190	188	220
Per kilogram of body weight	1.68	1.66	1.76	1.59	1.39	1.63	1.72	1.69	2.04
Thiamine (mg)									
Mean	1.41	1.41	1.36	1.38	1.45	1.29	1.41	1.41	1.45
Median	1.28	1.29	1.25	1.24	1.26	1.12	1.29	1.29	1.29
Mean nutrient intake:									
Percent of standard	158	158	163	168	170	163	158	120	163
Per kilogram of body weight	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Riboflavin (mg)									
Mean	2.24	2.30	1.86	2.03	2.12	1.92	2.27	2.32	1.75
Median	2.11	2.22	1.64	1.82	2.11	1.53	2.20	2.23	1.67
Mean nutrient intake:									
Percent of standard	184	187	160	180	181	176	184	187	144
Per kilogram of body weight	0.04	0.05	0.04	0.04	0.04	0.04	0.04	0.05	0.04
Preformed niacin (mg)									
Mean	15.95	16.05	15.22	14.67	14.92	14.36	16.15	16.16	15.83
Median	14.38	14.42	14.11	13.23	13.32	12.87	14.66	14.69	14.41
Per kilogram of body weight	0.32	0.32	0.31	0.30	0.31	0.29	0.32	0.32	0.32

[1]Total includes all races.
[2]Excludes persons with unknown income.
[3]Based on body weight for age, sex, and height.

Table 8. Intake of selected nutrients for persons aged 12-14 years by race and sex for income levels: number of persons, mean, median, and mean nutrient intake as a percent of standard and per kilogram of body weight: United States, 1971-74--Con.

Sex and nutrients	Total[1]	White	Negro	Total[1]	White	Negro	Total[1]	White	Negro
MALE	All income			Income below poverty level[2]			Income above poverty level[2]		
Number of examined persons	548	415	131	126	62	64	393	331	60
Estimated population in thousands	6,480	5,559	885	1,076	669	407	5,001	4,571	394
Calories									
Mean	2,519	2,564	2,253	2,185	2,249	2,082	2,585	2,607	2,373
Median	2,397	2,441	2,161	2,097	2,079	2,121	2,463	2,480	2,320
Mean nutrient intake:									
Percent of standard[3]	82	83	73	75	78	69	83	84	74
Per kilogram of body weight	50.54	50.97	47.41	47.30	48.80	44.84	51.13	51.31	48.37
Protein (gm)									
Mean	92.80	95.10	79.30	81.37	86.59	72.79	95.37	96.68	82.55
Median	85.98	88.27	75.25	74.01	77.87	70.83	88.36	89.40	84.26
Mean nutrient intake:									
Percent of standard[3]	158	162	134	145	156	127	161	164	135
Per kilogram of body weight	1.86	1.89	1.67	1.76	1.88	1.57	1.89	1.90	1.68
Calcium (mg)									
Mean	1,282	1,349	875	1,009	1,147	782	1,333	1,372	910
Median	1,205	1,280	830	986	1,200	742	1,251	1,298	893
Mean nutrient intake:									
Percent of standard	198	208	135	158	181	120	205	211	140
Per kilogram of body weight	25.73	26.81	18.41	21.83	24.89	16.86	26.37	27.00	18.56
Iron (mg)									
Mean	13.58	13.57	13.79	13.71	12.74	15.29	13.66	13.80	12.38
Median	12.09	12.27	11.29	11.23	10.97	11.39	12.32	12.43	11.21
Mean nutrient intake:									
Percent of standard	96	96	96	99	95	105	97	97	90
Per kilogram of body weight	0.27	0.27	0.29	0.30	0.28	0.33	0.27	0.27	0.25
Vitamin A (IU)									
Mean	4,746	4,812	4,360	4,952	4,647	5,453	4,678	4,791	3,416
Median	3,355	3,539	2,177	2,855	3,168	2,635	3,487	3,574	2,157
Median nutrient intake:									
Percent of standard	111	117	76	99	108	86	114	117	75
Mean nutrient intake:									
Percent of standard	157	160	139	165	161	170	154	157	112
Per kilogram of body weight	95.24	95.65	91.75	107.17	100.85	117.49	92.54	94.29	69.63
Vitamin C (mg)									
Mean	89.10	88.81	89.47	75.50	72.88	79.80	93.41	91.53	112.21
Median	61.52	63.02	51.91	48.60	46.04	49.30	64.56	64.37	74.19
Mean nutrient intake:									
Percent of standard	195	195	196	160	163	175	205	200	247
Per kilogram of body weight	1.79	1.77	1.88	1.63	1.58	1.72	1.85	1.80	2.29
Thiamine (mg)									
Mean	1.58	1.60	1.45	1.48	1.54	1.37	1.60	1.61	1.53
Median	1.49	1.52	1.33	1.34	1.36	1.33	1.52	1.52	1.36
Mean nutrient intake:									
Percent of standard	158	120	160	170	170	165	150	150	163
Per kilogram of body weight	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Riboflavin (mg)									
Mean	2.55	2.64	2.06	2.23	2.28	2.16	2.62	2.68	1.90
Median	2.38	2.51	1.77	2.07	2.22	1.69	2.48	2.57	1.86
Mean nutrient intake:									
Percent of standard	184	187	167	185	184	189	184	187	145
Per kilogram of body weight	0.05	0.05	0.04	0.05	0.05	0.05	0.05	0.05	0.04
Preformed niacin (mg)									
Mean	18.03	18.24	17.02	16.31	16.24	16.43	18.45	18.59	17.42
Median	16.57	16.75	15.38	14.59	15.26	14.47	16.77	16.95	15.57
Per kilogram of body weight	0.36	0.36	0.36	0.35	0.35	0.35	0.36	0.37	0.36

