

## 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 intakes among older adults in different income strata. 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 all analyses involving dietary outcomes differ slightly from those used in the remainder of the report. Specifically, the two oldest age groups (80-84 years and 85 and older) were collapsed. This was necessary because the available sample of individuals 85 and older was too small to support estimation of usual intakes (see appendix C).

To provide some context for considering data on usual energy and nutrient intakes of older adults, the chapter begins with information on several factors that may influence these outcomes: participation in the Food Stamp Program (FSP) and the Elderly Nutrition Program (ENP), household food sufficiency status, and meal and snacking patterns.

### Participation in the Food Stamp and Elderly Nutrition Programs

NHANES-III provides information on participation in two food and nutrition assistance programs that serve older adults: the FSP and the ENP. The survey question used to identify FSP participants asked specifically about current participation in the program: “(Are you/Is your family) receiving food stamps at the present time?” The 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 are “delivered to your home, such as Meals on Wheels.” Respondents who reported receipt of meals from either of these sources were considered ENP participants.

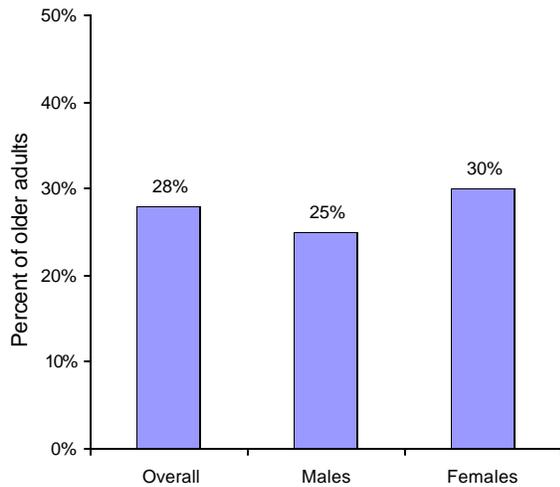
In reviewing the data presented in this section, it is important to bear two facts in mind. First, survey data tend to yield lower estimates of program participation than estimates derived from program administrative data. For example, data from the Survey of Income and Program Participation (SIPP), 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* participation rates.

### The Food Stamp Program

Although all persons with household incomes at or below 130 percent of poverty are eligible to participate in the FSP, only 28 percent of older adults with incomes in this range reported participating in the program (figure 1 and table D-1). Given the expected underreporting in survey data, these estimates are consistent with historical data on FSP participation among older adults during the relevant time period (1988-94) (Cody and Trippe, 1997).

Women participated in the FSP at a slightly higher rate than men (30% vs. 25%). In addition, the rate of FSP participation generally decreased as age increased. Thirty-nine percent of all income-eligible seniors between the ages of 60

**Figure 1—Percent of income-eligible older adults participating in the Food Stamp Program**



Statistical significance of difference between males and females not tested.

Source: NHANES-III, 1988-94.

and 64 participated in the FSP, compared with 22 percent of those 85 years old or older (statistical significance of gender- and age-based difference not tested) (table D-1).

Low FSP participation among older adults is a recognized problem. McConnell and Ponza (1999) identified five key reasons for lack of participation by older adults in the FSP and other food assistance and nutrition programs. These include lack of information, perceived lack of need, a perception that benefits are too low, problems related to program administration, and stigma or other psychological reasons. Issues related to the ability to travel are considered “problems related to program administration,” although health and frailty certainly contribute to travel difficulties.

Several program requirements have been changed over the years to encourage older adult participation in the FSP. In addition, State FSP agencies have implemented numerous initiatives to promote older adult participation (U.S. General Accounting Office (GAO), 2000). USDA’s Food and Nutrition Service (FNS) is currently evaluating a number of pilot demonstrations

designed to increase older adults’ participation in the FSP.

### **The Elderly Nutrition Program**

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.

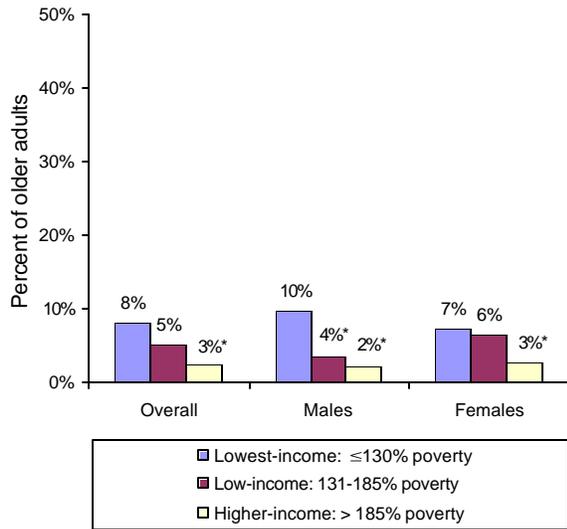
Only 4 percent of all older adults reported participation in the ENP, as measured by the NHANES-III survey questions described previously (table D- 2). Overall participation rates were comparable for males and females. In contrast to the FSP, where participation decreased with age, participation in the ENP increased with age. For the population as a whole, less than 2 percent of older adults younger than 70 years of age participated in the ENP. Among adults 85 and older, the rate of participation in the ENP was 12 percent (statistical significance of age-based difference not tested).

