

Chapter Two

Usual Intake of Food Energy and Nutrients

This chapter describes usual intakes of food energy and key nutrients and, to the extent possible, the prevalence of adequate usual intakes among FSP participants and nonparticipants. Nutrients included in the analysis are vitamin C, iron, zinc, and calcium. Usual intakes of fat, saturated fat, cholesterol, sodium, and fiber were also examined. These data are presented in Chapter Three.

As noted in Chapter One, the age groups used in the analysis of dietary intake data differ from those used in the remainder of the report. Specifically, the age groups used correspond to those used in the Dietary Reference Intakes (DRIs), the standards used to assess diets consumed by individuals and populations.¹ To maintain consistency across all dietary intake analyses presented in this report, the DRI age groups were also used in analyzing Healthy Eating Index (HEI) scores (Chapter Three).

To provide some context for the discussion, the chapter begins with information on several factors that may influence individuals' energy and/or nutrient intakes. These include participation in FANPs other than the FSP, household food sufficiency status, and meal and snacking patterns.

Participation in Other Food and Nutrition Assistance Programs

NHANES-III provides information on participation in four FANPs other than the FSP. These include the WIC program, the National School Lunch Program (NLSP), the School Breakfast

Program (SBP), and the Elderly Nutrition Program (ENP). The following sections describe the NHANES-III survey items used to define participation in these programs and the relative rates of participation among FSP participants and nonparticipants.

In reviewing the data presented in this section, it is important to bear two facts in mind. First, survey data tend to yield lower estimates of program participation than estimates derived from program administrative data. For example, data from the Survey of Income and Program Participation (SIPP), which is generally recognized as the optimal source of survey data on program participation, underestimates participation in most programs by 10 to 15 percentage points (Trippe, 2000). Second, data reflect participation rates at the time the NHANES-III data were collected (1988-94) and therefore are not expected to be representative of *current* program participation rates.

The WIC Program

The WIC program provides supplemental foods, nutrition education, and health and social service referrals to eligible pregnant and postpartum women, infants, and children up to 5 years of age. NHANES-III included a question that asked about current participation in the WIC program: "Are you/Is [infant/child] now receiving benefits from the WIC program?"

The income eligibility criterion for the WIC program is 185 percent of poverty. Because this exceeds the income eligibility criterion for the FSP (130 percent of poverty), all FSP participants and income-eligible nonparticipants who were categorically eligible (women who were

¹Other reports in this series provide dietary intake data for children under 5 broken down by year of age (Cole and Fox, 2004a), and for older adults (60 and over) in five different age groups (Cole and Fox, 2004b).

pregnant or had given birth within the preceding 12 months, infants, and children up to the age of 5) were eligible to participate in WIC. Higher-income nonparticipants whose income did not exceed the WIC program cutoff of 185 percent of poverty were also eligible to participate.

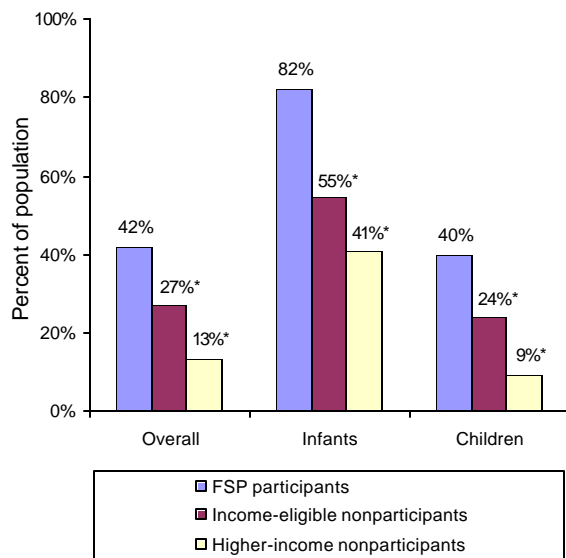
Among individuals who were both categorically and income-eligible for WIC, FSP participants were significantly more likely than either group of nonparticipants to participate in WIC. Overall, 42 percent of categorically eligible FSP participants reported participation in the WIC program, compared with 27 percent of income-eligible nonparticipants and 13 percent of higher-income nonparticipants who met the WIC income-eligibility criterion (figure 1 and table D-1).

Among infants and children, FSP participants were significantly more likely to participate in WIC than either income-eligible nonparticipants or higher-income nonparticipants. While 82 percent of FSP infants participated in WIC, the

same was true of only 55 percent of FSP-eligible infants and 41 percent of higher-income infants who were income-eligible for WIC. Similarly, among age-eligible children, 40 percent of FSP children participated in WIC, compared with about a quarter of the children in the income-eligible nonparticipant group and 9 percent of financially eligible children in the higher-income nonparticipant group.

Among women who were pregnant at the time they were interviewed or had had a child within the previous 12 months, there was no statistically significant difference between FSP participants and income-eligible nonparticipants in the rate of WIC participation (table D-1).² However, women who were participating in the FSP were significantly more likely to participate in WIC than higher-income women who were income-eligible for WIC. (Data for women are not reported in figure 1 because the point estimate for higher-income women is statistically unreliable).

Figure 1—Percent of income- and categorically eligible infants and children participating in the WIC Program



*Statistically significant difference from FSP participants at the .05 level or better.

Note: Women are not shown because the point estimate is statistically unreliable for higher-income women.

Source: NHANES-III, 1988-94.

Participation in the WIC program is based on more than just financial need. In order to participate in the program, individuals must also be at nutritional risk, as documented by a medical professional. The disparities seen in WIC participation rates may relate to differences in nutritional risk. Program availability may also influence WIC participation. WIC is not an entitlement program, so local WIC agencies can serve only as many individuals as their funding allows. In addition, in order to receive WIC benefits, individuals must live within specific local agency catchment areas.

The School Meal Programs

The NHANES-III survey items used to identify participation in the school meal programs asked whether the school the child attended “serve [d]

²Sample sizes were too small to estimate separate participation rates for pregnant and postpartum women.

school lunch [or breakfast],” and defined school lunches (or breakfasts) as “complete [meals] costing the same fixed price every day.” In cases where children attended schools where such meals were offered, caregivers were asked to report the number of days per week the child usually ate the “complete [meal].” These questions were asked for all school-age children up to age 16.³

The National School Lunch Program

The vast majority (93%) of all children attended schools in which the NSLP was offered (table D-2). FSP children were just as likely as income-eligible nonparticipant children to attend a school that offered the NSLP. However, FSP children were significantly more likely than higher-income nonparticipant children to attend a school that offered the NSLP (98% vs. 91%).