[1]Total includes all races.
[2]Excludes persons with unknown income.
[3]Based on body weight for age, sex, and height.

Table V-6
HANES - U.S. D.H.E.W., 1977
Dietary Intake Findings - P.#30

Table 8. Intake of selected nutrients for persons ages 12-14 years by race and sex for income levels: number of persons, mean, median, and mean nutrient intake as a percent of standard and per kilogram of body weight: United States, 1971-74--Con.

Sex and nutrients	Total[1]	White	Negro	Total[1]	White	Negro	Total[1]	White	Negro
FEMALE	All income			Income below poverty level[2]			Income above poverty level[2]		
Number of examined persons	559	413	141	140	53	86	404	349	52
Estimated population in thousands	6,436	5,445	920	1,049	527	519	5,188	4,749	392
Calories									
Mean	1,932	1,918	1,970	1,931	1,961	1,902	1,930	1,915	2,055
Median	1,859	1,858	1,731	1,720	1,721	1,714	1,899	1,889	1,738
Mean nutrient intake:									
Percent of standard[3]	73	72	75	74	75	74	72	72	76
Per kilogram of body weight	37.72	37.30	38.90	37.48	38.20	36.79	37.56	37.08	41.80
Protein (gm)									
Mean	72.94	73.16	69.74	69.56	72.43	66.74	73.22	73.08	72.45
Median	68.59	70.44	60.15	64.15	68.43	59.83	70.77	71.21	60.97
Mean nutrient intake:									
Percent of standard[3]	120	120	118	118	126	110	120	119	125
Per kilogram of body weight	1.42	1.42	1.38	1.35	1.41	1.29	1.43	1.42	1.47
Calcium (mg)									
Mean	964	1,004	737	851	933	767	988	1,013	704
Median	847	877	630	746	857	609	866	877	693
Mean nutrient intake:									
Percent of standard	148	155	114	131	144	118	152	156	108
Per kilogram of body weight	18.82	19.52	14.56	16.51	18.17	14.84	19.22	19.62	14.32
Iron (mg)									
Mean	10.42	10.32	10.54	10.91	11.75	10.07	10.29	10.15	11.00
Median	9.68	9.61	9.60	9.18	8.93	9.44	9.72	9.65	9.90
Mean nutrient intake:									
Percent of standard	58	57	59	61	65	56	57	56	61
Per kilogram of body weight	0.20	0.20	0.21	0.21	0.23	0.19	0.20	0.20	0.22
Vitamin A (IU)									
Mean	3,854	3,901	3,475	3,364	3,710	4,229	3,855	3,940	2,519
Median	2,686	2,746	2,190	2,028	2,507	2,570	2,750	2,765	1,741
Median nutrient intake:									
Percent of standard	81	82	74	76	73	79	82	82	67
Mean nutrient intake:									
Percent of standard	124	126	109	128	126	129	123	128	85
Per kilogram of body weight	75.26	75.85	68.60	77.52	72.27	81.82	75.04	78.30	51.24
Vitamin C (mg)									
Mean	80.30	79.70	83.65	71.14	60.62	80.64	82.08	81.55	88.46
Median	49.23	49.19	38.83	36.20	34.27	37.26	51.36	51.10	47.74
Mean nutrient intake:									
Percent of standard	174	173	180	154	137	170	177	176	194
Per kilogram of body weight	1.57	1.55	1.56	1.38	1.18	1.56	1.60	1.58	1.80
Thiamine (mg)									
Mean	1.24	1.22	1.28	1.27	1.33	1.22	1.23	1.21	1.36
Median	1.13	1.13	1.05	1.04	1.17	1.02	1.13	1.13	1.13
Mean nutrient intake:									
Percent of standard	160	160	163	165	170	160	160	158	165
Per kilogram of body weight	0.02	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.03
Riboflavin (mg)									
Mean	1.92	1.97	1.67	1.82	1.92	1.73	1.94	1.97	1.60
Median	1.75	1.77	1.46	1.53	1.77	1.47	1.76	1.77	1.43
Mean nutrient intake:									
Percent of standard	181	185	155	171	178	165	184	187	142
Per kilogram of body weight	0.04	0.04	0.03	0.04	0.04	0.03	0.04	0.04	0.03
Preformed niacin (mg)									
Mean	13.85	13.82	13.49	12.99	13.25	12.74	13.93	13.83	14.22
Median	12.68	12.72	12.18	11.69	11.80	11.48	12.74	12.58	12.95
Per kilogram of body weight	0.27	0.27	0.27	0.25	0.26	0.25	0.27	0.27	0.29