There was no significant difference between the lowest-income group and the low-income group in ENP participation, for the population as a whole or for females (figure 2). Among males, however, the rate of ENP participation in the lowest-income group was more than double that of the low-income group (10% vs. 4%).

In comparison with the higher-income group, older adults in the lowest-income group were significantly more likely to participate in the ENP. Overall, 8 percent of older adults in the lowest-income group reported participation in the program, compared with 3 percent in the higher-income group. This pattern was observed for both males and females.

The patterns observed in the NHANES-III data are consistent with data from the most recent

**Figure 2—Percent of older adults participating in the Elderly Nutrition Program**



\*Statistically significant difference from lowest-income group at the .05 level or better.

Source: NHANES-III, 1988-94.

nationally representative study of the ENP. The National Evaluation of the Elderly Nutrition Program, which was conducted in 1993-95, found that ENP participants tended to be older and poorer than the over-60 population in general (Ponza et al., 1996). They were also more likely to be members of racial and ethnic minorities and to live alone.

There are no official estimates of the percentage of older adults who are in need of ENP services but not participating in the program. However, funding for the program has remained relatively flat during a period when the number of older adults in the population, particularly those with functional impairments, has increased steadily (GAO, 2000). Moreover, evidence from the National Evaluation of the ENP suggests that there is a substantial unmet need, particularly for home-delivered meals. In 1993-95, 41 percent of home-delivered meal sites and 9 percent of congregate feeding sites had waiting lists (Ponza et al., 1996). The average number of persons on waiting lists for home delivered meals was 85 (median 35), and the average wait was 2 to 3 months. For congregate feeding sites, wait lists averaged 52 persons (median 47), and the

average wait was 2 months. In addition to older adults who are waiting for services, there are undoubtedly individuals who do not access the ENP for one or more of the reasons cited for low FSP participation.

### 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.<sup>1</sup> 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 majority of older adults (98%) lived in households that always had enough to eat (table D-3). This was true for all three income groups. However, in comparison with older adults in the low-income and higher-income groups, older adults in the lowest-income group were *less* likely to always have enough to eat and *more* likely to sometimes not have enough to eat. Six percent of the lowest-income older adults reported that their households sometimes did not have enough to eat. Only 1 percent of older adults in the low-income group and less than 1 percent of older adults in the higher-income group reported experiencing this problem. More

<sup>1</sup>Versions 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 questions were not tabulated for this report because of the restricted nature of the sample.

severe problems with food sufficiency (“often” not having enough to eat) were rare for all three income groups.

Because so few older adults in the various subgroups examined in this report resided in households that sometimes or often did not have enough to eat, the followup questions on how often and why households experienced these problems were not analyzed. Sample sizes were too small to produce reliable subgroup estimates.

### Meals and Snacks Consumed

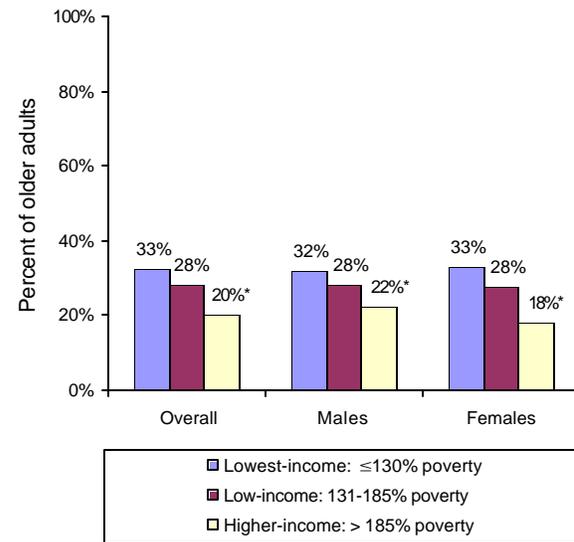
This analysis examined the number of meals and snacks consumed by older adults in the preceding 24 hours. Data from the 24-hour dietary recall were used to compute, for each individual, the total number of meals and snacks consumed. (As dietary intakes were reported, respondents were asked to identify 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, 24 percent of older adults consumed fewer than three meals per day (table D-5).<sup>2</sup> The percentage of older adults who ate fewer than three meals per day decreased with age, from a high of 28 percent for 60-64-year-olds to a low of 19 percent for adults 85 and older (statistical significance of age-based difference not tested).