More than half (54%) of all children usually ate a school lunch 5 days per week (table D-3). The percentage of males who consumed school lunches 5 days per week was greater than the percentage of females. This was particularly true for the oldest children. Among 12-16-year-olds, 63 percent of males usually consumed NSLP meals 5 days per week, compared with 46 percent of females (statistical significance of gender-based difference not tested).

All children attending NSLP schools are eligible to participate in the program. Children from low-income households are eligible to receive meals free of charge or at a reduced price. The criterion used to define income-eligibility for free meals is equivalent to income-eligibility for the FSP (130 percent of poverty). Thus, both FSP participants and income-eligible nonparticipants were eligible to receive NSLP meals free of charge. Higher-income children from households

with incomes between 131 and 185 percent of poverty were eligible to receive meals at a reduced price. Higher-income children with household incomes above 185 percent of poverty were required to pay full price for their meals.

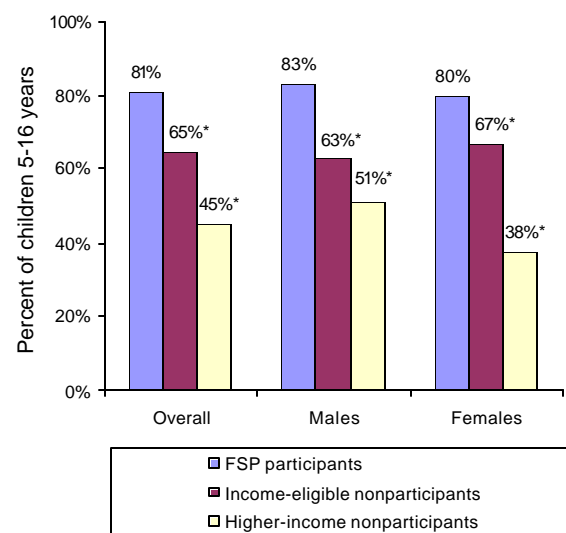
FSP participants were significantly more likely than either group of nonparticipants to consume a school lunch 5 days per week (81% vs. 65% and 45%) (figure 2). This pattern was noted for both males and females.

It is interesting to note that the difference in participation rates of males and females, noted above, was more pronounced in the higher-income-nonparticipant group (51% vs. 38%) than in the FSP participant group (83% vs. 80%) or the income-eligible-nonparticipant group (63% vs. 67%).

The School Breakfast Program

At the time the NHANES-III data were collected, about half of all school-age children attended schools that offered the SBP (table D-4). This estimate is consistent with historical data

Figure 2—Percent of children 5-16 years eating school lunch 5 days per week



*Statistically significant difference from FSP participants at the .05 level or better.
Source: NHANES-III, 1988-94.

³In NHANES-III, children 17 and 18 years old completed the adult interview, which did not include questions about school meal program participation.

on SBP availability, but substantially under-represents current program availability. In the 1992-93 school year, about two-thirds of the way through the NHANES-III data collection, approximately half of the Nation's schools offered the SBP (Burghardt and Devaney, 1993). Institutional participation in the SBP has increased substantially since that time. In the 1998-99 school year, when the most recent nationally representative study of the school meal programs was completed, more than three-quarters of all public schools that offered the NSLP also offered the SBP (Fox et al., 2001).⁴

FSP children were significantly more likely to attend a school that offered the SBP than children in either of the nonparticipant groups (table D-4) More than 70 percent of FSP children attended a school where the SBP was offered, compared with 58 percent of income-eligible nonparticipants and 44 percent of higher-income nonparticipants. Although recent initiatives have focused on increasing the availability of the SBP for all children, historically, the program has been most common in low-income areas.

About 13 percent of all children reported usually consuming a school breakfast 5 days per week (table D-5). The gender-based difference in participation noted for the NSLP was not apparent in reported SBP participation.

FSP children were significantly more likely to consume a school breakfast 5 days per week than children in either of the nonparticipant groups. Overall, 38 percent of FSP children regularly consumed a school breakfast, compared with 20 percent of income-eligible nonparticipant children and 5 percent of higher-income

nonparticipant children (figure 3). This pattern was observed for both males and females.

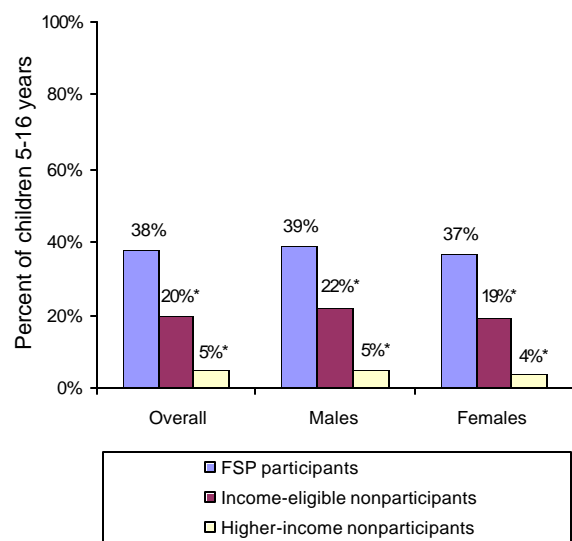
The Elderly Nutrition Program

The Elderly Nutrition Program (ENP) provides meals to adults 60 years of age and older. Most meals are served in congregate settings; however, qualified individuals may receive home-delivered meals. The NHANES-III survey items used to identify participation in the ENP asked about receipt of meals that “some churches, cities, and other organizations provide for senior citizens” and meals that were “delivered to your home, such as Meals on Wheels.”

The ENP does not use a means test to determine eligibility—all adults 60 years and older, and their spouses, are eligible to participate in the program. However, the ENP is not an entitlement program. Services can be delivered only to the extent that available funds allow.

Overall, only 4 percent of senior citizens reported participation in the ENP, as measured by the survey questions described above (table D-

Figure 3—Percent of children 5-16 years eating school breakfast 5 days per week



*Statistically significant difference from FSP participants at the .05 level or better.
Source: NHANES-III, 1988-94.