[1]Total includes all races.
[2]Excludes persons with unknown income.
[3]Based on body weight for age, sex, and height.

Table V-7

In order to make the Stefanich findings more comparable to the HANES study, we have derived from the study actual weights of children by age and sex and compared them to weighted averages of weights by age and sex found in the HANES survey. (p. 74).

CALORIES - HANES SURVEY

AGE	SEX	CAL/Kg. wt.	AVG. FOR YEARS (10-16)
10 - 12	M	68/Kg.	$\bar{x}$ = 64/Kg.
13 - 16	M	60/Kg.	
10 - 12	F	64/Kg.	$\bar{x}$ = 56/Kg.
13 - 16	F	48/Kg.	

ALASKA SAMPLE

SEX	M	F	M	F	M	F
AGE	13	13	12	12	11	11
n	7	3	16	13	26	20
$\bar{x}$ Kg.	39.44	46.2	41.84	45.52	40.94	43.32

Weighted average weight for Alaska sample.
Males n = 49

Male	13 Yr. Old Wtd. Ave.	7/49 x 39.44 Kg. = 5.634
Male	12 Yr. Old Wtd. Ave.	16/49 x 41.84 Kg. =13.662
Male	11 Yr. Old Wtd. Ave.	26/49 x 40.94 Kg. =21.723

Weighted Ave. Wt. Eskimo Males =41.019 Kg.

50th Percentile of Nelson Vaugh and McKay 1969 (C.D.A. 1974)

Male	13 Yr. Old Wtd. Ave.	7/49 x 45.50 Kg. = 6.499
Male	12 Yr. Old Wtd. Ave.	16/49 x 40.23 Kg. =13.136
Male	11 Yr. Old Wtd. Ave.	26/49 x 36.74 Kg. =19.494

Weighted Ave. U.S. Population =39.129 Kg.

Table V-8

Eskimo Females.
n = 36

Female	13 Yr. Old Wtd. Ave.	3/36 x 46.20 Kg. = 3.849
Female	12 Yr. Old Wtd. Ave.	13/36 x 45.52 Kg. =16.437
Female	11 Yr. Old Wtd. Ave.	20/36 x 43.32 Kg. =24.066

Weighted Ave. Eskimo females =44.352 Kg.

50th Percentile Nelson, Vaugh and McKay 1969

Female	13 Yr. Old Wtd. Ave.	3/36 x 47.04 Kg. = 3.919
Female	12 Yr. Old Wtd. Ave.	13/36 x 42.37 Kg. =15.300
Female	11 Yr. Old Wtd. Ave.	20/36 x 37.74 Kg. =20.966

Weighted Ave. Sample U.S. female=40.185 Kg.

Utilizing the above values we were able to recompute average nutritional intakes as a function of R.D.A.'s comparing Eskimo weighted averages with HANES R.D.A. equivalents appropriately weighted.

Table V-9

100% R.D.A. AS DERIVED FROM HANES COMPARED TO ESKIMO WEIGHTING

		MALE 10 - 11	FEMALE 10 - 11	MALE 12 - 14	FEMALE 12 - 14	AVE. MALE	AVE. FEMALE
kc/kg	Calories	67.3	60.93	61.63	51.67	64.4[1]	56.3[1]
gr/kg	Protein	1.19	1.15	1.17	1.19	1.18	1.17
mg/kg	Calcium	17.67	17.29	12.99	12.71	15.33	15.00
mg/kg	Iron	.27	.48	.27	.344	.28	.41
i.u./kg	Vitamin A	68.0	67.14	60.66	60.69	64.33	63.91
mg/kg	Thiamine	.024	.018	.018	.018	.021	.018
mg/kg	Riboflavin	.036	.032	.027	.021	.03	.026
	Niacin	6.6 mg/1000 cal.				6.6 mg/1000 cal.	
mg/kg	Ascorbic Acid (Vitamin C)	1.098	1.067	.91	.90	1.	1.