On average, there was no difference between the lowest-income group and the low-income group in the percentage of older adults who consumed fewer than three meals per day (figure 3). This was true for both males and females. In comparison with the higher-income group, however, older adults in the lowest-income group were more likely to consume

**Figure 3—Percent of older adults consuming fewer than three meals per day**



\*Statistically significant difference from lowest-income group at the .05 level or better.  
Source: NHANES-III, 1988-94.

fewer than three meals per day. Overall, one-third of older adults in the lowest-income group consumed fewer than three meals, compared with 20 percent of older adults in the higher-income group. This pattern was observed for both males and females, although the between-group difference was notably larger for females than for males (15 percentage point difference vs. 10 percentage point difference).

#### 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. The data indicate that 83 percent of all older adults consumed breakfast every day (table D-7). In keeping with previous findings on the consumption of three or more meals per day, the percentage of older adults who reported regular consumption of breakfast increased with age. Overall, 71 percent of 60-64-year-olds reported eating breakfast every day, compared with 95 percent of adults 85 and older (statistical significance of age-based differences not tested).

<sup>2</sup>Data on the mean number of meals consumed is presented in table D-6.

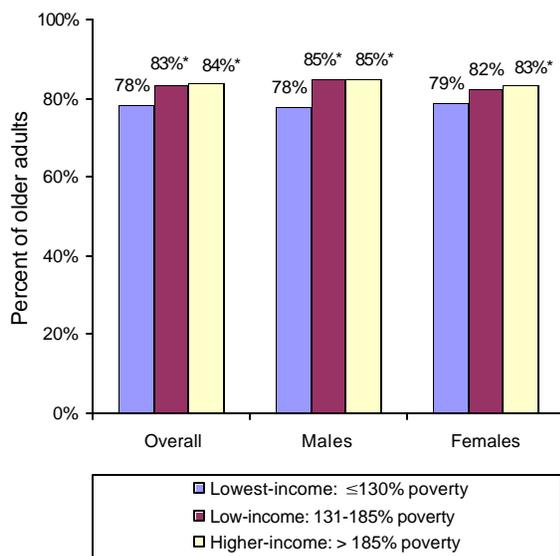
Older adults in the lowest-income group were significantly less likely than older adults in the other two income groups to consume breakfast every day (figure 4). Seventy-eight percent of older adults in the lowest-income group consumed breakfast every day, compared with 83 percent of older adults in the low-income group and 84 percent of older adults in the higher-income group. This trend was noted for both males and females. However, among females, the difference between the lowest-income group and the low-income group was not statistically significant.

### Number of Snacks Consumed

Eighty-one percent of all older adults consumed at least one snack per day (table D-8).<sup>3</sup> In contrast with meal consumption, which tended to increase with age, consumption of snacks decreased with age. Eighty-seven percent of 60-64-year-olds and 65-69-year-olds reported eating at least one snack per day. The same was true for only 68 percent of those aged 85 and older

<sup>3</sup>Data on the mean number of snacks consumed is presented in table D-9.

**Figure 4—Percent of older adults consuming breakfast every day**



\*Statistically significant difference from lowest-income group at the .05 level or better.  
Source: NHANES-III, 1988-94.

(statistical significance of age-based differences not tested).

In addition to consuming fewer meals per day and being less likely to consume breakfast on a daily basis, the lowest-income older adults were less likely than their counterparts in the higher-income group to consume at least one snack. Seventy-seven percent of older adults in the lowest-income group consumed one or more snacks per day, compared with 84 percent of the older adults in the higher-income group. This pattern was observed for both males and females. There were no overall differences between the lowest-income group and the low-income group in snacking patterns (tables D-8 and D-9).

### Usual Intake of Food Energy and Key Nutrients

This section describes usual intakes of food energy, vitamin C, iron, zinc, and calcium among older adults. 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 Intake of Individuals (CSFII). (The procedures used in making these adjustments are described in appendix C.) As such, the data presented are indicative of older adults' *usual* dietary intakes, exclusive of vitamin and mineral supplements, and can be used to assess the prevalence of adequate intakes.<sup>4</sup>

### Standards Used to Assess Usual Intakes

Older adults' usual nutrient intakes were assessed relative to Estimated Average Require-

<sup>4</sup>Data on usual nutrient intakes do not include contributions from vitamin and mineral supplements. At the time this report was being drafted, 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.

ments (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), Food and Nutrition Board (FNB), 1999, 2000a, 2000b, 2002a, 2002b, 2004). The DRIs replace the *Recommended Dietary Allowances* (RDAs) used in most previous research (National Research Council (NRC), 1989a).<sup>5</sup> 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, FNB, 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-

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<sup>5</sup>In addition to EARs and AIs, the DRIs define two other reference standards: Recommended Dietary Allowances (RDAs) and Tolerable Upper Intake Levels (ULs) (see appendix B).

