

Nutrition Information

Introduction

Available nutritional surveys of the elderly, although limited and flawed, reveal a low to moderate prevalence and/or increased risk of nutrient deficiencies among both institutionalized and noninstitutionalized groups. Inadequate nutrition may exacerbate many aging processes, including progressive changes in body composition and decline in function of various organ systems. It may also increase the incidence of certain age-related diseases. Evidence is surfacing on the prevalence and effects of long-term “subclinical” deficiencies that produce no immediate symptoms but could induce progressive and subtle changes. Moreover, many elderly exhibit changes with age that can affect their dietary requirements, including altered eating behavior, decreased physical activity, and reduced ability to digest, absorb, and metabolize many nutrients.

Despite increasing amounts of evidence of the importance of adequate nutrition to the physical and mental well-being of the elderly, specific dietary needs of this growing segment of the population remain ill-defined. This has important implications for the Title 111 Nutrition Program for the Elderly—and especially for the meal and education services.

This appendix reviews the extent and reliability of current information on the nutritional requirements and status of the elderly. Evaluations of the title HI programs are also reviewed in order to examine both the efficacy of the programs and the accuracy of the evaluations themselves.

Recommended Dietary Allowances

The Committee on Dietary Allowances (CDA) of the Food and Nutrition Board, part of the National Academy of Sciences, has published a set of Recommended Dietary Allowances (RDAs) every 4 to 6 years since 1943. Their latest estimates were published in 1980. These RDAs specify the minimum levels of intake of essential nutrients needed to maintain normal body function in healthy population groups. The Committee, which consists of 8 to 10 scientists who are chosen as experts in nutrition-related fields, draws on the international scientific literature, including epidemiological and metabolic studies, to determine RDAs.

According to the Committee, intakes below the recommended levels are not necessarily inadequate for all individuals, but they increase the risk of deficiency.

For proteins, vitamins, and minerals, the allowances are targeted to meet the needs of 95 percent of individuals within a defined population group (12). Average requirements for these nutrients are first estimated, along with their variability, within the group. These figures are then increased once to meet the needs of almost all of the group members, and once more to compensate for inefficient utilization of consumed nutrients due to, for example, poor digestion or absorption. The energy allowance is meant to be adequate to maintain desirable weight while ensuring adequate nutrition.

RDAs are subdivided by age, sex, height, and weight, and are adjusted to account for special nutritional needs during periods of rapid growth, pregnancy, and lactation. Unfortunately, the elderly are lumped into a 51-and-over age group whose needs are not homogeneous and whose RDAs are essentially extrapolated from survey and research information gathered from younger adults. Except for the vitamins thiamine, riboflavin, and niacin, which are adjusted for males, the recommended nutrient levels are the same for those over 50 as they are for those 23 to 50. The recommended caloric intake is lowered for those over 50 and again for those over 75.

It is generally agreed that changes in metabolism, physical activity, efficacy of organ systems, and body composition that occur in the elderly, along with age-related disabilities and chronic disease, can significantly alter the intake, absorption, and utilization of various nutrients (see following section), RDAs extracted from direct study of the elderly, reflecting what is known about relevant age-related changes, are therefore sorely needed.

Although cost, time factors, and ethical constraints have been barriers to thorough studies of the nutritional requirements and status of the elderly (12), the National Academy of Sciences is planning to launch a study of nutrition and the elderly with an emphasis on what further research is needed to establish accurate age-adjusted RDAs.

Current survey estimates of energy, nutrient intake, and dietary adequacy among the elderly are often flawed by unstandardized methods, errors in estimates of consumption, food table analytical values, and assumptions about absorption of nutrients in the gastrointestinal tract. When short observation periods (1 to 3 days) of food intake are used, the proportions of individuals at both extremes of the distribution are greatly exaggerated because of the large day-to-day variation in intake of many nutrients. Moreover, nu-

tritional surveys of the elderly in the United States have been of very limited scope, lack standards from which to derive comparative frequencies of nutrient deficiencies, and have seldom included individuals over 75.

Ideally, nutritional assessment surveys of dietary adequacy in any population group would be conducted in a three-pronged fashion: quantification of food intake over several days to derive an average daily consumption of energy and major nutrients; measurement of biochemical indices for many nutrients (or their metabolites) in the blood or urine in order to estimate tissue levels; and physical examination of the subjects for clinical evidence of any nutrient deficiencies and for illnesses that may affect nutritional state.

Recent technological advances in assessing nutritional needs include more sensitive and specific biochemical assays (i.e., tests to measure the quantity or activity of a substance) for nutrients in the blood and body tissues, tests of physiological functions related to nutritional status, the development of functional assays for the activity of enzyme systems for which certain vitamins are cofactors, and the analysis of more vital foods for their nutrient content and for how that content may be affected by food processing or preparation.

Without valid standards of adequacy for nutrient intake and tissue levels in the elderly, however, results of even an ideal survey could not be calibrated and would be of limited value. In addition, very little is known about how specific deficiencies, especially long-term subclinical deficiencies for which symptoms may not be immediately apparent, contribute to the aging process,

Age-related physiological and sociological changes affecting nutrition

Age-related factors that affect food intake, digestion, absorption, and/or metabolism include: physiological and biochemical changes accompanied by decline of certain body functions with age; age-related disabilities and disease; drug-nutrient interactions (discussed in ch. 5 of this report); and psychosocial circumstances—including isolation, depression, senile dementia, and lower levels of physical activity.

The human body is known to undergo general changes in composition with age, including a loss of lean body mass (10,13) and an increase in fatty tissue mass (39). The decrease in metabolically active tissue and in physical activity indicates that caloric intake should be cut back. This may increase the risk of nutrient deficiencies, however, which reinforces the

need for careful diet management by the elderly. The age-related decline in acuity of taste and smell dulls the pleasure of eating and may further reduce food intake.

The most outwardly apparent age-related changes that affect food intake occur in the mouth. In 1971, about 45 percent of Americans over 65 who were surveyed had no natural teeth (43). Ninety percent of extractions are due to tooth decay or periodontitis. The elderly are particularly susceptible to decay of the roots of the teeth because the gums recede with age, leading to greater exposure of the base of the teeth (an area more susceptible to acid erosion). An added risk factor is age-related decrease in the flow or changes in the composition of the saliva (22).

Intake of starches and simple sugars (e.g., sucrose or table sugar) aggravates decay and increases the risk of loss of teeth (4). Carbohydrates are fermented by oral bacteria to acid that erodes the dental enamel. Impairment of biting and chewing due to lack of teeth or ill-fitting dentures could have a significant influence on the food choices of the elderly. Clinical observations that suggest a high prevalence of vitamin C and B-complex deficiencies in older persons without teeth (17,32) need to be updated and explored further.

Age-related physiological changes in the gastrointestinal (GI) tract may affect food intake, digestion, and absorption. Minor abnormalities in esophageal tract motility (movement in the tube connecting the mouth and stomach) commonly seen in the elderly include disordered contractions and more frequent spontaneous regurgitation of food. In the stomach, age-related changes include decreased hydrochloric acid secretion, decreased intrinsic factor secretion, and decreased pepsinogen secretion (6)—all of which are important to digestion. The absorption of iron and folic acid is known to be acid-sensitive. Diminished hydrochloric acid may also allow overgrowth of bacteria in the small intestine and interfere with absorption.

In the elderly, the villi, or tiny absorptive protrusions in the intestine, are often blunted, and the mucosal surface area of the GI tract lining is reduced. The effects of these histological changes on digestion are as yet unknown.

The elderly often exhibit a decrease in activity of the enzyme lactase, which breaks down the milk sugar lactose in the small intestine. When the absorption of lactose is thus hindered, it moves down the GI tract to the large bowel to be metabolized by bacteria into short-chained fatty acids and various gases. The resulting abdominal discomfort, bloating, and diarrhea may deter the elderly from consuming milk products, contributing to the documented decrease of milk-product intake and difficulty in maintaining adequate calcium in later life. Enzyme additives available over

the counter can be used to aid digestion of liquids containing lactose. More research is needed into dairy products in which the lactose has been predigested.

Little is yet known about age-related changes in the absorption of vitamins and minerals, although it appears that the intestine is less able to compensate for low calcium intake in the elderly. More study is also needed on changes in the gut blood vessel circulation that might affect absorption. GI hormone secretion may change with age, affecting the utilization of nutrients and possibly influencing appetite. The constipation that is prevalent among the elderly may also limit food intake.

A progressive reduction in renal function is often observed in the elderly (40) and may affect the homeostatic level of various body substances normally regulated in part by the kidneys. Potentially harmful accumulations of nitrogenous waste from proteins and phosphate due to kidney malfunction are often observed in the elderly and may be treatable by dietary therapy (45).

The incidence of adult-onset noninsulin-dependent diabetes mellitus increases with age. According to one study (46), half the population over 70 would be diagnosed as having diabetes if the criteria used for glucose tolerance in younger people were used. The cause of this age-related decrease in glucose tolerance is unknown, but it obviously has some impact on the recommended diet, including restriction of concentrated simple sugars.

Finally, the psychosocial changes associated with aging may also influence food intake and metabolism. Dementia, isolation, depression, and other emotional stresses can act as appetite suppressants. Social isolation, including living alone, has been shown to correlate positively with poor nutritional status (18,41). Forced or voluntary reduction in physical activity may also limit food intake by reducing appetite and even exacerbate loss of bone mass in the elderly. One study showed that nursing home residents aged 65 to 95 experienced a significant 4.2-percent increase in forearm bone mass after exercising for 30 minutes three times weekly for 3 years, while a control group exhibited a 2.5-percent loss over the same time period (21).

The nutritional status of the elderly

The largest nutrition survey to date was taken in the National Health and Nutrition Examination Survey (HANES, 1971-74). This survey, however, excluded individuals over 74 and presented no authoritative biochemical evidence to correlate with low nutrient intakes or with the presence of clinical symptoms associated with specific deficiencies.

Very few published nutrition surveys recorded the use of vitamin, mineral, or other nutritional supplements. Although their use varies considerably among ethnic groups, such dietary supplements are used by an estimated 40 to 60 percent of the total older population in the United States (14,15,19) and can substantially affect reported nutrient intakes and biochemical indices.

In general, serious or extreme nutritional deficiencies manifesting clinical symptoms are rarely seen among the elderly in the United States. Unfortunately, little information is available on the prevalence of subclinical deficiencies and their possible long-term effects.

Possible connections between nutritional imbalances and aging or age-related diseases are discussed in chapter 4. Many of these connections are tentative as yet. More research is needed to yield conclusive evidence as a basis for diagnosis and treatment of deficiencies.

Food programs for the elderly

In 1980, the rate of deaths due to nutritional deficiencies in the general population was 1 per 100,000 (42). The rates among those over 65 were several times higher (table C-1): 2.4 in the 65 to 74 group, 9.4 in the 75 to 84 group, and 42.9 in the over 85 group. Although reliable figures are not yet available, far greater numbers of elderly may suffer from chronic, though not fatal, malnutrition; the long-term effects on physiological and cognitive functions are only beginning to be understood (see ch. 4).

In 1965, the Federal Government assumed an active role in fighting nutritional deficiencies in the poor with

Table C-1.—Mortality Among the Elderly Due to Nutritional Deficiencies, 1980

Age group	Total number of deaths in age group	Rate (per 100,000 in) specified group	Percent total deaths in age group
65 and over. . . .	2,060	8.0	0.15
65-75	372	2.4	0.08
75-84	728	9.4	0.14
85 and over. . . .	960	42.9	0.27

SOURCE: National Center for Health Statistics, Advance Report of Final Mortality Statistics, 1980 (42).

the enactment of the Food Stamp Act, then a small-scale program designed to meet what was thought to be a limited need for financial assistance in purchasing food. The Food Stamp Program is now the largest of all food and nutrition programs affecting the non-institutionalized elderly. In fiscal year 1981, for example, an average of 22.4 million people received food stamps each month.

The Administration on Aging (AoA) first sponsored congregate meals for people 60 and over (and their spouses) in 1968 as a research and demonstration project under Title IV of the Older Americans Act Amendment (public Law 92-258). Nutritional surveys conducted in the early 1970s by the Department of Health, Education, and Welfare (now the Department of Health and Human Services) revealed a substantial prevalence of malnutrition among the poor and the inadequacy of the small-scale Food Stamp Program (1).