[1] Using 11.52 years as an average - (The Eskimo Average) and weighting HANES information for 11.52 years.

Table V-10

Eskimo Age/Sex Nutritional Need Via HANES Base Compared To Stefanich Data

SEX	WEIGHT	CALORIES	PROTEIN	CALCIUM	IRON	VITAMIN A	THIAMINE	RIBOFLAVIN	NIACIN	VITAMIN C
Male	41.019	2,641	48.4	628.82	11.48	2,638	.86	1.23	17.43	41.019
24-Hour Recall With Home Lunch										
Male Recall		2,203	84	964	14	3,755	1.1	1.9	15	157
Male RDA %		83	173	153	127	142	127	154	86	382

Eskimo Females Nutritional Need Via HANES Base

SEX	WEIGHT	CALORIES	PROTEIN	CALCIUM	IRON	VITAMIN A	THIAMINE	RIBOFLAVIN	NIACIN	VITAMIN C
Female	44.35 kg.	2,496	51.88	665.25	18.18	2,834	.798	1.15	16.47	44.35
24-Hour Recall With Home Lunch										
Female Recall		2,261	84	1,039	12	4,174	1.200	1.9	16	195
Female RDA %		90	161	156	63	147	150	165	97	439

Table V-11

As can be seen from N.S.L.P. addition computed by Stefanich, N.S.L.P. added nothing which was in need for boys and would have reduced iron and niacin. The only marginal dietary elements for girls. This computation was based on N.S.L.P. as eaten. If eaten in its entirety, the N.S.L.P. would have added nothing which was needed to the diet except for a marginal increment in niacin for boys.

A similar picture emerges if boys and girls are combined in proper weighting for proportions and need by age/sex.

Eskimo Weighted Average By Age-Male Utilizing HANES Standards and Stefanich Data

SEX	AGE	CALORIES	PROTEIN	CALCIUM	IRON	VITAMIN A	THIAMINE	RIBOFLAVIN	NIACIN	VITAMIN C
Male	12 - 14	28.9	.548	6.092	.126	28.449	.0084	.0126	-	.426
Proportion: 23/49 = .469 x HANES										
Male	10 - 11	35.6	.630	9.635	.143	36.04	.0127	.019	-	.581
Proportion: 26/49 = .530 x HANES										
	TOTAL:	63.5	1.178	16.727	.269	64.489	.0211	.0316	-	1.007
41.019 kg. Ave. x HANES		2,604	48.3	686	11.03	2,645	.86	1.29	17.1	41.3
Actual Consumption + Home Lunch		2,203	84	964	14	3,755	1.1	1.9	15	157
% RDA		84	173	140	127	142	127	147	87	380

Table V-12

Eskimo Weighted Average By Age-Female Utilizing HANES Standards and Stefanich Data

SEX	AGE	CALORIES	PROTEIN	CALCIUM	IRON	VITAMIN A	THIAMINE	RIBOFLAVIN	NIACIN	VITAMIN C
Female	12 - 14	22.94	.528	5.64	.452	26.94	.0079	.0093	-	.3996
Proportion: .444 x HANES										
Female	10 - 11	33.87	.639	9.61	.266	37.32	.010	.0178	-	.5932
Proportion: .556 x HANES										
	TOTAL:	56.81	1.167	15.25	.418	64.26	.0179	.027	-	.9928
44.35 kg. x HANES Nutritional Need		2,519	51.75	676	18.5	2,849	.793	1.197	16.62	44.03
Actual Consumption + Home Lunch		2,261	84	1,039	12	4,174	1,200	1.90	16	195
% RDA		90	162	154	64	146	151	159	96	443

Table V-13

N.S.L.P. As Eaten from Stefanich Data Compared to HANES RDA Standards

SEX	CALORIES	PROTEIN	CALCIUM	IRON	VITAMIN A	THIAMINE	RIBOFLAVIN	NIACIN	VITAMIN C
Male	2,076	94	1,223	15	3,713	1.1	2.5	15	129
% RDA									
Comparison to Home Lunch Greater ↑ Less ↓	79↓	194↑	178↑	135↑	140	127	194↑	88	312↓
Female	2,006	81	1,145	10	4,212	1.2	2.1	14	165
%RDA									
Comparison to Home Lunch Greater ↑ Less ↓	79↓	156↓	169↑	54↓	148	151	175↑	84↓	375↓