⁴The 1992-93 and 1998-99 estimates are not directly comparable. The former is based on all schools, including private schools, while the latter is based on public schools that offer the NSLP. Given that private schools make up a small percentage of all schools nationwide and that the vast majority of all schools offer the NSLP, the difference between the two estimates is a reasonable proxy for the growth of the SBP over

6). FSP participants reported the highest rate of participation in ENP, at 11 percent (figure 4). This was not significantly different from the rate of participation among income-eligible nonparticipants (7%), but was significantly higher than the rate of participation reported by higher-income nonparticipants (3%). This pattern was observed for both males and females. FSP males had the highest rate of participation in the ENP (16%, which was double the rate of FSP females) and higher-income males had the lowest rate of participation (3%) (statistical significance of gender-based differences not tested).

Household Food Sufficiency

NHANES-III data were collected before dissemination of the 18-item Federal food security module, the currently accepted standard for measuring household and individual food security (Price et al., 1997 and Bickel et al., 2000). NHANES-III included a question that asked whether the household had enough to eat, sometimes did not have enough to eat, or often did not have enough to eat. Respondents who

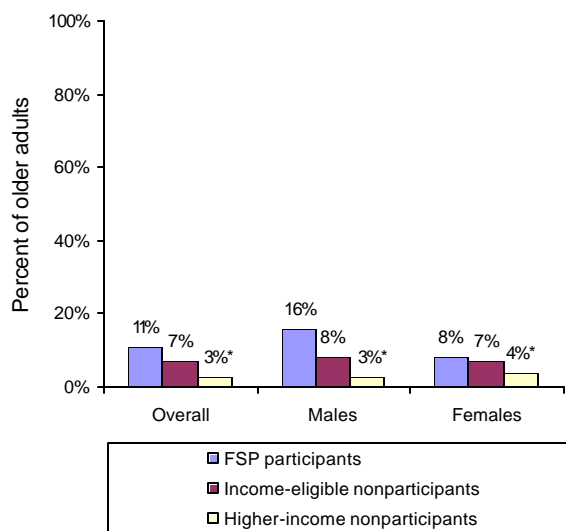
indicated that their household sometimes or often did not have enough to eat were asked how many days this occurred during the past month and why it occurred.⁵ This measure has been used in NHANES-III as well as in other studies to identify households with food insufficiency (defined as households that report that there is “sometimes” or “often” not enough food to eat) (Alaimo, et al., 1998).

The data indicate that the majority of the population (96%) lived in households that always had enough to eat (table D-7). However, this was true for a significantly smaller proportion of FSP participants than for either group of nonparticipants (83% vs. 89% and 99%) (figure 5).

Fifteen percent of FSP participants reported that their households sometimes did not have enough to eat. The percentages of income-eligible and higher-income nonparticipants who experienced

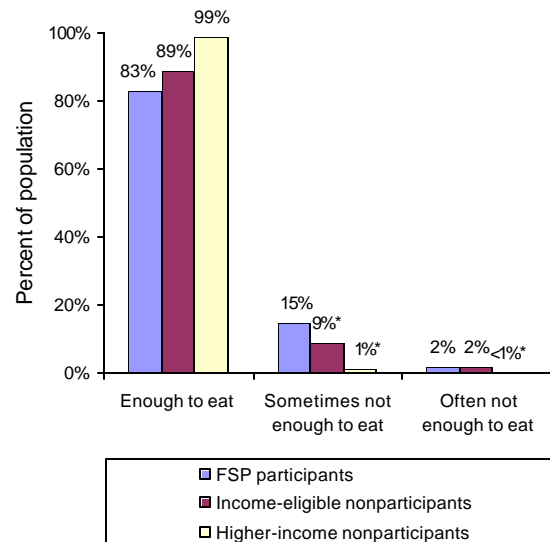
⁵Versions of the questionnaires used in the last two rounds of data collection included additional followup questions about whether children or adults in the household had decreased the size of their meals because there was not enough food. These data were not tabulated for this report because of the restricted nature of the sample.

Figure 4—Percent of adults 60 and older participating in the Elderly Nutrition Program



*Statistically significant difference from FSP participants at the .05 level or better.
Source: NHANES-III, 1988-94.

Figure 5—Distribution of persons by household food sufficiency status



*Statistically significant difference from FSP participants at the .05 level or better.
Source: NHANES-III, 1988-94.

this problem were significantly lower (9% and 1%). Problems of severe food insufficiency (often not having enough to eat) were relatively rare. Two percent of both FSP participants and income-eligible nonparticipants reported this situation, and virtually no higher-income nonparticipants (0.1%) reported it. The difference between FSP participants and higher-income nonparticipants was statistically significant.

Because so few individuals reported that their households sometimes or often did not have enough to eat, followup questions on how often and why households experienced these problems were not analyzed. Sample sizes for some subgroups were too small to produce reliable estimates.

Meals and Snacks Consumed

This analysis examined the number of meals and snacks consumed in the preceding 24 hours. Data from the 24-hour dietary recall were used to compute, for each individual, the total number of meals and snacks consumed. (As dietary intakes were reported, respondents were asked to identify eating occasions as meals (breakfast, brunch, lunch, or dinner/supper) or snacks.) Responses to a separate survey question about daily breakfast consumption were also tabulated.

Number of Meals Consumed

Overall, 35 percent of individuals 1 year of age and older consumed fewer than three meals in the preceding 24 hours (table D-9).⁶ There was no significant difference between FSP participants and income-eligible nonparticipants on this measure. In comparison with higher-income nonparticipants, however, FSP participants were significantly more likely to have consumed fewer than three meals in the preceding 24 hours (44% vs. 33%). This pattern was observed for both males and females; however,

differences were concentrated among adult females.

Consumption of Breakfast

NHANES-III included a separate question about usual breakfast consumption habits: "How often do you eat breakfast?" Response options were: every day, on some days, rarely, never, and on weekends only.

Overall, 54 percent of all persons reportedly consumed breakfast every day (table D-11). In keeping with the findings reported above, the percentage of FSP participants who consumed breakfast every day was significantly lower than the percentage of higher-income nonparticipants (50% vs. 55%). This difference was concentrated among females (50% vs. 57%).

Number of Snacks Consumed

Eighty-eight percent of all persons consumed at least one snack in the preceding 24 hours (table D-12). Differences between FSP participants and nonparticipants parallel those observed in the analysis of meals consumed. There was no difference between FSP participants and income-eligible nonparticipants in the percentage of persons who consumed at least one snack. However, FSP participants were significantly less likely than higher-income nonparticipants to have consumed one or more snacks (83% vs. 89%). This pattern was observed for both males and females. Overall differences were concentrated among adults 40 years and older.