In response, Congress expanded the existing food assistance programs and established the Nutrition Program for the Elderly in 1972 in an amendment to the Older Americans Act under Title VII. This congregate meal program was designed to meet the nutritional needs of elderly people who were either unable to buy nutritious food or prepare nutritionally adequate meals, and for these who were isolated and lacked the incentive to prepare meals at home. Another major goal was to attract isolated elderly people to the program centers in order to promote social interaction and facilitate delivery of other services.

Congregate meals under this program are available at least once a day and usually 5 days a week. The meal sites are meant to be strategically located to best provide other supportive services such as outreach, escort and transportation services, health services, information and referral, health and welfare counseling, and nutrition and consumer education.

In 1978, the Older Americans Act was amended (Public Law 95-478) to consolidate the title VII nutrition services and the title V multipurpose senior centers with the social service programs provided under title III. Separate funding was made available to the congregate meal programs to provide home-delivered meals for individuals homebound due to illness, disability, or transportation problems. State agencies distribute funds to area agencies that provide nutritional services within the State. Local providers contract with these area agencies. Federal guidelines suggest that each area agency have a board of directors consisting of local volunteers and senior citizens.

An estimated 1.9 to 2.0 million elderly persons are currently enrolled in the congregate and home-delivered meal programs (36,37).

The Federal Government now sponsors 13 major programs designed to increase the amount and quality

of food available to "high risk" segments of the population, including the elderly (table C-2). In fiscal year 1980, \$475 million was authorized for the National Nutrition Program for the Elderly (\$375 million for congregate meals and \$100 million for home-delivered meals). Only \$225 million was appropriated. Recent figures show that these funds provided more than 168 million total meals at an average cost of \$2.27 per meal (1). These included almost 132 million home-delivered meals for 3,083,454 people over 60.

A total of \$676.7 million was appropriated for Older Americans Act programs for fiscal year 1984, including \$386.1 million for title 111 nutrition programs (a \$5 million increase over the previous year). Funding levels for State agencies, senior centers, and other supportive services—as well as for title IV research, training, and demonstrations—remained the same (35).

EVALUATION OF FOOD ASSISTANCE PROGRAMS FOR THE ELDERLY

Most evaluations of food assistance programs for the elderly have concentrated on the social and psychological benefits of the meals. The nutritional adequacy of the programs has been evaluated in seven recent surveys: one major national survey contracted by AoA in 1983 (36,37), two area surveys in central Missouri (26,29,30,31) and Maryland (9), and four local evaluations of single meal sites in Nebraska, Colorado, New York, and Illinois (8,16,20,23).

There is considerable variability in the conclusions drawn by these surveys due to differences in how and what kind of information was collected, and how the

Table C.2.—Federal Food Assistance Programs

Department of Agriculture:

Food Stamps^a
Food Distribution^a
National School Lunch Program
School Breakfast Program
Child Care Food Program
Special Milk Program
Summer Food Service Program for Children
Special Supplemental Food Program for Women, Infants, and Children (WIC)

Department of Health and Human Services:

Head start
Nutrition Program for the Elderly^a
Aid to Families with Dependent Children
Supplemental Security Income^a

Community Services Administration:

Community Food and Nutrition Program^a

^a Most likely to include elderly people.

SOURCE: Aging Health Policy Center, University of California at San Francisco, 1983 (1).

data were analyzed. Certain generalizations about the efficacy of the programs can be made, however.

The surveys generally agreed that the programs were very effective in improving intake of protein. There was disagreement as to whether intake of iron, niacin, thiamine, and vitamins A and C was improved as dramatically. The consensus was that energy and calcium intake were less improved than other nutrients by program meals. Yet intake of almost all of the nutrients surveyed was found to be better overall in participants as compared with both nonparticipants and former participants.

The meals seemed to be reaching varying percentages of the designated target groups. The low-income group was best represented, followed by those over 75. Other target groups, especially minorities and the socially isolated, were less well represented among participants. These underrepresented needy groups may either be ill-informed about the meal programs and nutrition in general or find access to the program difficult.

Problems were also found in the sanitary conditions at program meal sites, especially at those serving catered meals, although conditions varied widely among sites. In addition, the nutrition education mandated by title 111 was found to be generally insufficient and infrequent at most sites. Furthermore, the nutrition education lectures were often too long—a short (10-minute) talk accompanied by take-home reference pamphlets may be more effective. A general dearth of personnel trained in nutrition and management at the meal sites may contribute to many of these problems.

The above findings and other points raised by the surveys are discussed in greater detail in the following sections. The parameters and limitations of each of the five program surveys are presented in tables C-3 and C-4. Flaws in the surveys that limit their accuracy and comparability are outlined below, including sample selection procedures, method of assessing dietary intake, and data analysis procedures.

Sample Selection. Only three of the studies—the national, Missouri, and Maryland surveys—appeared to have used randomly and purposively selected samples that were representative of the meal program participants (9,26,29,30,31,36,37). Unfortunately, both the Missouri and New York surveys, though random, were racially homogeneous and did not record income levels (table C-4). Both of these factors are important in characterizing target populations in order to determine whether those in need are actually being reached by the meal programs.

Two of the single-site surveys used volunteers for subjects (16,23). Since volunteers may be more nutritionally aware and generally more involved in the program, this sample selection criterion may further bias the results. Generalizations about the efficacy of food programs cannot be made from nonrepresentative samples; the data they contain are, at best, illustrative. They can provide background data for surveys with appropriate samples.

Assessment of Nutritional Intake and Status. Only the central Missouri area survey and the single-site evaluations in Colorado and Nebraska (16)20,26,31 attempted to use objective measures of health status, such as biochemical measurements of nutrients in blood and anthropometric measurements (i.e., measurement of height/weight proportions and skin-fold thickness) for detecting problems with weight status. The Missouri survey also used some clinical tests (table C-3). These assessments take into account not only dietary intake but possible problems in the absorption and metabolism of various nutrients that may change with age and with certain age-related diseases.

The subjective measures of dietary intake used by the other surveys, such as 24-hour recall, food diaries (the individual records types and quantities of food consumed over a specified period), and dietary histories (based on recall of the frequency with which certain foods are habitually consumed), are limited in accuracy and usefulness.

Accurate recall of the kinds and amounts of food eaten over a 24-hour period, for example, is difficult for anybody and may be especially difficult for the elderly due to possible memory problems (34). Food diaries are usually more accurate and can be useful if those who review them are trained in food value and nutrition. Often, however, only one day's intake is measured, in which case a large sample size must be used to get a representative estimate for the designated population. Dietary histories can give an estimate of food intake over a longer period of time.

Even such subjective assessments, however, can reveal general trends in the effects of the congregate meal program on nutrient intake, the proportion of the RDA for particular nutrients, and the total day's intake contributed by the meal program (8,9,16,20,23,26,29,30)31,36,37). These are also economical in terms of the relatively small amount of time and effort needed to obtain the information.

Data Analysis. Comparisons of data from different food program evaluations can be further complicated by differing procedures for analyzing data, especially dietary intake data. For example, the national evalua-

Table C-3.—Description of Surveys for Evaluating Title III Congregate Meal Programs Funded by the Older Americans Act

Survey	Sample selection	Sample size	N	Parameters measured	Limitations of survey
National (1976, 1981)	Participants Purposive	Participants— Ate a meal 800 Did not eat a meal . . 920		Dietary intake— 24 hour recall	1. Use of 24-hour recall 2. No biochemical measures 3. No health status measures 4. No anthropometric measurements
	Non-participants Purposive	Non-participants— Neighbors 1,039			
Missouri (1975, 1976, 1979)	Participants Random sample of lists of participants	Participants Ate a meal. 154 Did not eat a meal . . 213		Dietary intake— Food record (1 day) Dietary histories	1. Area sample 2. Only white participants
	Nonparticipants Subjects most likely to participate in fact did participate 1 year later.	Non-participants . . . 99		Biochemical measures— Hct, Hb, serum, iron, vitamins B, A and C, albumin, cholesterol Clinical—Height, weight, triceps skinfold thickness, blood Pressure	
Nebraska (1980)	Participants Volunteers	Participants— Volunteers. 30		Dietary intake— 24 hour recall Biochemical— Hct, Hb, vitamins B ₆ , B ₁₂ , A and C, serum albumin Anthropometric— Height, weight, triceps skinfold thickness, arm girth, waist girth	1. Use of 24-hour recall 2. Small sample size 3. No comparison group 4. Local site only 5. Sample selection bias
Colorado (1979)	Participants Not stated	Participants. 59		Dietary intake— Food record (1 day)	1. Local site only 2. No anthropometric measures 3. Sample selection bias
	Non-participants Not stated	Nonparticipants . . . 32		Biochemical— Hct, Hb, serum protein and albumin, serum vitamins A and C, serum iron, total iron binding capacity	4. Cross-sectional survey
New York (1979)	Participants Random selection from list of participants	Participants. 73		Dietary intake— Food record (1 day)	Local site only ;: No biochemical measures 3. No anthropometric measures 4. No comparison group

Table C.3.—Description of Surveys for Evaluating Title III Congregate Meal Programs Funded by the Older Americans Act

Survey	Sample selection	Sample size N	Parameters measured	Limitations of survey
Maryland (1980)	Participants Random selection from 11 site lists	Participants. 169	Dietary intake— Food record (3 days)	1. County sample 2. No biochemical measures 3. No anthropometric measures 4. No comparison group
Illinois (1981)	Participants Volunteers Non-participants— Volunteers	Participants. 8 Non-participants . . . 32	Dietary intake— 24 hour recall	1. Local sample 2. Sample size and selection 3. Limited number of nutrients reported 4. No biochemical measures 5. No anthropometric measures

SOURCES: Opinion Research Corp. and Kirschner Associates (1963) (37); Kohrs, O'Hanlon, and Eklund (1978) (29); Kohrs, et al. (1979); Kohrs (1979) (26); Kohrs, et al. (1960) (31); Grandjean, et al. (1961) (16); Harrill, et al. (1981) (20); Caliendo (1960) (8); Caliendo and Smith (1961) (9); Kim, et al. (1964) (23).

Table C-4.—Description of Subjects and Advantages of Each Nutrition Evaluation Survey

Survey	Race	Income	Advantage
National	Participants 190/o minority Non-participants 19% minority	<\$6,000-1981 Participants 520/o Non-participants 460/o	1. National sample and sample size 2. Minorities represented 3. Longitudinal
Missouri	97% White	NA (State guide- lines did not permit)	1. Representative sample of area participants 2. Longitudinal 3. Dietary methodology 4. Biochemical evaluation 5. Clinical evaluation 6. Analysis of dietary data pro- vided in meaningful ways 7. Sample size
Nebraska	NS*	NS	1. Biochemical measures 2. Anthropometric measurements
Colorado	NS	NS	1. Dietary methodology 2. Biochemical measures
New York	White	NS	1. Analysis of dietary data pro- vided in meaningful ways
Maryland	670/o White 300/o Black 30/o other	NS	1. Minorities represented 2. Sample size 3. Dietary methodology
Illinois	Korean	NS	1. Minority evaluation

*Not stated.

SOURCES: Opinion Research Corp. and Kirschner Associates (1963); Kohr% O'Hanlon. and Eklund (1978); Kohrs, et al. (1979); Kohrs (1979); Kohrs, et al. (1980); Grand-
jean, et al. (1981); Harrill, et al. (1981); Caliendo (1960); Caliendo and Smith (1981); Kim, et al. (1964).

tion presents figures for proportions of people meeting certain dietary intake criteria, while others give mean values for nutrient intake.

Yet both the national and Missouri evaluations offer longitudinal data that are extremely useful in evaluating progress in participants' nutritional status over time.

Conclusions on the Effectiveness of the Food Programs.—*Dietary Intake and Nutritional Status of Participants:* Guidelines for the Federal programs state that a minimum of one-third of the RDAs for specified nutrients should be provided in any meal served to an elderly program participant. The national evaluation reported that those elderly who ate a program meal were more likely to achieve this goal between 11 a.m. and 4 p.m. than those who did not participate (36,37; table C-5). The specified hours are those during which all of the surveyed programs, and a majority of programs in general, serve their meals. Participants were also more likely to meet at least two-thirds of the RDAs over the entire day for the specified nutrients (table C-6). The results for both congregate and homedelivered meals indicated that program meals were most successful at improving dietary intake of protein, B vitamins (riboflavin, niacin, thiamine) and iron (table C-7). This evaluation documented a consistent tie between the program meal and a generally improved diet during the entire 1976 to 1981 evaluation period.