Table V-14

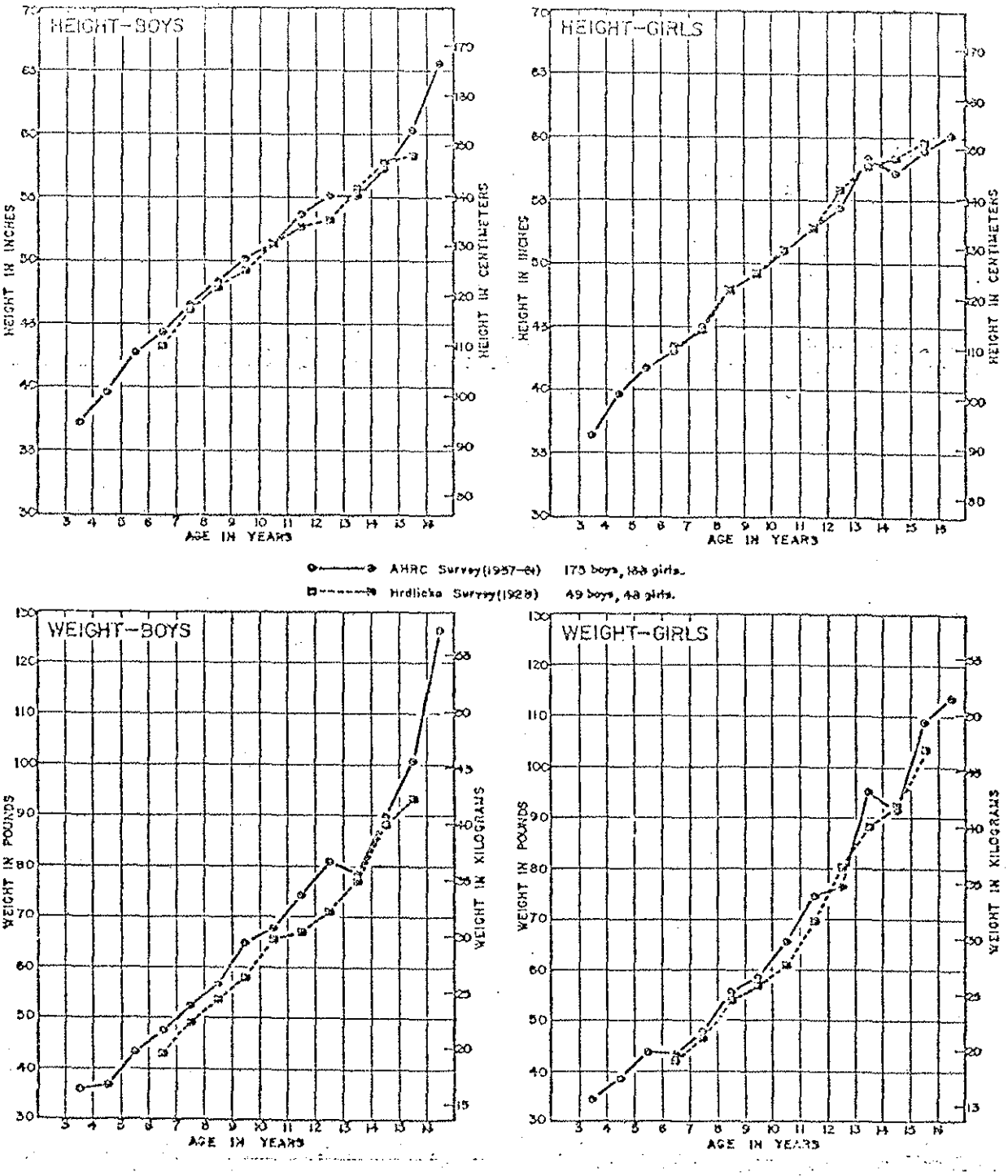


Fig 3.—Mean height and weight of southwestern Eskimo children, present and 1928[3] (from Falkner[3]).

Table V-15
WEIGHT DATA FOR SAMPLE*

AGE*		AGE*		AGE*	
13		12		11	
Male	Female	Male	Female	Male	Female
39.80	46.20	41.84	45.52	40.94	43.32

*Weight in kilograms

OVERALL MALES 11-13 WTD.	
Eskimo	41.233
U.S. Sample	38.033

FEMALES 11-13 WTD.	
Eskimo	43.32
U.S. Sample	40.185

*Stefanich Sample

Table V-16

CALORIC NEED EQUIVALENTS OF STEFANICH SAMPLE USING HANES STANDARDS

Male:	At 30 kg. =	80 K cal/kgram body weight
	At 44 kg. =	63.63 K cal/kgram body weight
Female:	At 44 kg. =	54.54 K cal/kgram body weight

Age Range:
7 - 14 7 = ave. 30Kg for males

Extrapolating from the Food and Nutrition Board (1974) analysis of nutrition needs suggests the unusual difficulty in determining caloric intake levels at youthful pre-pubertous ages. Differences in actual caloric intake for Eskimos from R.D.A. suggested requirements may not reflect caloric deficits at all.