Although FSP participants were no more or less likely than income-eligible nonparticipants to consume at least one snack in the preceding 24 hours, FSP participants consumed fewer snacks, on average, than their income-eligible counterparts (1.8 vs. 2.0) (table D-13). This difference was concentrated among males. FSP participants also consumed fewer snacks, on average, than higher-income nonparticipants (1.8 vs. 2.3).

⁶Data on the mean number of meals consumed are presented in table D-10

Usual Intake of Food Energy and Key Nutrients

This section describes usual intakes of food energy, vitamin C, iron, zinc, and calcium among FSP participants and nonparticipants. Infants were excluded from these tabulations because of differences between the nutrient standards defined for infants and those defined for the rest of the population.⁷

Tabulations are based on the single 24-hour recall collected in NHANES-III. The data have been adjusted, however, to account for within-person variation using variance estimates from the Continuing Survey of Food Intakes by Individuals (CSFII). (The procedures used in making these adjustments are described in appendix C.) As such, the data presented are indicative of individuals' *usual* dietary intakes, exclusive of vitamin and mineral supplements, and can be used to assess the prevalence of adequate intakes.⁸

Standards Used to Assess Adequacy of Usual Intake

Usual nutrient intakes were assessed relative to Estimated Average Requirements (EARs) and Adequate Intakes (AIs). EARs and AIs are part of a newly established set of dietary standards—the Dietary Reference Intakes (DRIs) (Institute of Medicine (IOM), 1999, 2000a, 2000b, 2002a, 2002b, 2004). The DRIs replace the *Recommended Dietary Allowances*

(RDAs) used in most previous research (National Research Council (NRC), 1989a). When adequate scientific evidence is available, an EAR is established. The EAR is the level of intake that is estimated to meet the requirements of half of the healthy individuals in a particular life stage and gender group. When the available data are insufficient to estimate requirements, an AI is established rather than an EAR. The AI is the level of intake that is assumed to be adequate, based on observed or experimentally determined estimates of intake.

EARs have been defined for three of the four nutrients examined in this chapter (vitamin C, iron, and zinc). For the fourth nutrient (calcium), AIs have been defined. For nutrients that have EARs and a symmetrical requirement distribution, the IOM recommends that usual nutrient intakes be assessed using the “EAR-cutpoint method” (IOM, 2001). This approach compares the distribution of usual intakes in a population with a population-specific EAR. The proportion of the population with usual intakes below the EAR is an estimate of the proportion of the population with inadequate intakes—intakes that do not meet nutrient requirements.

For nutrients with AIs, methods for assessing usual intakes are more limited. AIs cannot be used to determine the proportion of a population with inadequate intakes. Instead, assessment focuses on comparison of mean usual intakes to the AI. Populations with a mean usual intake equivalent to or greater than the population-specific AI can be assumed to have adequate intakes.

At the time the analyses presented in this report were completed, DRIs had not been established for food energy.⁹ Therefore, assessment of usual energy intakes also focuses on comparison of mean intakes, expressed as a percentage of the

⁷The reference standard used in estimating the prevalence of inadequate intakes of vitamin C, iron, and zinc—the Estimated Average Requirement (EAR)—has either not been defined for infants (vitamin C), or has been defined only for infants 7-11 months of age (iron and zinc). Sample sizes for 7-11 month olds were too small to produce reliable estimates for the subgroups examined in this report.

⁸Data on usual dietary intake do not include contributions from vitamin and mineral supplements. At the time this report was being prepared, other investigators were working on methods for incorporating supplement data into estimates of usual nutrient intake. In the NHANES-III data, the issue is not straightforward because of a lack of congruence in recall period—the preceding 24 hours for food and beverage intake vs. the preceding month for supplements.

⁹DRIs for food energy have subsequently been released (IOM, 2002b).

1989 Recommended Energy Allowance (REA) (NRC, 1989a).

Because the EARs and the calcium AI are relatively new reference standards, appendix B includes a table that shows the 1989 RDAs for vitamin C, iron, zinc, and calcium—the reference standards used in most previous research. The interested reader can compare data on mean usual intakes with the most appropriate RDA to obtain a reasonable approximation of how these data compare with previously published data. In addition, appendix D includes tables that show means and the full distribution of usual intakes (the 5th, 10th, 15th, 25th, 50th, 75th, 85th, 90th, and 95th percentiles) for food energy and each of the four nutrients.

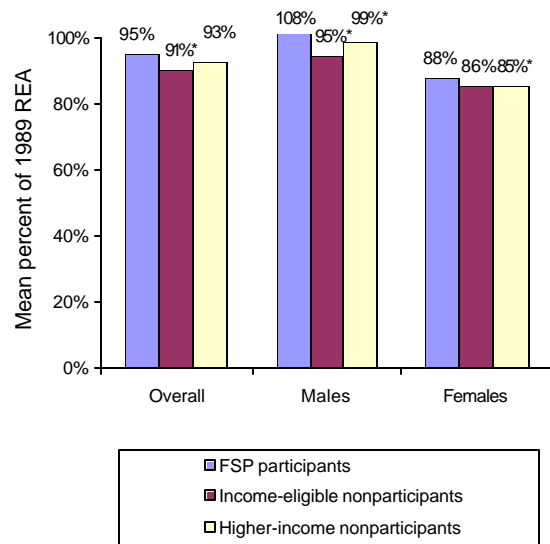
Food Energy

With the exception of adults 71 years and older, mean usual energy intakes of all age groups exceeded 90 percent of the 1989 REA (table D-15).¹⁰ Males consumed more energy, relative to the 1989 REA, than females (98% vs. 86%) (statistical significance of gender-based difference not tested).

On average, FSP participants consumed more food energy than income-eligible nonparticipants (95% of the 1989 REA vs. 91%) (figure 6). FSP participants also consumed more food energy than higher-income nonparticipants, on average, but this difference (95% vs. 93%) was not statistically significant.

Differences in the mean usual energy intakes of FSP participants and nonparticipants varied substantially by gender and age. Among males, the mean usual energy intake of FSP participants was significantly greater than the mean usual intakes of both income-eligible and higher-income nonparticipants (108% vs. 95% and

Figure 6—Mean usual intake of food energy as a percent of the 1989 Recommended Energy Allowance



*Statistically significant difference from FSP participants at the .05 level or better.
Source: NHANES-III, 1988-94.