Although the national survey also found that the program meals were less successful at improving intake of other nutrients—such as calcium and vitamins A and C—it could not be determined whether this reflects the nutritional content of the meals served or the food preferences of the participants.

The national evaluation of food service delivery systems used in the title HI programs also studied the nutrient content of program meals. Table C-8 compares the results of this evaluation for percentage of RDAs provided by the menus to two other evaluations (25). This study found that for most of the nutrients analyzed, the meals contributed more than one-third of the RDA for participants over 50.

A notable exception was the trace element zinc, of which the menus provided less than one-third of the RDA. The national report failed to note this exception in its discussion. Deficient zinc intake seems to impair immune system function (44) and may be especially detrimental to the elderly, since ability to ward off infection and harmful-micro-organisms often declines with age.

This report also compared the estimated values for nutrient content of the meals to values obtained from chemical analyses of the food after cooking (25; table C-9). Chemical analyses are particularly important for nutrients that, like vitamin C, may be destroyed by overcooking and for nutrients about which there is little information available regarding the amount pres-

Table C.5.—Percentage of Elderly Who Consumed 1/3 of Recommended Dietary Allowance During the 11 a.m. -4 p.m. Period

Nutrient ^a	Ate a program meal		Did not eat a program meal		Non-participants	Former participants
	Congregate dining participants	Home-delivered meal recipients	Congregate dining participants	Home-delivered meal recipients		
	(N = 800)	(N = 340)	(N = 920)	(N = 63)	(N = 1,039)	(N = 249)
Calcium	510/-	50%	26%	30%	250/-	25%
Vitamin A	55	50	28	32	26	
Vitamin C	59	52	36	44	34	36
Thiamine	70	67	49	49	52	54
Niacin	73	66	52	46	49	46
Iron	75	67	46	51	44	40
Riboflavin	78	75	57	54	56	55
Protein	87	83	64	63	60	58
Calories	53	48	35	30	32	31

^aElderly persons who ate a program meal were significantly more likely to meet 1/3 RDA for each nutrient (all 1df, 90.0 all P's 0.01) (36)

SOURCES: Opinion Research Corporation and Kirschner Associates (1983).

Table C-6.—Percentage of Elderly Meeting at Least 2/3 of Recommended Dietary Allowance (RDA) for Key Nutrients During Wave i and Wave ii

Nutrient ^b	Wave II (Wave I in Parentheses) ^a					
	Congregate dining participants		Home-delivered meal recipients		Non-participating neighbors	Former participants
	Ate a site meal yesterday	Did not eat a site meal yesterday	Ate a program meal yesterday	Did not eat a program meal yesterday		
	N = 800 (N = 765)	N = 920 (N = 1,049)	N = 340 (N = 0)	= 63 (= 0)	N = 1,039 (N = 1,788)	N = 249 (N = 0)
Calcium	640% (67%)	460% (490/0)	580%	41%	47% (470/0)	49%
Vitamin A	(69)	(56)	64	46	(53)	51
Vitamin C	(81)	(73)	73	75	(70)	67
Thiamine ^c	(79)	(74)	90	83	(71)	89
Niacin ^c	(81)	(75)	81	68	(72)	79
Iron	(86)	(77)	79	63	(76)	78
Riboflavin	(89)	(79)	94	83	(79)	90
Protein	(96)	(91)	95	90	(90)	92
Calories	(73)	(68)	64	48	(63)	63

^aDietary intake was not assessed for home-delivered meal recipients and former participants during Wave I.

^bDiscriminant analysis revealed that having eaten a congregate or home-delivered meal was significantly related to better overall diet scores (univariate F for congregate meal participants, $df = 1$ and 741 , ≈ 27.7 , $p < 0.01$; univariate F for home-delivered meal recipients, $df = 1$ and 123 , ≈ 11.8 , $p < 0.01$).

^cThe Wave-to-wave increases in intake of these nutrients may be strongly related to 25 to 50 percent increases in food nutrient enrichment levels that took effect for these nutrients since Wave I while RDAs for these nutrients have changed little.

SOURCES: Opinion Research Corp. and Kirschner Associates (1983) (38).

Table C-7.—Percent of Total Day's Nutrient Intake Supplied by Title III Meal

Nutrient	Meal Program					
	Missouri ^a		Colorado ^b		New York ^c	
	Men	Women	Men	Women	Both sexes	Range
Energy	46.4V0*	52.4V0*	41 + 3%	48 + 2%	45 + 3%	29-72%
Protein	47.5*	55.1'	54* 3	59* 2	51 + 2	22-86
Calcium	42.4	45.2	48 + 4*	61 + 3'	44* 3	12-91
Iron	41.6*	46.7*	46 + 3	52 + 2	48 + 3	12-79
Vitamin A	50.5	52.6	49* 5	59 + 3	57* 4	19-70
Thiamine	38.8	42.2	39* 3	42 + 2	48 + 3	18-90
Riboflavin	41.4	44.4	50* 3	56 + 2	47* 2	12-94
Niacin	45.6'	53.0"	53* 4	54* 2	52 + 2	2-94
Vitamin C	48.4	46.3	36 + 5	44* 4	48 + 4	10-95

^a Based on 54 men and 100 women

^b Based on 14 men and 45 women

^c Based on 53 subjects of both sexes

.Differences between men and women are statistically significant for the survey ($p < 0.05$)

SOURCES: Kohrs, O'Hanlon, and Eklund (1978) (29); Kohrs, et al. (1980) (31); Harrill, et al. (1981) (20); Caliendo (1980) (8).

Table C-8.—Mean Percentages of Recommended Dietary Allowances (RDAs) Provided by Meals Served at Congregate Meal Sites (mean + standard error)

Nutrient	Area served by meals					
	National ^a		Missouri ^b		Colorado ^c	
	Men	Women	Men	Women	Men	Women
Protein	66+ 1%	84* 2%	75* 3%	91* 4%	81 + 12%	99* 14%
Calcium	61 + 2	61&2	65 + 3	65* 3	60* 3	60* 3
Iron	51* 1	51* 1	5 3 3	53* 3	62+7	62 + 7
Vitamin A	106 +0	133 +2	70* 12	87 +15	72& 28	90* 35
Thiamine	34+1	48 +1	41* 4	4 9 +	36 +1	43* 2
Riboflavin	6 4 +	71* 3	63 +3	86&3	61 +4	8 3 +
Niacin	49+1	57* 2	40* 3	54& 3	65 +10	86& 13
Vitamin C	73&3	73&3	8 3 +3	8 3 +3	5 2 +	5 2 +
Zinc	2 4 +	2 4 +	—	—	—	—

^aBased on 117 meals from representative of each region and the United States.

^bBased on 20 meals served during survey days 5 sites.

^cBased on 5 meals served at site during survey.

NOTE: CAUTION NEEDS TO BE EXERTED IN USING SUCH VALUES BECAUSE NUTRIENTS MAY HAVE BEEN LOST OR DESTROYED DURING COOKING PROCESS. THESE RESULTS ARE ALSO BASED ON THE ASSUMPTION THAT THERE INADEQUATE PORTION CONTROL.

SOURCES: Opinion Research Corporation and Kirschner Associates (1983) (37); Kohrs, O'Hanlon, and Eklund (1978) (29); Harrill, et al. (1981) (20).

Table C-9.—Comparison of Analyzed and Calculated Percentage of Recommended Dietary Allowance (RDA) Values in Meals Served to the Elderly (+ standard error)

Nutrient	Analyzed		Calculated	
	Men	Women	Men	Women
Protein	70 2%	90* 2%0	65 + 2%	83 + 2%
Calcium	53 + 2	53* 2	59& 2	59* 2
Vitamin A	62 + 6	78 + 8	112 +20	140 +24
Thiamine	40* 4	56& 6	34+ 1	48 + 2
Riboflavin	51 + 2	60 + 6	64 + 5	75 + 6
Vitamin C	20* 2	19+2a	67+6	67+6
Zinc	29+2a	29&2a	24+1a	24+10a

^a less than One-third of the RDA

SOURCES: Opinion Research Corporation and Kirschner Associates (1983)(37)

ent in certain foods (e.g. folic acid or zinc) (3,7,44). More such chemical analyses would enhance the accuracy of these kinds of evaluations.

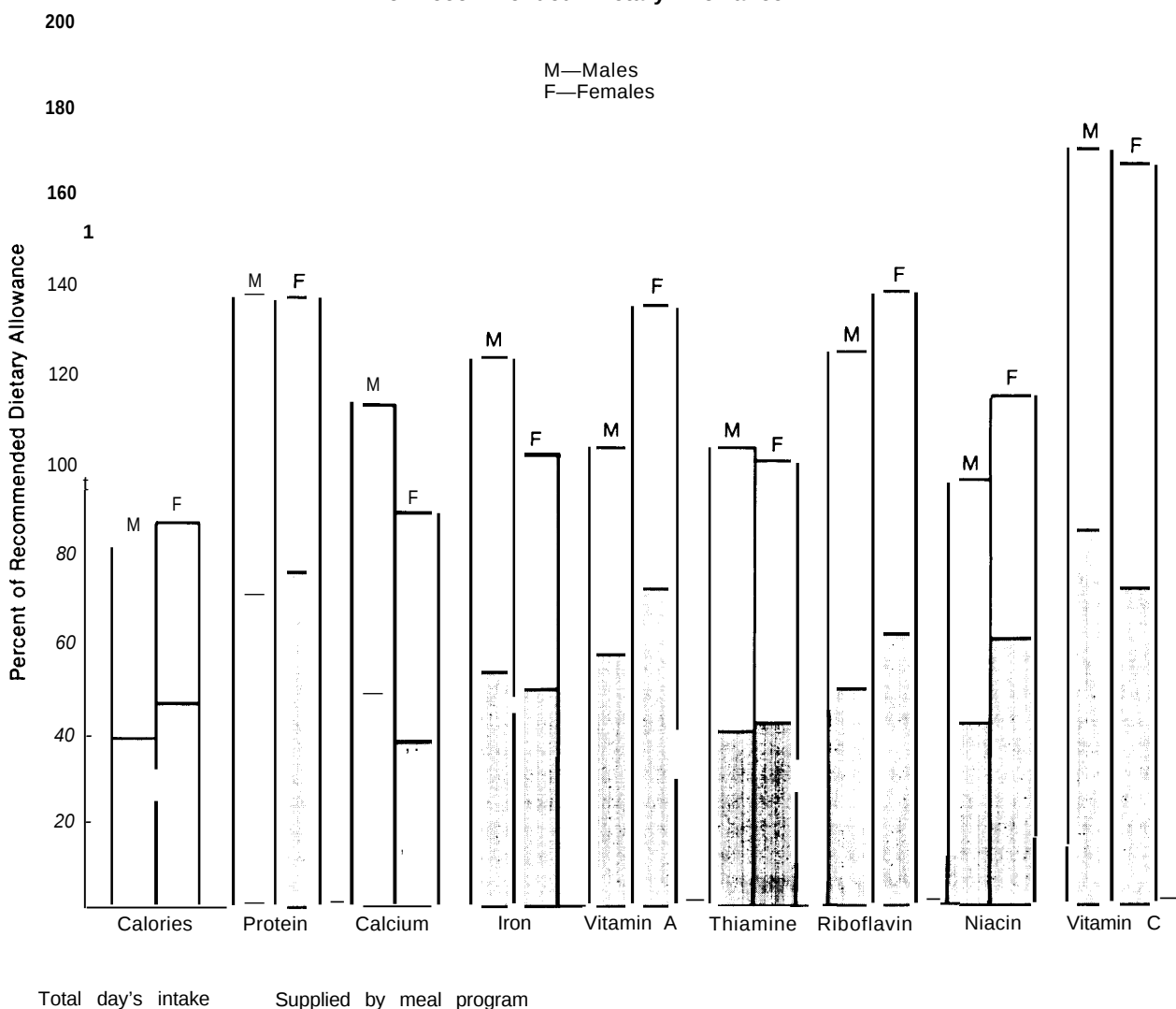
In the Missouri evaluation, the total day's dietary intake of nutrients reflected the nutritional content of the program meal (26,29; see fig. C-1). The nutrients provided in the greatest amount by the program menu—protein and vitamins A and C—were also consumed in the greatest amount. Nutrients that were provided in smaller proportions of the RDA in the meals—energy and niacin for men and thiamine for both sexes—were those for which the total daily consumption was less than 100 percent of the RDA (fig. C-1). These results from food records were reinforced by data from dietary histories and blood sample analyses (27)28,31).