Table V-17

DIETARY ANALYSIS BASE FOR STEFANICH SAMPLE COMPARING R.D.A.'s DEFINED BY HANES AND ACTUALLY CALCULATED AT I.S.E.R.

K/Cal. Calories	Gram Protein	Gram Fat	Gram Cho.	Milligram Calcium	Milligram Iron	Vitamin A IU	Thiamine	Riboflavin	Niacin	Vitamin C Mg.
2203	84	85	273	964	14	3755	1.1	1.9	15	157
(a) 2800	44	-	-	1200	18	5000	1.4	1.5	18	45
(b) 2240	25-35	12-25g	1000-1500*							

a R.D.A.
b Actual Needs
* 7.2 per kg for ad., 620-1240: extreme range

Broad comparisons of achieved heights and weight through time are documented in Heller, Scott and Hammes, 1967. The findings may tend to show a slight increase in height over the time periods and in the places measured, though sample size and comparisons by place make the results questionably comparable.

Table V-18
MEAN HEIGHTS OF ADULT MALES:
PAST AND PRESENT (25 YEARS AND OLDER)

	Present (1958)		In Past*		
Village	No.	Mean Height (cm)	No.	Mean Height (cm)	Differences (cm)
Noatak	44	169.4	11	167.9 (1897)*[3]	+1.5
Point Hope	40	165.4	13	166.4 (1913)*[2]	-1.0
Hooper Bay	50	164.8	20	162.5 (1930)*[1]	+2.3

* Year of measurement indicated in parentheses.

1
2 Hrdlicka, Ales (1930)
3 Jenness, D. (1923)
Boas (1901)

Table V-19
HISTORICAL ESKIMO WEIGHT DATA

In comparing age/sex data which seem comparable from different sources on Eskimos, we can compare Hrdlicka (1928), Heller, Scott and Hammes (1967), and Stefanich (1973).

Weighting Hrdlicka (1928) to fit the Stefanich (1973) sample, we find the following.

HRDLICKA (1928)

ESKIMO SEX	AGE	APPROX. WT. kg.	WEIGHTING	AVE. WT.
Male	13	≃ 33	7/49 x 33 = 4.714	
Male	12	≃ 32	16/49 x 32 =10.448	
Male	11	≃ 30	26/49 x 30 =15.918	
				31.080
Female	13	≃ 37	3/36 x 37 = 3.083	
Female	12	≃ 33	13/36 x 33 =11.916	
Female	11	≃ 29	20/36 x 29 =16.111	
				31.110

HELLER, SCOTT AND HAMMES (1967)

ESKIMO SEX	AGE	APPROX. WT. kg.	WEIGHTING	AVE. WT.
Male	13	39.3 x 7/49 =	5.614	
Male	12	36.9 x 16/49 =	12.048	
Male	11	34.2 x 26/49 =	18.146	
				35.844
Female	13	42.4 x 3/36 =	3.533	
Female	12	35.8 x 13/36 =	12.927	
Female	11	34.2 x 20/36 =	18.999	
				35.459

Table V-20

STEFANICH (1973)

ESKIMO SEX	AGE	APPROX. WT. kg.	WEIGHTING	AVE. WT.
Male	13	39.44 x 7/49 =	5.634	
Male	12	41.84 x 16/49 =	13.662	
Male	11	40.94 x 26/49 =	21.723	
				41.019
Female	13	46.2 x 3/36 =	3.849	
Female	12	45.52 x 12/36 =	16.437	
Female	11	43.32 x 20/36 =	24.066	
				44.352

Without considering possible errors and statistical anomalies and based upon the data as it stands, there seems a clear tendency for increased body mass for Eskimo children. Absent comparable height information over the entire period we cannot say whether these results are a function of better diet, changes habits which increase height and hence body mass or other factors as in what proportion. At its worst the data does not seem to suggest decreasingly adequate diets for Eskimo children.

We may compare these figures with those on non-native U.S. children using Falkner (1962) study of white children, Nelson, Vaughn and McKay (1969) (unidentified as to race), and the HANES (1971-72) data on whites and others in the U.S.

Using the weighting we have used for other measures, we bring these figures into comparability with Stefanich (1973).