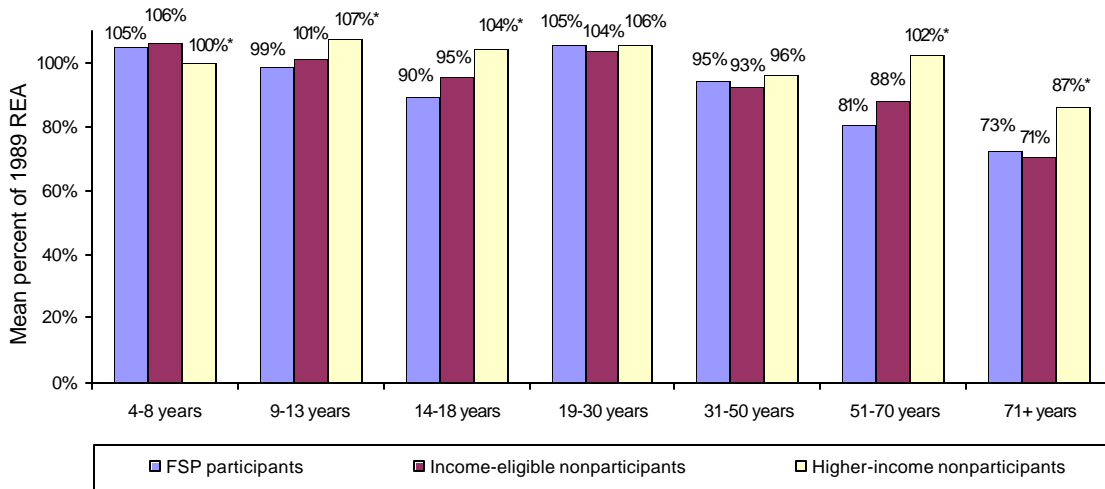
99%). There was some variation in this pattern by age, however. Among male children and adolescents between 9 and 18 years, as well as adult males 51-70 and 71 and older, the mean usual energy intake of FSP participants was significantly *less* than the mean usual energy intake of higher-income nonparticipants (figure 7).

Among females, between-group differences were generally less pronounced (figure 6). The mean usual energy intake of FSP females was comparable to that of income-eligible nonparticipant females (88% vs. 86%). The difference between FSP females and higher-income nonparticipant females was statistically significant, but the magnitude of the difference (88% vs. 85%) was substantially smaller than the difference observed for males.

There was some variation in between-group differences by age. In most cases, FSP females had greater mean usual energy intakes than one or both groups of nonparticipants, and many of these differences were statistically significant.

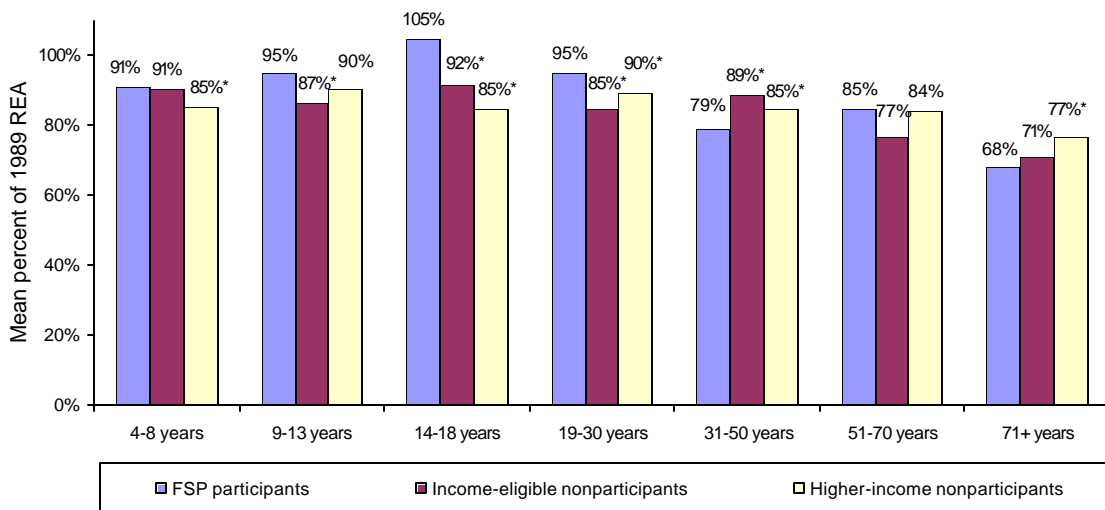
¹⁰Data on mean intakes in kilocalories are presented in table D-14 and the full distribution of intakes is presented in table D-16.

Figure 7—Mean usual intake of food energy as a percent of the 1989 Recommended Energy Allowance:



*Statistically significant difference from FSP participants at the .05 level or better.
Source: NHANES-III, 1988-94.

Figure 8—Mean usual intake of food energy as a percent of the 1989 Recommended Energy Allowance: Females



*Statistically significant difference from FSP participants at the .05 level or better.
Source: NHANES-III, 1988-94.

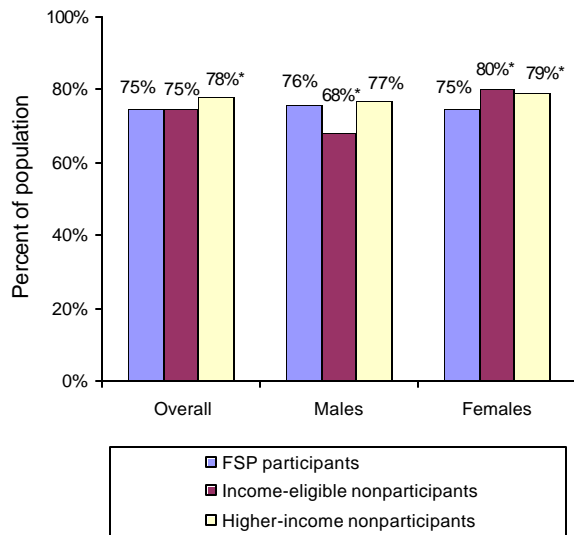
Among 31-50-year-old females, however, the mean usual energy intake of FSP participants was significantly *less* than the mean usual intake of either group of nonparticipants (figure 8). The same was true of FSP females 71 years and older, in comparison with higher-income females.