People who participated regularly in the Missouri program reduced their risk for clinical deficiencies of vitamins A and C. These results were strengthened by longitudinal data; fewer incidences of low serum

values for these vitamins were recorded after 1 year in the program, and none were found after 4 years of participation (27)28; table C-10). In contrast, no improvement was seen in risks for anemia, especially iron-deficiency anemia, in terms of dietary intake or serum hemoglobin and iron (26,27,28)31).

There is a risk of increasing intake of foods high in saturated fats and cholesterol (like red meat) when providing meals high in energy, protein, and calcium. The Missouri evaluation, however, found no evidence of either elevated intake of these substances or of obesity (another risk factor for cardiovascular disease) among regular participants who ate program meals two to five times a week (27)31).

Percent of Total Day's Intake Provided by Meal: The proportion of the total day's nutrient intake provided by the program meal was evaluated by the Missouri and the single-site surveys in Colorado and New York. All three evaluations (8,20)29) indicated that a substantial proportion of the total day's intake was consumed

Figure C-1.—One-Day Intake of Nutrients by Participants Eating at the Meal Program, Expressed as Percentage of Recommended Dietary-Allowance

SOURCE: Kohrs, O'Hanlon, and Eklund (1978), (29).

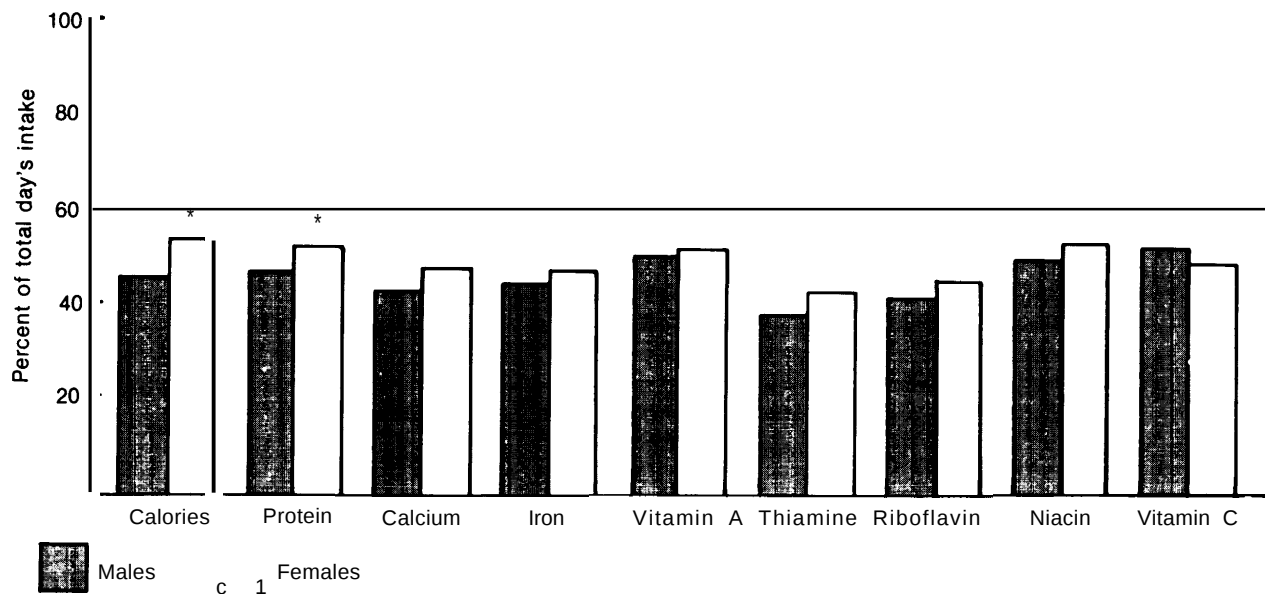
Table C-1 O.—Percentages of Participants at One Site Who Had Low Concentrations for Serum Vitamins A and C,* According to Year Blood Samples Were Taken

Year	Serum vitamin A	Serum vitamin C
1975	430%	70%
1976	13	2
1979	0	0

a Low concentrations for vitamins A and C were $\geq 100\%$ and $< 1\%$, respectively.

SOURCE: Kohrs (1982), (27)

during the program meal. All indicated that an average of 40 percent or more of the total daily nutrient intake (not the RDA) for each individual was consumed during the meal (table C-7). The results of the other two surveys are similar to those from Missouri (fig. C-2). In some cases, an average of 60 percent of the total day's nutrient intake was provided by the program meal (table C-7). In Missouri, the program meal supplied a larger average proportion of the total day's intake of energy, protein, iron, and thiamine to women than to men.

Figure C-2.—Percent of Total Day's Intake of Nutrients Furnished by the Meal Program, for Males and Females

• Significantly different ($p < 0.05$)

SOURCE: Kohrs (1982), (27).

These results suggest that a large number of participants in the three programs depend on the program meal for much of their daily food intake. Ironically, those participants whose major nutritional source is the program meal are probably more at risk for deficiencies since, even if the meal provides its mandated 33 percent of the RDA for most nutrients, their total daily intake would be well below the RDA.

The values for the New York evaluation reflect the great variability underlying these data (table C-7). For some participants in the New York program, the meal provided more than 75 percent of their day's intake of protein, iron, calcium, riboflavin, niacin, thiamine, and vitamin C. If the meal in fact provided only 33 percent of the RDA for these nutrients, these participants could be consuming less than half of the RDA per day. Yet some received 12 percent or less of their daily intake for many of these nutrients in the meal and thus would be more likely to meet the RDA by supplementing their diet outside of the program.

Participants v. Nonparticipants: The national, Missouri, and Colorado surveys all compared the nutrient intake of participants with that of nonparticipants. All three found that intake of vitamins and minerals was significantly increased by participation in the title III congregate meal program (20,29,36)37). The national survey used 24-hour recall; the other two surveys used food records.

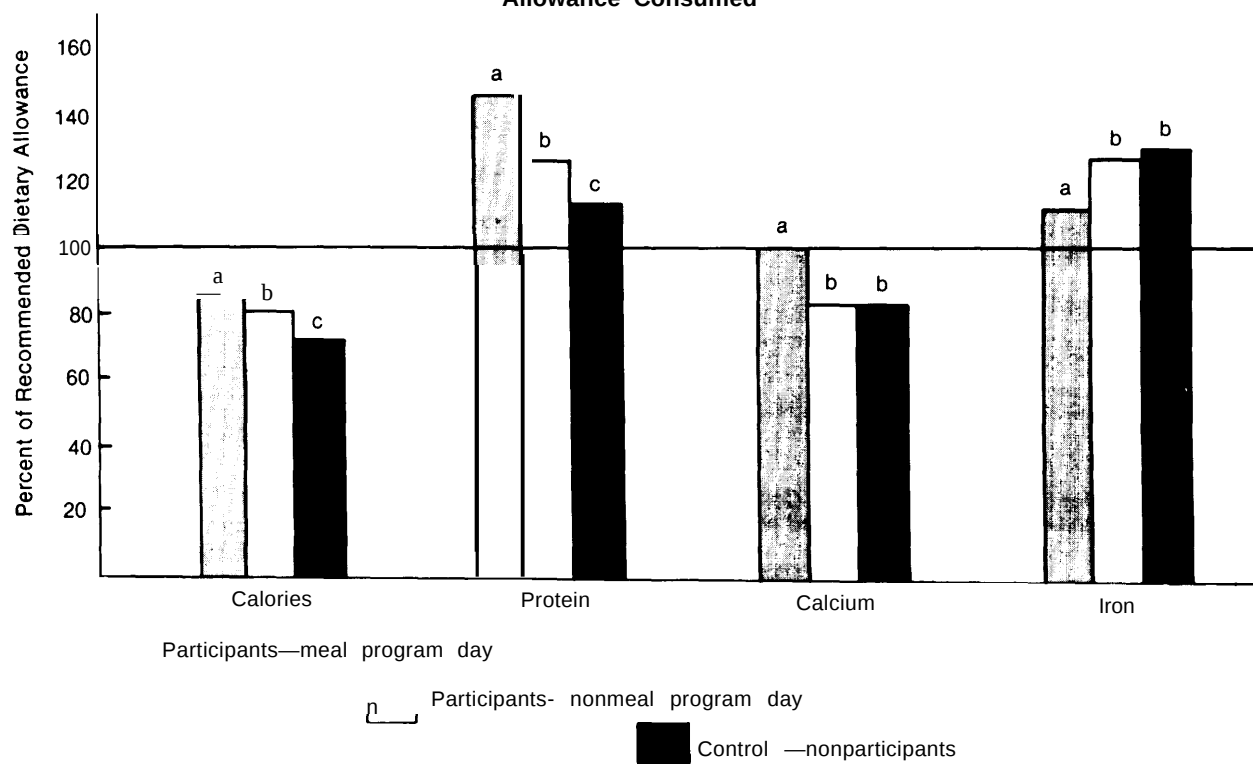
These three surveys and another evaluation of elderly Koreans participating in the meal program (23) all found that the program significantly increased calcium intake, one of the major nutrients frequently lacking in the diets of older women and implicated in hypertension and osteoporosis.

The Missouri survey revealed that intakes of energy and protein were greater for the participants who ate the program meal than for both nonparticipants and participants who did not eat a program meal on the day of the food record (fig. C-3). The national survey demonstrated that the energy intake for women under age 76 who ate the program meal was proportionally greater than that of women who did not participate.

Moreover, the energy and protein intake of those participants not involved on a particular day was still higher than that of the control group (nonparticipants) in Missouri. This finding suggests that other services such as transportation, shopping assistance, and nutrition education contribute to improved intake for participants even when not eating at the program, and that partial savings by eating program meals may be used to buy more and better food.

In Colorado, the survey found that intake of several other nutrients, including fat and some of the B vitamins (thiamine, riboflavin, and niacin), was greater for participants than for nonparticipants. Biochemical evidence of iron-deficiency anemia, found in a small

Figure C-3.—Influence of Meal Program Participation Status on Percentage of Recommended Dietary Allowance Consumed*



a Bars with different letters (a,b,c) are significantly different (P < 0.05)

SOURCE: Kohrs, O'Hanlon, and Eklund (1978), (29).

number of participants and nonparticipants in Colorado (220), was more common among the nonparticipants.

The national evaluation further reported that overall intake of energy and eight nutrients was greater for participants in comparison with nonparticipants, former participants, and those who did not eat the meal that day (table C-6). The report suggests that improvement in dietary intake is a function of actually *consuming* the program meal rather than simply being enrolled in either congregate or home-delivery services (36,37).

Correlation of Nutritional Status With Sex, Age, Race, and Income: The Nutrition Program for Older Americans is mandated to help meet the needs of those who are poor, socially isolated, over 75, members of an ethnic minority, limited in ability to speak English, and/or have a mobility impairment. A profile of participants in both the congregate and homedelivered meal programs, as well as former participants and nonparticipating neighbors, is given in table C-II. The low-income and over-75 target groups appear to have higher proportions who are program participants,

with those who suffer mobility impairment predictably composing most of the homedelivered meal recipients. Other groups, however, comprise markedly lower proportions of all participants—including minorities, those who are socially isolated, and especially those whose English is limited (table C-II). This could be due to lack of awareness or inaccessibility of the program among these groups.

Other demographic variables of interest are presented in table C-12. Recipients of homedelivered meals were generally older, poorer (65 percent had incomes below \$6,000 in 1981), and in poorer health than the congregate meal recipients. The national evaluation concluded that congregate-meal participants qualifying as "priority" recipients due to advanced age, low income, minority status, isolation, mobility impairment, or lack of fluency in English aggregatedly constitute three-quarters of all congregate participants (36)(37).

On average, participants are getting older—ne-third of participants were over 75 in 1978 compared with 41 percent of congregate participants and two-thirds of homedelivered meal recipients in 1982. Interest-

Table C-11.—Percentage of Survey Respondents With Specific Priority Traits

	Priority traits					
	Low income ^a	Minority status	Social isolation	Mobility impairment	Limited ability to speak English	Advanced age ^b
Home-delivered meal recipients (N=415)	650%	15%	190/0	720%	20%	670%
Former participants (N=249)	61	14	17	22	— ^c	59
Congregate participants (N=1,735)	52	19	17	11	2	41
Non-participating neighbors (N=1,039)	46	18	15	17	1	40

^a Below \$6,000 annual 1981 income.