Table V-21

WT. COMPARISONS ESKIMOS AND U.S. SAMPLE

FALKNER (1962) (Whites)

SEX	AGE	APPROX. WT. kg.	WEIGHTING	AVE. WT.
Male	13	≃ 45	7/49 x 45 = 6.428	
Male	12	≃ 39	16/49 x 39 =12.734	
Male	11	≃ 36	26/49 x 36 19.102	
				38.264
Female	13	≃ 48	3/36 x 48 = 3.999	
Female	12	≃ 43	13/36 x 43 =15.527	
Female	11	≃ 37	20/36 x 33 =20.555	
				40.081

NELSON, VAUGHN AND McKAY (1969)

SEX	AGE	APPROX. WT. kg.	WEIGHTING	AVE. WT.
Male	13	45.5 x 7/49 =	6.499	
Male	12	40.23 x 16/49 =	13.136	
Male	11	36.74 x 26/49 =	19.494	
				39.129
Female	13	47.04 x 3/36 =	3.919	
Female	12	42.37 x 13/36 =	15.300	
Female	11	37.74 x 20/36 =	20.966	
				43.185

HANES SURVEY (1971-72)

SEX	AGE	APPROX. WT. kg.	WEIGHTING	AVE. WT.
Male	13	51.8 x 7/49 =	7.400	
Male	12	45.2 x 16/49 =	14.759	
Male	11	37.5 x 26/49 =	19.897	
				42.056
Female	13	53.4 x 3/36 =	4.450	
Female	12	46.2 x 13/36 =	16.683	
Female	11	40.3 x 20/36 =	22.388	
				43.516

Table V-22

STEFANICH STUDY - ORIGINAL DATA BASED ON C.D.A. 1974 R.D.A. ASSUMPTIONS

DIETARY ANALYSIS

FEMALES - 11 - 14 YEARS - 41

24-HOUR RECALL RECORDS

	FOOD ENERGY CAL.	PROTEIN gm.	FAT gm.	CHO TOTAL gm.	CALCIUM mg.	IRON mg.	VIT. A VALUE I.U.	THIAMINE mg.	RIBOFLAVIN mg.	NIACIN mg.	ASCORBIC ACID mg.
RDA	2,400	44	-	-	1,200	18	400	1.2	1.3	16	45
TOTAL CONSUMPTION WITH THEORETICAL HOME LUNCH											
$\bar{x}$	2,261	84	90	291	1,039	12	4,174	1.2	1.9	16	195
SD	628	28	33	98	510	4	3,126	0.7	0.9	7	190
% RDA	94	191	-	-	87	67	104	100	146	100	433
TOTAL CONSUMPTION WITH N.S.L.P. AS EATEN											
$\bar{x}$	2,006	81	74	264	1,145	10	4,212	1.2	2.1	1.4	165
SD	674	33	37	96	568	5	3,821	0.8	1.0	8	192
% RDA	84	184	-	-	95	56	105	100	162	88	367
TOTAL CONSUMPTION WITH POTENTIAL N.S.L.P. CONTRIBUTION											
$\bar{x}$	2,145	92	77	276	1,272	12	4,322	1.4	2.5	16	169
SD	641	29	36	92	531	5	3,794	0.8	1.1	8	191
% RDA	89	209	-	-	106	67	108	117	192	100	376