Vitamin C

More than three-quarters (77%) of all persons 1 year and older consumed adequate amounts of vitamin C (table D-18).¹¹ Overall, there was no significant difference between FSP participants and income-eligible nonparticipants in the percentage of persons with adequate usual intakes of vitamin C (figure 9). In comparison with higher-income nonparticipants, however, FSP participants were less likely to have an adequate usual intake of vitamin C (75% vs. 78%).

¹¹Data on mean intakes of vitamin C (in mg.) are presented in table D-17 and the full distribution of intakes is presented in table D-19.

Figure 9—Percent of persons with adequate usual intake of vitamin C



*Statistically significant difference from FSP participants at the .05 level or better.
Source: NHANES-III, 1988-94.

There was a noteworthy difference in findings for males and females. Among males, FSP participants were significantly *more* likely than income-eligible nonparticipants to have an adequate usual intake of vitamin C (76% vs. 68%) and there was no significant difference between FSP participants and higher-income nonparticipants. FSP females, on the other hand, were significantly *less* likely than females in either of the nonparticipant groups to consume an adequate amount of vitamin C (75% vs. 79-80%).

There were also some interesting variations by age group among males (table D-18). Among males between the ages of 14 and 30, FSP participants were significantly *more* likely than either group of nonparticipants to consume an adequate amount of vitamin C (97% vs. 74-84%). Among males between the ages of 51 and 70, the trend was reversed. FSP males in this age group were significantly *less* likely than higher-income nonparticipants to have an adequate usual intake of vitamin C (48% vs. 69%).

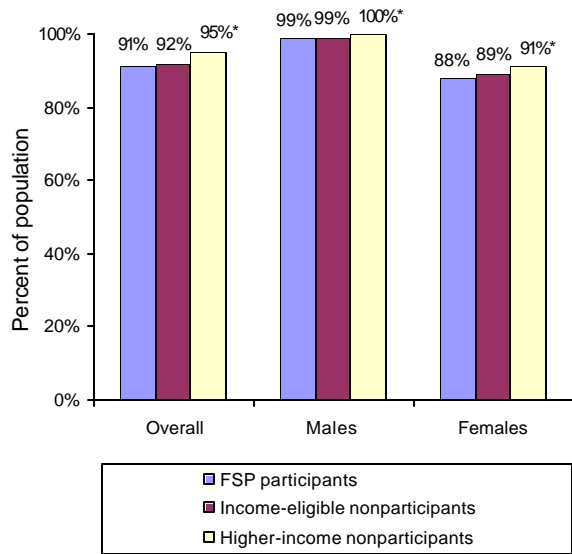
Iron

More than 9 out of 10 persons 1 year and older (94%) had adequate usual intakes of iron (table D-21).¹² The prevalence of adequate intakes was greater for males than females (100% vs. 90%) (statistical significance of gender-based difference not tested).

FSP participants were no more or less likely than income-eligible nonparticipants to have an adequate intake of iron. In comparison with higher-income nonparticipants, however, FSP participants were significantly less likely to consume adequate amounts of iron (91% vs. 95%) (figure 10). This pattern was observed for

¹²Data on mean intakes of iron (in mg.) are presented in table D-20 and the full distribution of intakes is presented in table

Figure 10—Percent of persons with adequate usual intake of iron



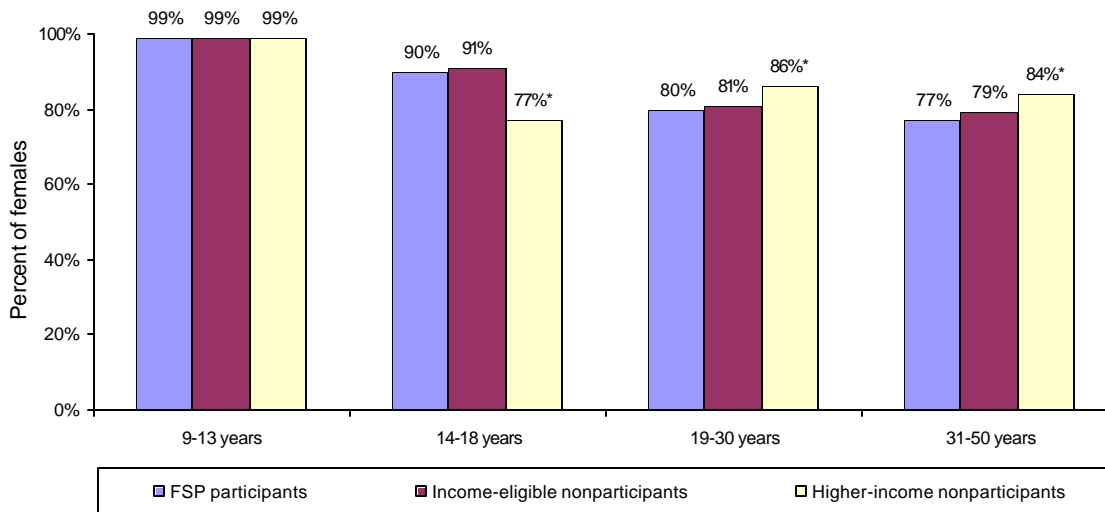
*Statistically significant difference from FSP participants at the .05 level or better.
Source: NHANES-III, 1988-94.

both males and females; however, the magnitude of the between-group difference was smaller for males (99% vs. 100%) than for females (88% vs. 91%).

Because of increased iron needs, menstruating females are at greater risk of consuming inadequate amounts of iron than other subgroups.¹³ Among females in this age range (for the age groups used in this report, this includes 9-13-year-olds through 31-50-year-olds), there were no significant differences between FSP participants and income-eligible nonparticipants in the prevalence of adequate usual iron intakes (figure 11). In contrast, differences between FSP females and higher-income females were observed for all but the youngest age group. Among 14-18-year-old females, FSP participants were *more* likely than higher-income nonparticipants to have an adequate usual intake of iron (90% vs. 77%). In the two older age groups (19-30 years and 31-50 years), the trend was reversed, with FSP females being *less* likely than their higher-income counterparts to con-

¹³Because iron requirements for menstruating females are not normally distributed, it is not appropriate to use the EAR cut-point method to estimate the prevalence of inadequate intake. Instead, the full probability approach was used for these age groups (IOM, 2001). See appendix C.