^b 75 years of age or older.

^c Denotes less than 1 Percent.

SOURCES: Opinion Research Corporation and Kirschner Associates (1983), (36).

Table C-12.—Selected Characteristics of Congregate Meal Participants and Home-Delivered Meal Recipients

Characteristic	Congregate participants (N=1,313)	Home-delivered meal recipients (N=415)
Average age (in years)	73	78
Live alone	550%	61%
1981 family income below \$6,000	52	65
Income takes care of needs only "poorly" . . .	16	24
Household receives food stamps	13	19
Receives Medicaid benefits	18	30
Get out of house nearly every day	81	24 ^a
Able to clean and maintain home by themselves	89	41 ^a
Fair or poor current health	25	59 ^a
Health worse than last year	16	38
Spent time in hospital/nursing home in past year	23	44 ^a
Rarely or never attend religious services	24	63 ^a
Never invite others to eat at their homes	23	66 ^a

^a Discriminant function analysis revealed that these variables maximally discriminate between the two groups. All univariate F values >650, all p's 0.01 (df = 1 and 1,208)

SOURCES: Opinion Research Corp. and Kirschner Associates (1983), (36).

ingly, the average annual income of participants is also rising and is more evenly distributed in the \$9,999 and under group with fewer participants earning less than \$4,000 a year (table C-13).

Results of both the national and Missouri evaluations for dietary intake indicated that at least some of the program's target groups benefited (30)36,37). The Missouri evaluation found that participants over 75 consumed a larger proportion of their total daily intake of calories and vitamin A than did younger participants.

The national evaluation found income to be significantly related to dietary intake among congregate and home-delivered meal participants as well as nonparticipants (36,37). Among persons receiving less than \$6,000 annually, a greater proportion of those who ate a program meal consumed the minimum recommended amounts of calcium, vitamin A, and calories than those who did not participate (table C-14). Eating a program meal significantly reduced income-related intake differences for calcium and calories.

Although the Missouri evaluation did not indicate income, it did conclude that the meal program ameliorated the differences in nutrient intake found to be related to level of education and pre-retirement occupation (26,30; fig. C-4 and C-5). In fact, education, pre-retirement occupation, and marital status were not shown to be related to the RDA-proportion of nutrients consumed by those who ate the program meal on the day of the food record. In contrast, such socioeconomic factors were significantly related to intakes

Table C.13.—Income Distribution of Respondents During Wave I and Wave 11, 1975 and 1981

	Wave II (Wave I in parentheses)				
	Participants			Home-delivered meal recipients	Non-participating neighbors
Annual family income ^a	Total	Longer term	Recent entrants		
	N = 1,735 (N= 2,803)	N = 878 (N= 972)	N = 857 (N= 1,831)	N = 415 (N =0)	N = 1,037 (N= 1,797)
Less than \$2,000	3% (19%)	3% (220 / 0)	4% (1 7%)	7% (N .A.) ^d	3% (15%)
\$2,000-\$ 3,999	(23)	(50)	(45)	(N^aA)	(40)
\$4,000-\$ 5,999	(17)	(14)	(19)	(N.A)	(19)
\$6,000-\$9,999	(11)	(10)	(12)	(N.A)	(14)
\$10,000-\$ 13,999	10	10	10		
(\$10,000 or more) ^b	(5)	(3)	(6)	(N.A.)	(11)
\$14,000-\$ 17,999	6	5	7		6
				(N.A.)	
\$18,000 -\$21,999	2	2	2	(N.A)	3
\$22,000 or more	3	2	3		6
				(N.A.)	
Refused/no response	(1)	(1)	(1)	(N.A)	(1)
Total	100 (100)	100 (100)	100 (100)	100 (N. A.)	100 (100)

^aWave I data reflect self-reported or estimated annual family income for 1975. Wave II data reflect self-reported or estimated annual family income for 1981.

^bor more was the highest income category used during Wave I.

^cDenotes less than 1 percent.

^dNot assessed.

SOURCES: Opinion Research Corp. and Kirschner Associates (1963), (36).

Table C-14.—Relationship Among Daily Dietary Intake of Low Intake Nutrients, Nutrition Program Participation, and 1981 Family Income

Met or exceeded two-thirds RDA ^a	Ate a program meal		Did not eat a program meal ^a	
	Below \$6,000	\$6,000 or more	Below \$6,000	\$6,000 or more
	(N = 678)	(N = 409)	(N = 1,107)	(N = 1,077)
Calcium	61%	63%	42%	51%
Vitamin A	65	74	46	54
Calories	73	78	62	73

^aIncludes all respondents who did not eat a program meal (i.e. participants, home-delivered meal recipients, nonparticipants and former participants).

Among those who did not eat a program meal, income was significantly related to higher intake for each nutrient (all χ^2 2.1 df, $p > .01$).

Among those who consumed a program meal, income was significantly related to higher intake of vitamin A (χ^2 1 df = 79, $p > .01$), but not for calcium or calories (all χ^2 2.1 df, 29, all p 's $> .05$).

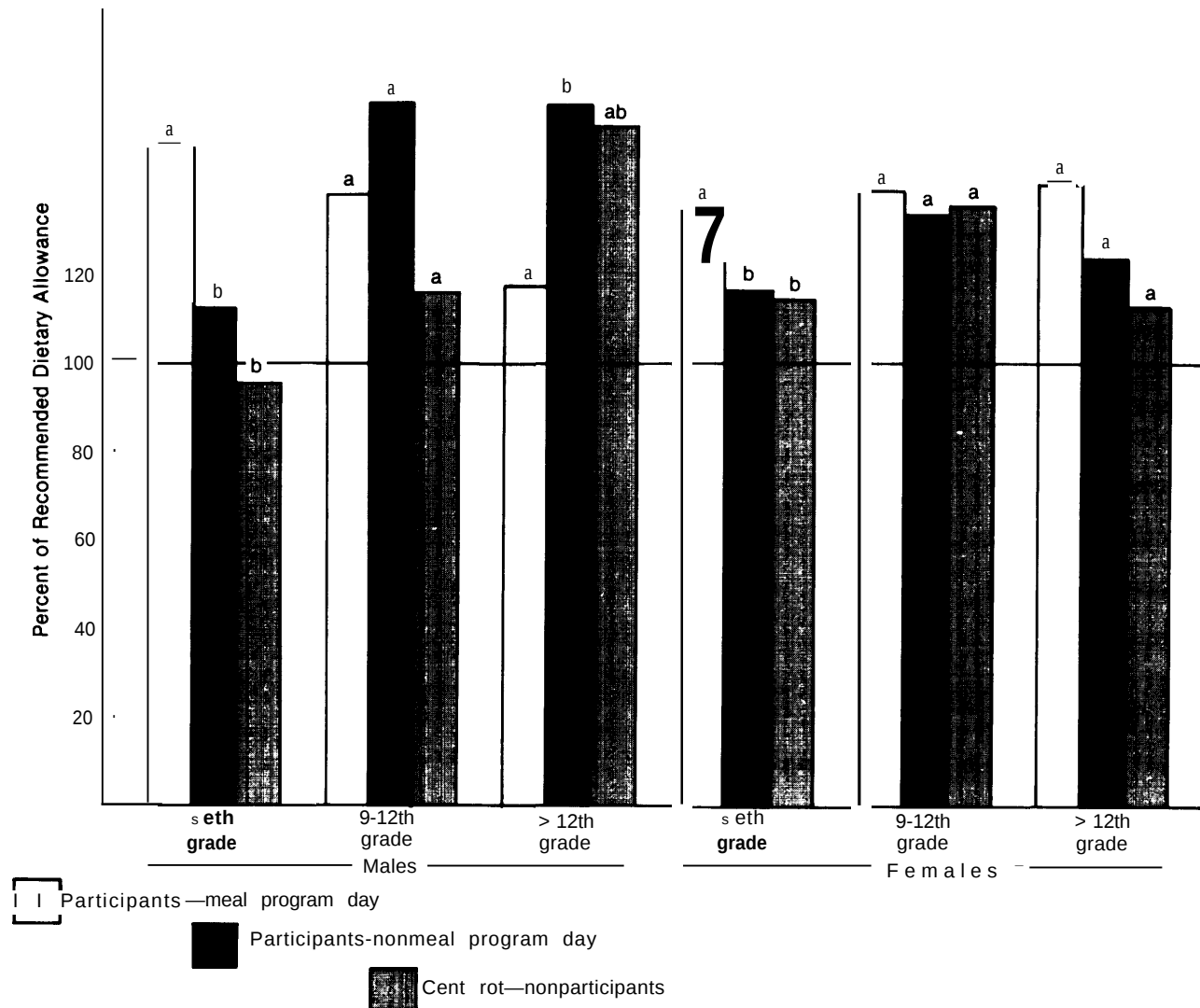
SOURCES: Opinion Research Corp. and Kirschner Associates (1963), (36).

of calories and seven nutrients among the participants who did not eat the meal program that day and also to the intake of six nutrients among nonparticipants (figs. c-4 and c-5).

In general, using dietary intake as a measurement for meeting the nutritional goals of the title III program, the national and Missouri evaluations found that people with lower socioeconomic status benefited the most by eating the program meal.

Nutrition Education: The title III program is mandated to provide nutritional education as one of the services associated with the meal program. The national evaluation reported that at most sites nutrition education classes were generally offered less than once a month (36)(37). Site managers reported that benefits of nutrition education could be augmented by increasing the frequency of the classes and by improving the qualifications of the teaching personnel.

Figure C-4.—influence of Group, on Percentage of Recommended Dietary Allowance for Protein,^a by Sex and Education



a. Bars with different letters (a,b,c) are significantly different ($p \leq 0.05$) within each education group.

SOURCES: Kohrs, et al. (1979), (30).

Nutrition instruction is useful in that it helps individuals to shop and prepare nutritious foods in an economical way. The cost effectiveness of providing nutrition education by registered dietitians and trained nutritionists in terms of health costs averted and fewer dependents on the meal program has not yet been evaluated.

A pilot program in Missouri found not only that older people were interested in participating in nutrition education classes, but that those who attended a program regularly for 5 out of 10 classes increased

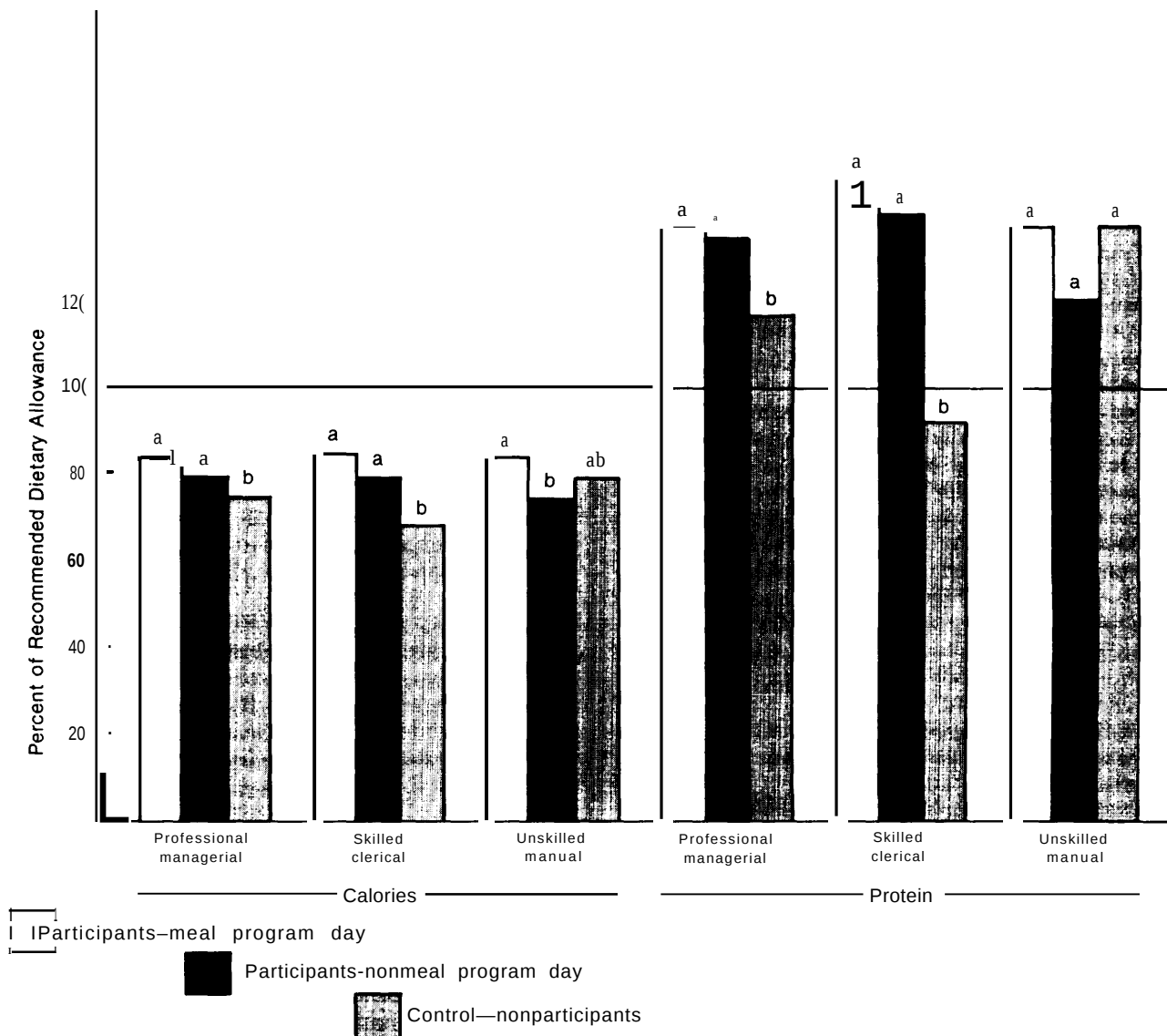
their knowledge of good nutrition (27,28). The effect on dietary intake, however, was not evaluated.