Table V-23

STEFANICH STUDY - ORIGINAL DATA BASED ON C.D.A. 1974 R.D.A. ASSUMPTIONS

DIETARY ANALYSIS

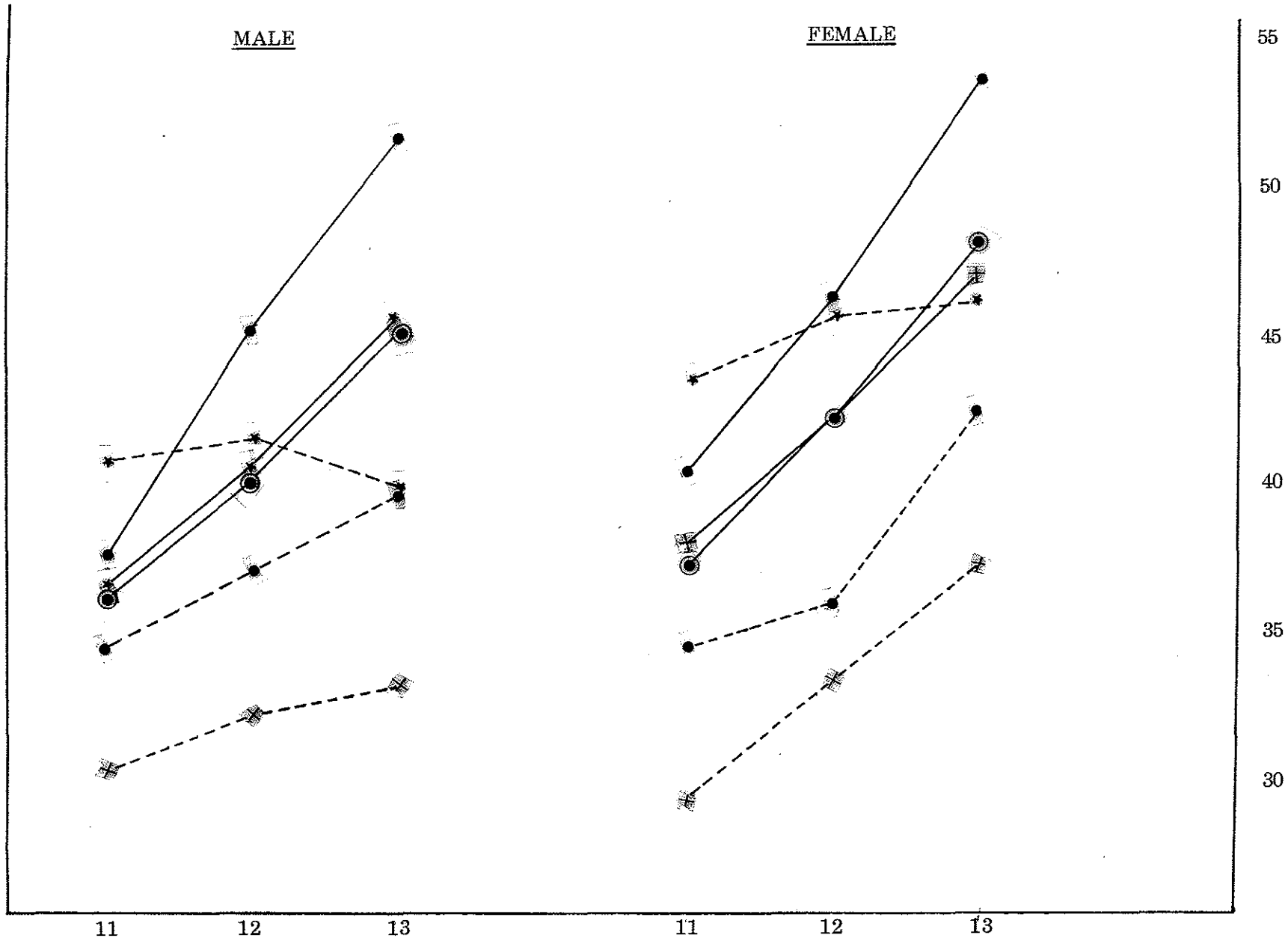
MALES - 11 - 14 YEARS - 55

24-HOUR RECALL RECORDS

	FOOD ENERGY CAL.	PROTEIN gm.	FAT gm.	CHO TOTAL gm.	CALCIUM mg.	IRON mg.	VIT. A VALUE I.U.	THIAMINE mg.	RIBOFLAVIN mg.	NIACIN mg.	ASCORBIC ACID mg.
RDA	2,800	44	-	-	1,200	18	5,000	1.4	1.5	18	45
TOTAL CONSUMPTION WITH THEORETICAL HOME LUNCH											
$\bar{x}$	2,203	84	85	273	964	14	3,755	1.1	1.9	15	157
SD	566	28	29	78	426	19	2,987	0.5	0.8	7	157
% RDA	79	191	-	-	80	78	75	79	127	83	349
TOTAL CONSUMPTION WITH N.S.L.P. AS EATEN											
$\bar{x}$	2,076	94	71	262	1,223	15	3,713	1.1	2.5	15	129
SD	613	33	32	86	524	20	3,742	0.6	1.4	8	157
% RDA	74	214	-	-	102	83	74	79	167	83	287
TOTAL CONSUMPTION WITH POTENTIAL N.S.L.P. CONTRIBUTION											
$\bar{x}$	2,106	96	72	267	1,291	15	3,761	1.3	2.5	16	129
SD	564	30	31	78	454	20	3,566	0.6	0.9	8	159
% RDA	75	218	-	-	108	83	75	93	167	89	287

Figure V-1

CHANGES IN WEIGHT THROUGH TIME, ESKIMO AND U.S. SAMPLE



SOURCES:

HANES	1971-72	HRDLICKA	1928
NELSON	1969	HELLER, et.a.	1969
FALKNER	1962	STEFANICH	1973

The graph showing comparative weight changes through time suggests that Eskimo weights for children appear in general to be following the U.S. average movement which is upward.