Figure 11—Percent of menarche-aged females with adequate usual intake of iron



*Statistically significant difference from FSP participants at the .05 level or better.
Source: NHANES-III, 1988-94.

sume adequate amounts of iron (77-80% vs. 84-86%).

Zinc

Overall, 87 percent of all persons had adequate usual intakes of zinc (table D-24).¹⁴ FSP participants were significantly less likely than either group of nonparticipants to have an adequate zinc intake (figure 12). Eighty percent of FSP participants had an adequate usual intake of zinc, compared with 83 percent of income-eligible nonparticipants and 88 percent of higher-income nonparticipants. The difference between FSP participants and income-eligible nonparticipants was concentrated among females, while the difference between FSP participants and higher-income nonparticipants was noted for both males and females.

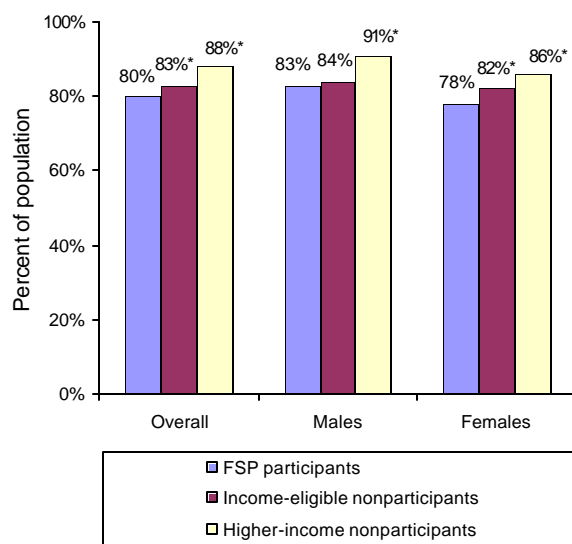
Among males, 83 percent of FSP participants consumed an adequate amount of zinc, compared with 84 percent of income-eligible nonpar-

ticipants (difference was not statistically significant) and 91 percent of higher-income nonparticipants (difference was statistically significant). While not significant for males overall, the difference between FSP participants and income-eligible nonparticipants was statistically significant for both 9-13-year-olds and 31-50-year-olds (table D-24). In both instances, FSP males were significantly less likely than income-eligible males to have adequate intakes of zinc.

Among females, 78 percent of FSP participants had an adequate usual intake of zinc, compared with 82 percent of income-eligible nonparticipants and 86 percent of higher-income nonparticipants. Both of these differences were statistically significant. Among 14-18-year-old females, FSP participants were *more* likely than higher-income nonparticipants to have adequate usual intakes of zinc (87% vs. 64%) (table D-24). This is consistent with the patterns noted for this cohort of young women for usual intakes of both food energy and iron.

¹⁴Data on mean intakes of zinc (in mg.) are presented in table D-23 and the full distribution of intakes is presented in table D-25.

Figure 12—Percent of persons with adequate usual intake of zinc



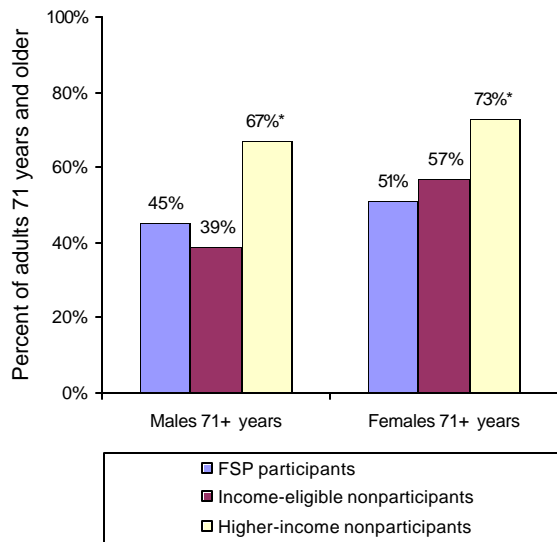
*Statistically significant difference from FSP participants at the .05 level or better.
Source: NHANES-III, 1988-94.

The oldest adults (71 years and older) were at the greatest risk of inadequate zinc intake and the risk was significantly greater for FSP participants than for higher-income nonparticipants. (The difference between FSP participants and income-eligible nonparticipants was not statistically significant). Among males 71 and older, 45 percent of FSP participants had an adequate usual intake of zinc, compared with 67 percent for higher-income nonparticipants (figure 13). Among females in this age group, 51 percent of FSP participants had an adequate usual intake of zinc, compared with 73 percent of higher-income nonparticipants.

Calcium

As noted in the introduction to this section, it is not possible to determine the percentage of individuals with adequate intakes of calcium because an EAR for calcium has not been established. Therefore, in comparing calcium

Figure 13—Percent of adults 71 and older with adequate usual intake of zinc



*Statistically significant difference from FSP participants at the .05 level or better.
Source: NHANES-III, 1988-94.

intakes of FSP participants and nonparticipants, the analysis examined mean usual intakes, expressed as a percentage of the AI. In reviewing these data, readers should note that the AI is expected to exceed the actual needs of essentially all healthy individuals. Thus, mean intakes below the AI cannot be interpreted as indicative of inadequate intakes. On the other hand, populations with mean intakes that meet or exceed the population-specific AI can be assumed to have adequate intakes.

On average, the usual diets of persons 1 year and older provided 81 percent of the AI for calcium (table D-27).¹⁵ Mean usual intake, as a percent of the relevant AI, was substantially greater for males than for females (93% vs. 70%) (statistical significance of gender-based difference not tested).

As a group, FSP participants consumed a significantly smaller percentage of the AI for

¹⁵Data on mean intakes of calcium (in mg.) are presented in table D-26 and the full distribution of intakes is presented in table D-28.