In general, the nutrition classes tend to be too long. A 10-minute lecture accompanied by take-home nutritional guides may be more effective.

Participants' Perception of Program Benefits: The national evaluation and an evaluation in Boston both studied the participants' perceptions of the meal program.

The national evaluation found that people enrolled in the program reported that participation may help

Figure C-5.—influence of Meal Program Participation Status on Percentage of Recommended Dietary Allowance for Calories and Protein, by Occupation*



a B With different letters (a,b,c) are significantly different within each Occupation.

SOURCE: Kohrs, et al. (1979), (30).

to keep them mobile. Those who remained active in the program from the beginning of the survey in 1975 reported more mobility than did respondents who either left the program or never enrolled. The national evaluation also reported that when age, minority status, sex, and self-reported health were controlled, program benefits were not apparent in terms of increased longevity. Even so, the evaluation asserted, participation itself may help sustain the quality of life

by enhancing social activity and maintenance of positive self-perceptions of health status (36,37).

The Boston evaluation attempted to determine the participants' perceptions in terms of their personal goals and the programs' value to them (38). The participants most valued the setting for the congregate meal, the recreational and social activities, and the financial relief. Most of the participants (81 percent) indicated that the program was achieving all of the

following goals: provision of the meal, increased opportunities for socialization, and better health through improved nutrition.

The greatest impact of the Boston program was found to be in the financial, social, and recreational areas. Even though the participants felt that the program was meeting the goal of improved health through nutrition, fewer than 5 percent reported that the program affected their diet or health. The Boston study concluded that those with more frequent patterns of participation and those with greater need for financial assistance reported significantly greater effects on monetary savings, food preparation practices, food consumption, and food purchasing behavior (38).

Nutrition, Cost, Sanitation, and Acceptance of Different Food Delivery Systems: By 1982, the number of congregate meal sites was about 13,500, more than twice the total of 6,700 in 1976. The number of meals served per day also doubled during that period, rising to approximately 800,000 congregate and home-delivered meals in 1982. Although the prevalence of homedelivered meals did not change from 1976 to 1982 (most programs offer them), the average number of homedelivered meals served daily per site doubled, and the proportion of homedelivered meals relative to all meals being served tripled. Currently, about 175,000 title III meals are being home-delivered daily within the contiguous States, constituting about 22 percent of all title III meals (36,37).

Nutrition: The clearest comparison of the nutritional effectiveness of congregate v. home-delivered meals is presented in the national evaluation (table C-5). Intake of all nutrients measured was consistently lower for home-delivered meal recipients. The national evaluation attributes this, at least partly, to the home recipients' poorer health status and greater difficulty in chewing (36,37). The greater isolation and related depression to which the homebound are especially vulnerable may also inhibit intake.

The congregate and home-delivered meals were identical in 80 percent of the sites—any differences were attributable to transportation constraints or to the different dietary needs of the homebound recipients who are more likely to need low-salt, low-sugar, or low-fat meals. The national survey also concluded that the recipients of home-delivered meals benefited more than congregate participants, since the former showed lower intakes for most nutrients on non-meal program days (36,37).

Cost: A study of food delivery systems in the title III programs for the elderly looked at four factors that could theoretically influence cost of the meals: meal preparation systems (i.e., catered v. onsite preparation), project size, urban v. rural setting, and region.

Project size was the only factor found to be related to cost (25). The slightly lower costs per meal achieved by larger projects were not a result of lower food and food service costs but of lower cost for support activities like administration, outreach, and nutrition education. Statistical analysis of the relationship between the cost and the quality of the meals found that the two were unrelated.

The average cost per meal was calculated to be \$4.08 by a later national study. Although figures were not provided, a major problem with home-delivery service is that funding is inadequate to meet demand. According to area directors, only 52 percent of the elderly people who need home-delivered meals in the United States are receiving them. Home-delivered meals are usually prepared at or distributed through the congregate meal sites (36,37). Additional cost may be incurred, however, in providing delivery equipment and personnel.

Sanitation: A local evaluation in Ohio (24) studied the sanitary conditions and acceptance of onsite-prepared v. catered meals in the title III program. Analyses of the meals for microbial contamination indicated that onsite preparation was generally more sanitary than catering.

Meal safety was also assessed in the 1981 national study (25) through sanitary inspections of meal sites and microbiological analyses of the meals themselves. Results varied widely among sites, some of which were found to be deficient in their sanitary practices. Although this study did not evaluate the administrative personnel of the meal programs, it suggested that food programs would benefit by utilizing registered dietitians to improve sanitation and food management in general. Such dietitians are trained not only to regulate the nutritional content and sanitary conditions of the meals but to ensure optimum preservation of nutrients in food preparation and cost-effective food management.

In a nationwide study of food delivery systems and technologies commissioned by the AoA with the American Dietetic Association, a major finding was that service regulations failed to designate qualified personnel to plan, manage, and evaluate nutrition services (33). Other problems identified included a lack of detailed food specifications on food products, equipment, packaging, and delivery practices for both congregate and home-delivered meals. Also cited as concerns were: maintenance of food temperature during transportation; a reliance on untrained volunteers to deliver meals and services; variable food portion control; limited space for food preparation and delivery; safety and sanitation hazards; and a limited number of certified management personnel.

Many of the staff and food management problems cited in the above studies could be addressed by instituting standard regulations for food programs mandating the employment of registered dietitians at meal program sites. The national evaluation did not analyze whether or how registered dietitians are used. One of the most frequent complaints of State and area program directors reported in this study, however, concerned the low quality of the staff. Most of the local directors (71 percent) said that additional training in fiscal, personnel, and food management, as well as gerontology, would improve nutrition program operations (36,37).

The national evaluation reviewed the educational levels of certain management personnel, including those called “nutritionists/dietitians.” It is probable that many people so designated are not registered dietitians, since 7 percent did not finish college; this figure jumps to 11 percent for area agency directors, 39 percent for “nutrition directors,” and 83 percent for “site managers” (36,37). Registered dietitians must have a college degree with additional on-the-job experience and must have been accepted into the American Dietetic Association. A nutritionist is required to have still more training and usually also holds an advanced degree.

Acceptance: Expert tasting panels were used in the local Ohio study to assess the taste and esthetic quality of the meals. onsite-prepared meals were found to be of superior quality and greater in quantity than catered meals (24). Ratings for acceptance and food quality were low for both types of meal preparations; however, only 36 out of 501 respondents indicated that they enjoyed the food served at the meal sites. This clearly indicates a need for revised content and preparation of the meals.

FOOD STAMP PROGRAM PARTICIPATION

The Food Stamp Program is the largest of all food and nutrition programs affecting the noninstitutionalized elderly. The degree of participation and the factors determining participation in the Food Stamp Program (FSP) have been evaluated in two studies. One was based on the National Food Consumption Surveys of low-income households conducted in the periods 1977-78 and 1979-80 (2), and the other was an evaluation of a local food stamp cashout demonstration (5).

The national study found that about 50 percent of eligible elderly households participated in 1979-80, as opposed to less than 40 percent in the earlier period (2). Participation increased at about the same rate among whites and blacks. This increase in participation could be due largely to elimination of the purchase requirement in January 1979. There has been recent

speculation, however, that the expanding FSP is still not reaching the most needy (38). Correlation of demographic variables with participation can help reveal factors affecting the decision to participate and thus help generate policies or regulations that would encourage participation of the most needy population groups.

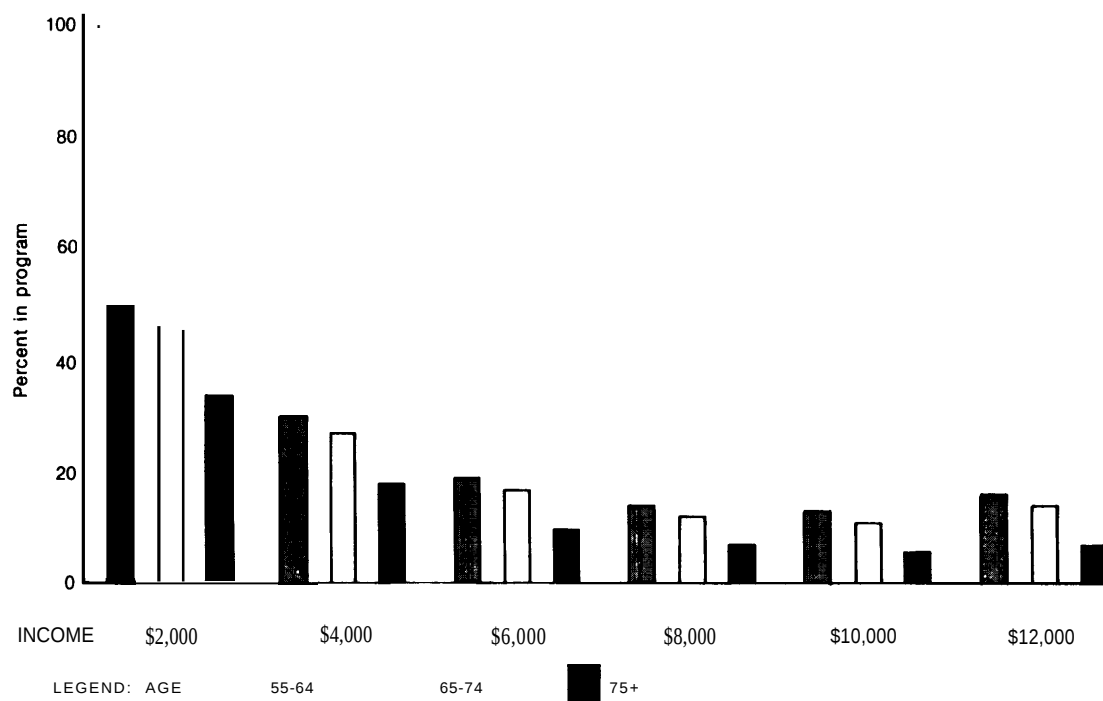
Significant influence of several variables on FSP participation was found in both the 1977-78 and 1979-80 periods. Participation at every income level among those eligible rose by 10 to 15 percent in the later survey, although figures for the lower income groups and younger age groups were consistently higher in both time periods (2,5; figs. C-6 to C-9). The proportion of the poorest households (those below poverty level) participating rose from about 33 percent in 1977-78 to 60 percent in 1979-80 (2). Interestingly, estimates of participation in elderly feeding programs (including congregate and homedelivered meals) dropped, while overlap between these and the FSP seemed to rise (tables C-15 and C-16). Since there **was no** change in sampling criteria to allow for tightening of eligibility requirements in 1979, FSP participation among the relatively smaller eligible group in 1979-80 may in fact have been underestimated.

Owning a home, which negatively affected participation, did so more strongly among urban than rural residents in both surveys (figs. C-10 to C-13). Receiving Supplemental Security Income dramatically increased participation for all age groups (2,5). Participation of urban elderly increased more than that of rural elderly in the later survey and most markedly at the lower income levels; the increase in the *proportion* of eligible rural elderly participating, however, was relatively greater (2).

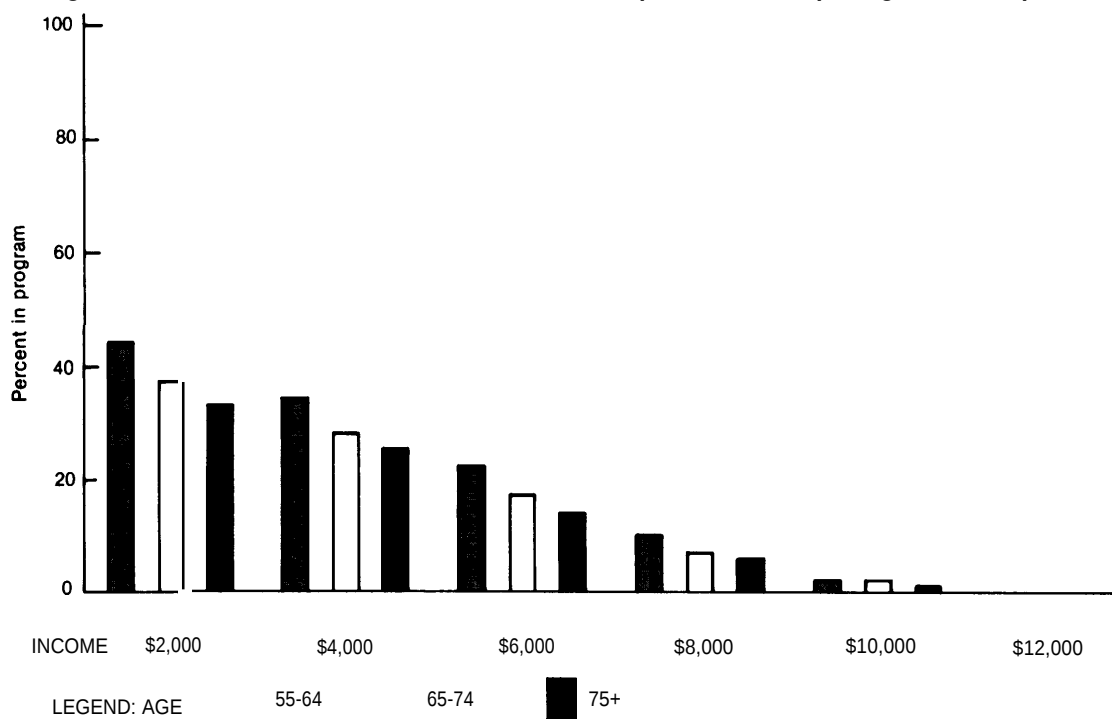
Households headed by women were significantly more likely to participate both in the local demonstration (5) and nationally, in urban areas in 1977-78, and rural areas in 1979-80. People who lived in larger households were more likely to participate in the FSP. Living alone had a statistically significant effect only in rural areas in 1979-80. Unfortunately, this means that the socially isolated population, one of the FSP target groups, is not well represented among participants.

The local cashout demonstration also found that people with some high school education were less likely to use food stamps. Other factors inhibiting participation included lack of awareness, stigma, and distance from FSP offices (5). Participation in the FSP was shown to increase food expenditures among those surveyed.

The cashout demonstration further evaluated the effects of the food stamps and cashout on dietary intake of nutrients. While the overall estimated effect of the program was positive for intake of all nutrients

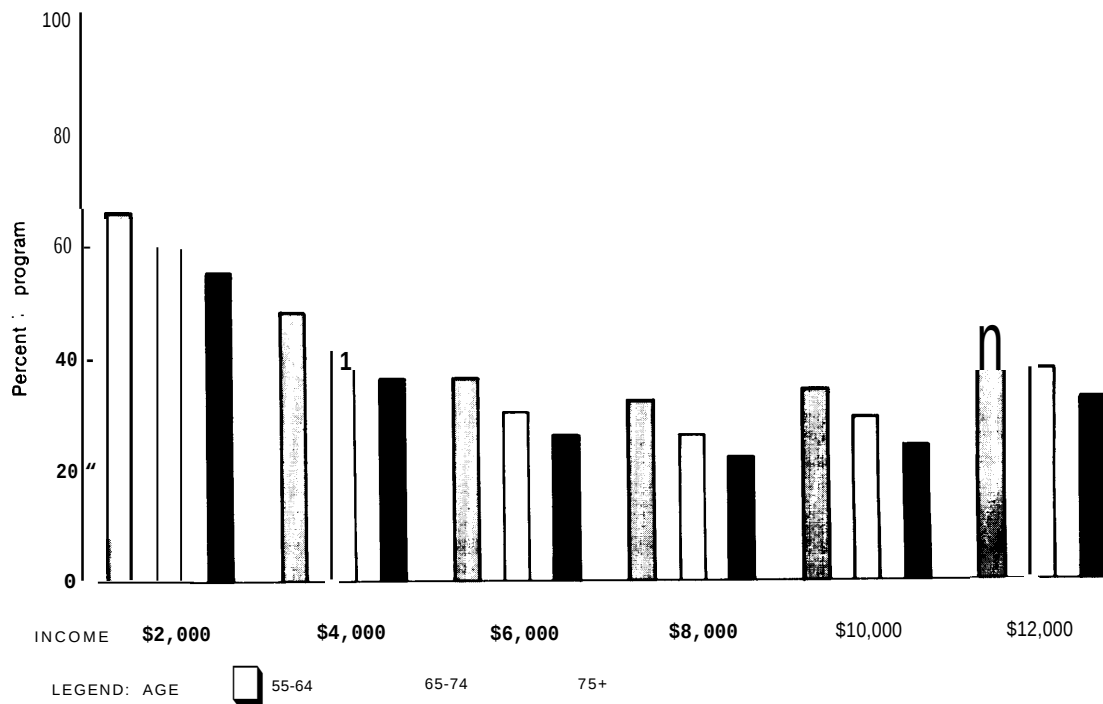
Figure C-6.-1977-78 Low-Income NFCS Urban Sample, Food Stamp Program Participation

SOURCE: Akin, Guilkey, and Popkin (unpublished data), (2).

Figure C.7.-1977.78 Low-Income NFCS Rural Sample, Food Stamp Program Participation

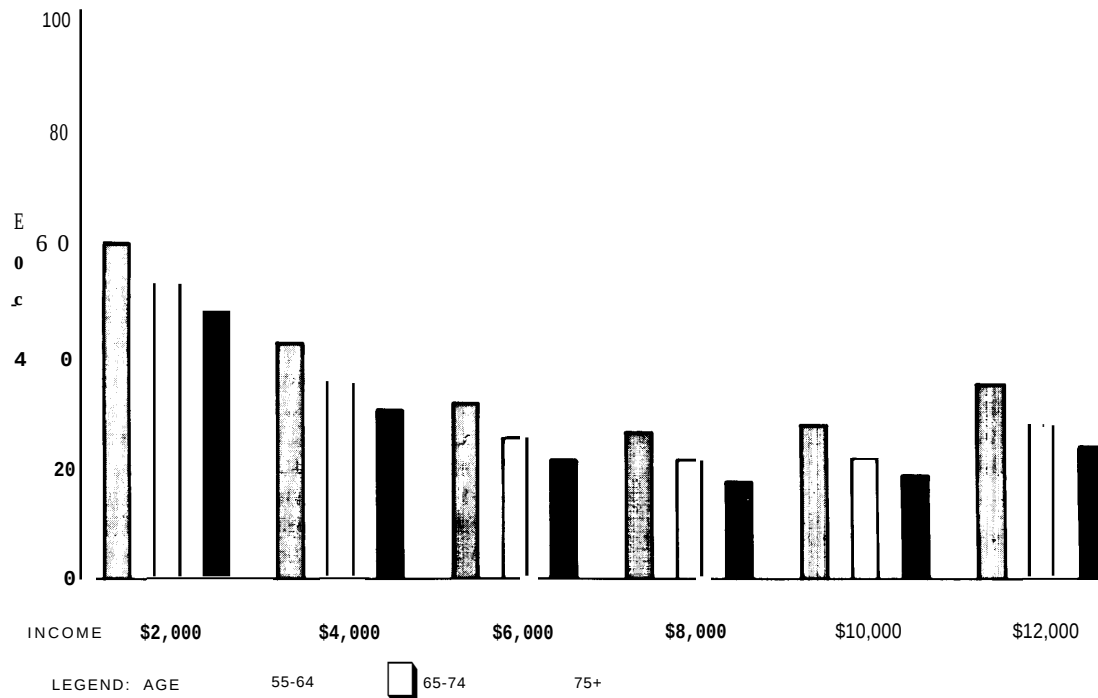
SOURCE: Akin, Guilkey, and Popkin (unpublished data), (2).

Figure C-8.— 1979-80 Low-Income Followup Urban Sample, Food Stamp Program Participation



SOURCE: Akin, Guilkey, and Popkin (unpublished data), (2).

Figure C-9.— 1979-80 Low-Income Followup Rural Sample, Food Stamp Program Participation



SOURCE: Akin, Guilkey, and Popkin (unpublished data), (2).

Table C-15.—1977-78 Low-Income Population: Participation in Elderly Food and Feeding Programs, Participation Status for Persons Aged 65 and Older (in percent)

	In neither program	In only food stamp program ^a	In only elderly feeding program ^a	In both programs	Total
Income as a percentage of poverty					
< 100%	66.7%	29.5%	3.0%	0.8%	100%
> 100% and < 125%	58.7	36.0	3.4	1.9	100
125% and < 175%	75.0	20.9	2.6	1.4	100
175%	73.1	24.9	1.6	0.4	100
Race:					
White	68.8	26.8	2.9	1.5	100
Non-white	60.8	34.7	3.0	1.5	100
Residence:					
Urban	61.7	33.2	3.1	2.0	100
Rural	68.7	27.5	2.8	1.0	100

Note: Sample size 2,501 households.
^a Includes congregate feeding, meals on wheels, and other home-delivery programs. Because eligibility criteria for these programs exclude most of the 55 to 64 age group, statistics are presented only for those aged 65 and older.

SOURCE: Akin, Gullkey, and Popkin (unpublished data), (2)

Table C-16.—1979-80 Low-Income Population: Participation in Elderly Food and Feeding Programs, Participation Status for Persons Aged 65 and Older (in percent)

	In neither program	In only food stamp program	In only elderly feeding program ^a	In both programs	Total
Income as a percentage of poverty					
<100%	41.0%	51.8%	1.2%	6.0%	100%
>100% and <125%	41.7	52.0	2.8	3.5	100
125% and <175%	56.3	41.9	1.4	0.4	100
175%	63.5	33.2	1.7	1.7	100
Race:					
White	53.2	42.8	2.4	1.7	100
Non-white	45.2	50.1	1.7	3.0	100
Residence:					
Urban	48.5	46.5	2.4	2.6	100
Rural	50.1	46.0	1.8	2.0	100

Note: Sample size is 1,588 households.
^a Includes congregate feeding, meals on wheels, and other home-delivery programs. Because eligibility criteria for these programs exclude most of the 55 to 64 age group, statistics are presented only for those aged 65 and older.

SOURCE: Akin, Gullkey, and Popkin (unpublished data), (2)

surveyed, the improvement was significant only for calcium (5). There were no significant differences for the intake of nine nutrients between food stamp participants and nonparticipants. Those who received cash instead of stamps, however, had a higher intake of four out of the nine nutrients: protein, calcium, vitamin C, and thiamine.