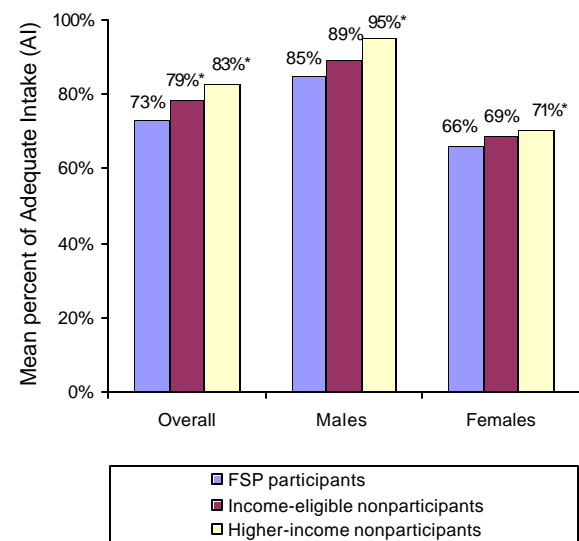
calcium than either income-eligible nonparticipants or higher-income nonparticipants (73% vs. 79% and 83%) (figure 14). This general pattern was noted for both males and females; however, in the gender-specific analyses, only the differences between FSP participants and higher-income nonparticipants were statistically significant.

Consumption of Milk and Soft Drinks

Data on trends in the National food supply indicate that Americans are consuming substantially less milk and substantially more soft drinks than they were 25 years ago (Putnam and Gerrior, 1999). On average, Americans consume more soft drinks per day than milk. Concerns have been raised about the potential impact of this trend on calcium intake, particularly among children (Yen and Lin, 2002).

To determine whether the relative consumption of milk and soft drinks differed for FSP participants and nonparticipants, 24-hour recall data were used to compute the total grams of fluid

Figure 14—Mean usual intake of calcium as percent of Adequate Intake



*Statistically significant difference from FSP participants at the .05 level or better.
Source: NHANES-III, 1988-94.

milk consumed and the total grams of soft drinks consumed in the preceding 24-hour period. Both carbonated and noncarbonated soft drinks were included in the tabulations. Coffee and tea were not included. For ease in interpretation, gram weights were translated into 8-ounce equivalent servings.

The data, presented in tables D-29 to D-32, verify that soft drink consumption outstripped consumption of fluid milk in all but the youngest age groups (1-3-year-olds and 4-8-year-olds). However, there were few significant differences between FSP participants and either group of nonparticipants in this regard.

Across all age groups, milk consumption averaged less than one full (8-ounce) serving per day (table D-30). In contrast, average consumption of soft drinks was 2.0 8-ounce servings per day (table D-32). (Most soft drinks purchased in individual containers include more than 8 ounces). Males consumed less milk and more soft drinks than females (0.8 and 2.2 servings, respectively, for males vs. 0.6 and 1.7 servings for females) (statistical significance of gender-based differences not tested). Males between 14 and 30 years consumed the most soft drinks, averaging about 3 servings (or 24 ounces) per day.

These patterns were noted for FSP participants and both groups of nonparticipants. There were few significant differences between FSP participants and either group of nonparticipants, and there was no consistent pattern in the differences that were observed.

Use of Dietary Supplements

As noted earlier in this chapter, NHANES-III dietary intake data do not include nutrients provided by dietary supplements. To provide some insight into the potential contribution of dietary supplements, data on reported supplement use were analyzed. The available data do

not permit a detailed analysis of this issue by specific nutrient, but provide some information on the prevalence of supplement use and general information on the number and types of supplements taken.

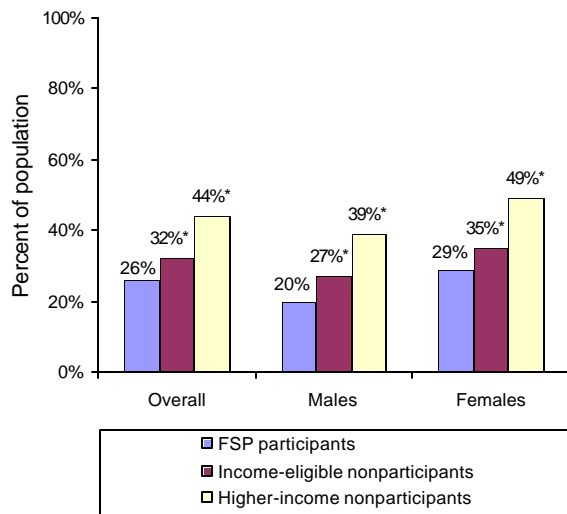
NHANES-III respondents were asked whether they used vitamin or mineral supplements during the preceding month. If supplements were used, respondents were asked to show the actual bottles or jars to interviewers so the type of supplement and associated dosage information could be recorded. Respondents were not asked specifically about use of other types of dietary supplements, such as herbs, botanicals, and fish oils; however, many respondents volunteered information about these types of supplements (CDC, 2001).

Overall, 40 percent of all individuals reported using some type of dietary supplement during the past month (table D-33). Supplement use was greater among females than males (44% vs. 35%) (statistical significance of gender-based difference not tested).

FSP participants were significantly less likely than either income-eligible nonparticipants or higher-income nonparticipants to use dietary supplements (figure 15). Slightly more than a quarter (26%) of FSP participants reported using dietary supplements. This compares with 32 percent of income-eligible nonparticipants and 44 percent of higher-income nonparticipants. This pattern was observed for both males and females.

Among persons who reported use of dietary supplements during the past month, 67 percent used one supplement, 19 percent used two supplements, and 14 percent used three or more supplements (table D-34). This pattern was observed for FSP participants and nonparticipants alike. FSP participants, however, were significantly less likely than either income-

Figure 15—Percent of persons using dietary supplements in the past month



*Statistically significant difference from FSP participants at the .05 level or better.
Source: NHANES-III, 1988-94.

participants to use a single-vitamin supplement (the third most common type of supplement overall) (18% vs. 28% and 31%). In addition, FSP participants were less likely than higher-income nonparticipants to use a multiple-vitamin (without minerals) supplement (the second most common type of supplement overall) (28% vs. 35%). All of these between-group differences were concentrated among females.

eligible or higher-income nonparticipants to have used three or more dietary supplements (7% vs. 11% and 15%). These differences were largely attributable to differences among females.

The type of supplement used most often was a multivitamin-and-mineral combination (table D-36). Overall, 47 percent of supplement users reported using a multivitamin-and-mineral combination. Such supplements are likely to include vitamin C, iron, and zinc, three of the four minerals examined in the preceding section. Calcium is likely to be included as well, but generally at levels well below other minerals.

The multivitamin-and-mineral combination was the most common supplement used by FSP participants and both groups of nonparticipants and, for the population overall, there were no significant differences between groups in the relative use of this type of supplement. There were, however, differences between groups in the use of other types of supplements. Specifically, FSP participants were less likely than either income-eligible or higher-income nonpar-