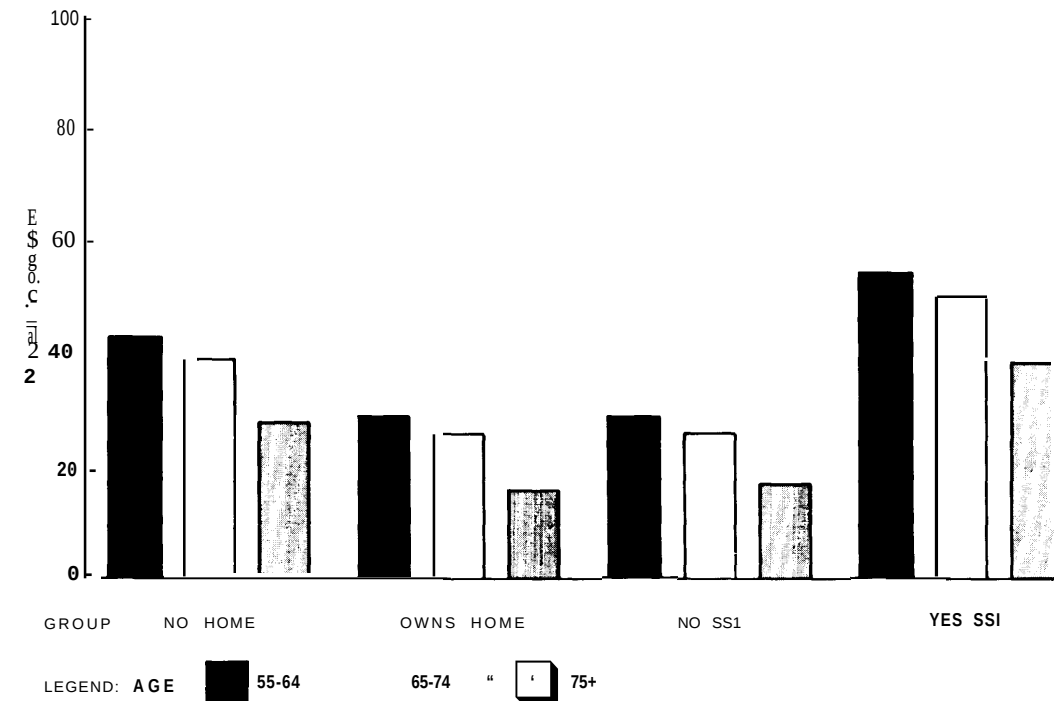
OTHER FOOD ASSISTANCE PROGRAMS

Food For Seniors, or the Elderly Feeding Pilot Project, was initiated by Congress in September of 1982 to analyze the cost effectiveness of distributing food commodity supplements to prevent chronic malnutrition among the elderly. The project was authorized to continue through fiscal year 1984 at three Com-

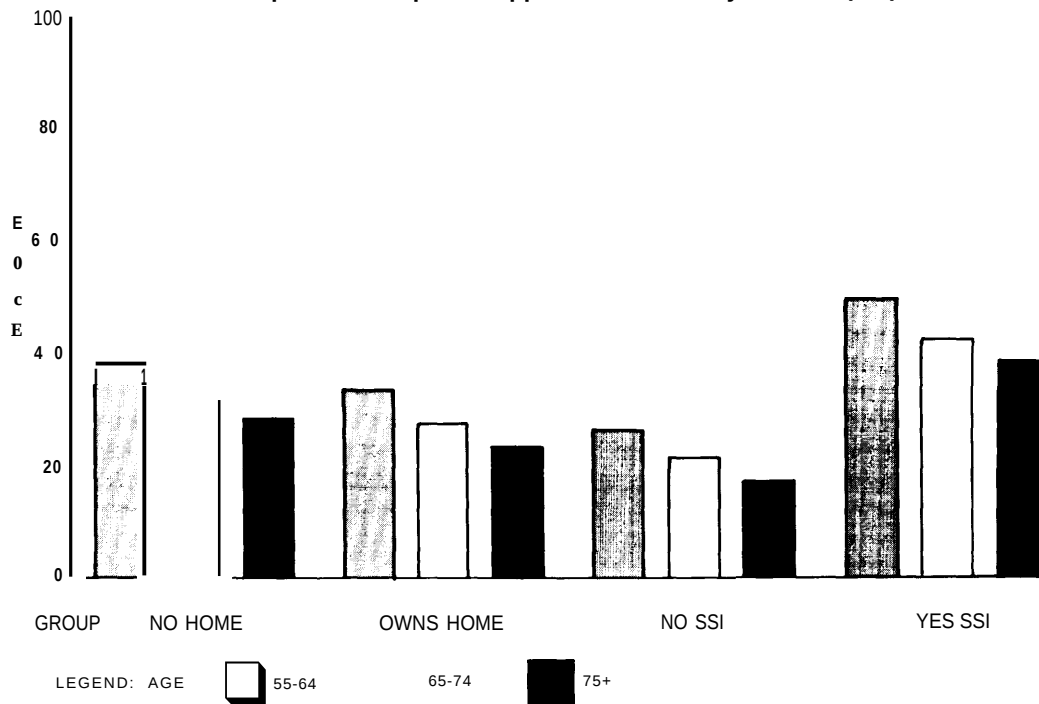
modity Supplemental Food Program sites (Public Law 97-98 and Public Law 97-103). These sites are located in Detroit, Des Moines, and New Orleans, with participation at each limited to 1,900 elderly persons.

The commodities are commercially produced for the U.S. Department of Agriculture through competitive bids and include milk, canned meats, vegetables, fruits, dried egg mix, peanut butter, instant potatoes, and cheese (11). The monthly supplements, worth more than \$25 at retail, are meant to satisfy 100 percent of the requirements for protein and other key vitamins and minerals at a cost of about \$11, which includes the food and local administration.

An initial progress report from the Detroit site reports that the supplement is satisfying more than 100 percent of the monthly RDA of protein, vitamin

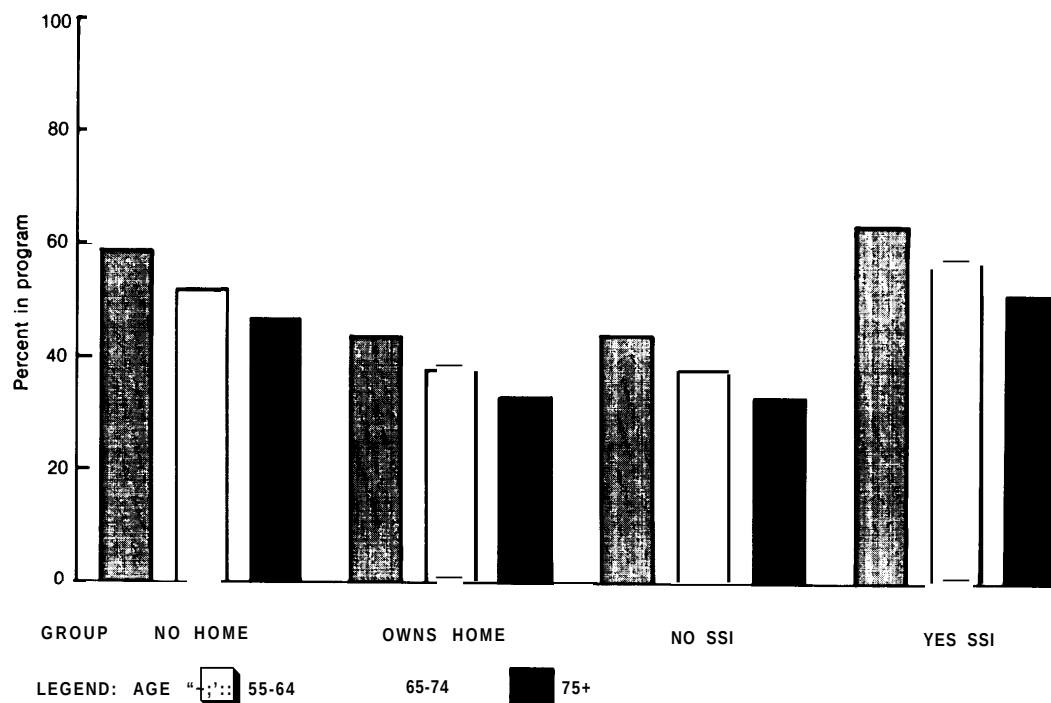
Figure C-10.—1977-78 Low-Income NFCS Urban Sample, Food Stamp Program Participation, by Housing Ownership and Receipt of Supplemental Security income (SSI)

SOURCE: Akin, Guilkey, and Popkin (unpublished data), (2).

Figure C-11.—1977-78 Low-income NFCS Rural Sample, Food Stamp Program Participation, by Housing Ownership and Receipt of Supplemental Security income (SSI)

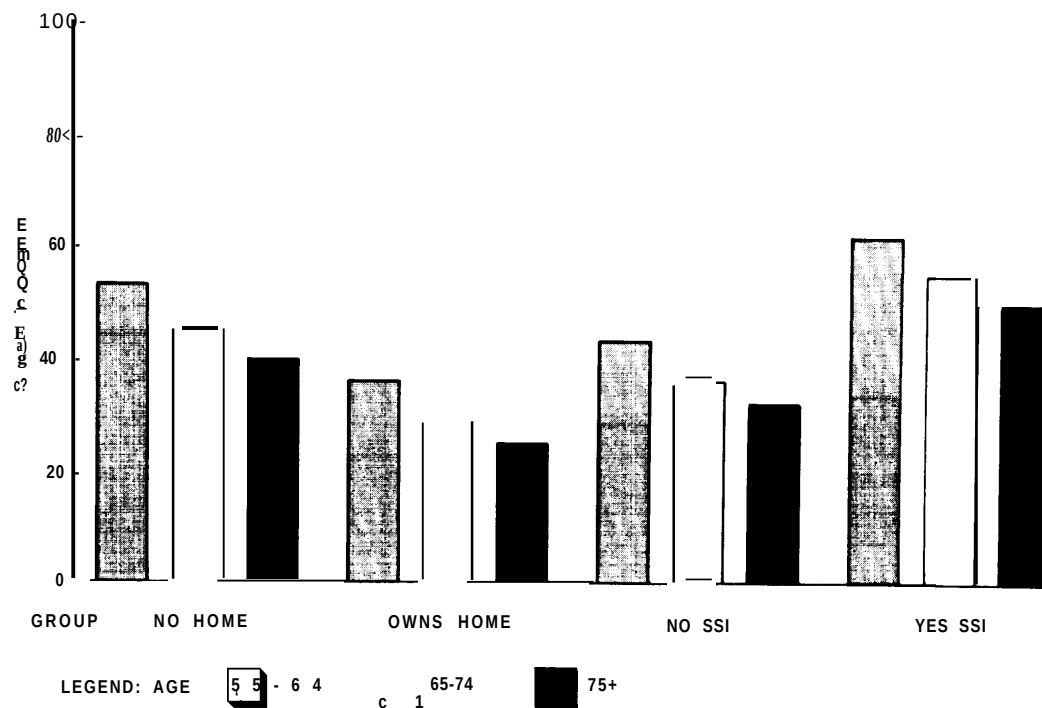
SOURCE: Akin, Guilkey, and Popkin (unpublished data), (2).

Figure C.12.-1979.80 Low-income Followup Urban Sample, Food Stamp Program Participation, by Housing Ownership and Receipt of Supplemental Security Income (SSI)



SOURCE: Akin, Gulikay, and Popkin (unpublished data), (2).

Figure C.13.- 1979.80 Low-income Followup Rural Sample, Food Stamp Program Participation, by Housing Ownership and Receipt of Supplemental Security Income (SSI)



SOURCE: Akin, Gulikay, and Popkin (unpublished data), (2).

D, calcium, iron, riboflavin, vitamin B-12, and phosphorus. of the participants surveyed (20 percent), all who responded said that the program had helped them and that they enjoyed the food. A majority of the participants were female, widowed, and black (11).

Conclusion

Overall, the title III congregate meal programs appear to be meeting many of the guidelines for nutrient intake. The evaluations, however, are flawed in both the gathering and the analysis of the data. Menus and meals have never been analyzed for some of the lesser known nutrients such as zinc, folic acid, and vitamin B₆. Recent surveys involving biochemical assessments of the nutrition of the elderly suggest that a significant proportion of this age group may be deficient in these nutrients (3,7,16,27,28,44).

The sanitary and esthetic quality of program meals, the program staff, and nutritional education for participants were all found lacking in some surveys, suggesting the need for more regulatory policy and further evaluations.

Finally, further study is needed to determine if either the meal programs or the rapidly growing Food Stamp Program are really reaching the most needy people. Analysis of the participant profile in both programs reveals that some of the target groups, especially the socially isolated, are not well represented among participants. This suggests that some needy groups are either ill-informed about the programs and nutrition in general or that the programs are not readily accessible to them.

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