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.<sup>6</sup> Therefore, assessment of usual energy intakes also focuses on comparison of mean intakes, expressed as a percentage of the 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 5<sup>th</sup>, 10<sup>th</sup>, 15<sup>th</sup>, 25<sup>th</sup>, 50<sup>th</sup>, 75<sup>th</sup>, 85<sup>th</sup>, 90<sup>th</sup>, and 95<sup>th</sup> percentiles) for food energy and each of the four nutrients.

### Food Energy

On average, the usual energy intake of older adults approximated 82 percent of the 1989 REA (table D-11).<sup>7</sup> Males consumed more energy than females (87% vs. 78%) and energy consumption generally decreased with age (statistical significance of gender- and age-based differences not tested).

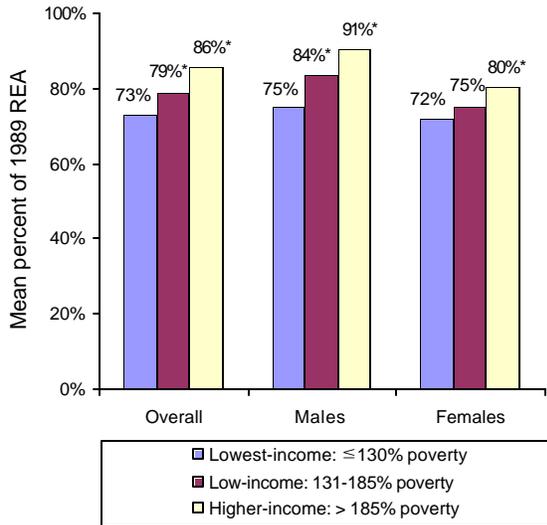
On average, older adults in the lowest-income group consumed significantly less energy, as a percentage of the 1989 REA, than older adults in either of the other income groups (figure 5). Older adults in the lowest-income group con-

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<sup>6</sup>DRIs for food energy have subsequently been released (IOM, FNB, 2002b).

<sup>7</sup>Data on mean usual energy intakes (in kilocalories) are presented in table D-10 and the full distribution of usual energy intakes is presented in table D-12.

**Figure 5—Mean usual intake of food energy as a percent of the 1989 Recommended Energy Allowance: Older adults**



\*Statistically significant difference from lowest-income group at the .05 level or better.  
Source: NHANES-III, 1988-94.

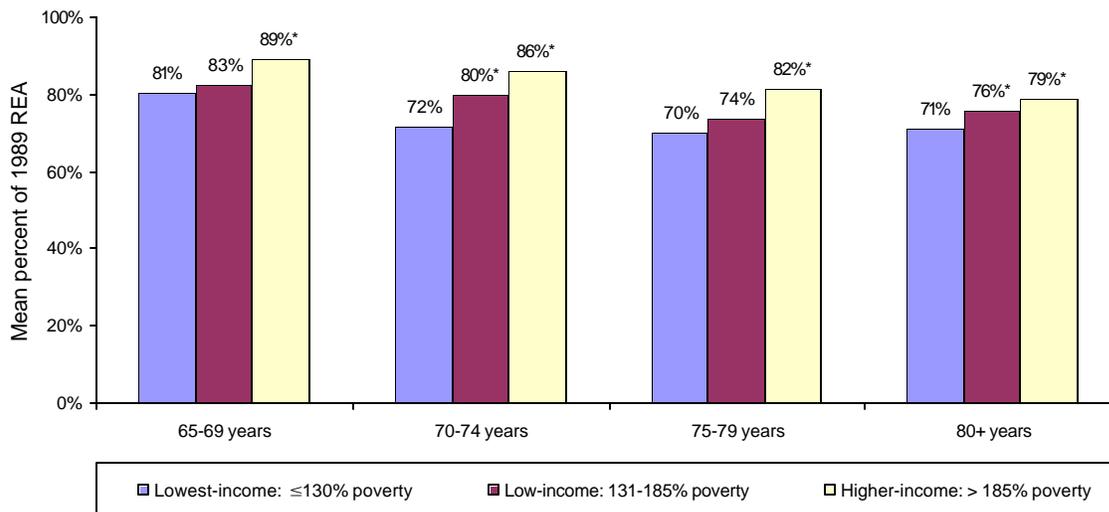
sumed an average of 73 percent of the REA, compared with 79 percent for older adults in the low-income group and 86 percent for older adults in the higher-income group. This pattern was noted for both males and females. However, among females, the difference between

the lowest-income group and the low-income group was not statistically significant.

This general trend was also observed when data were examined separately by age group (figure 6). Among 65-69-year-olds and 75-79-year-olds, however, the difference between the lowest-income group and the low-income group was not statistically significant.

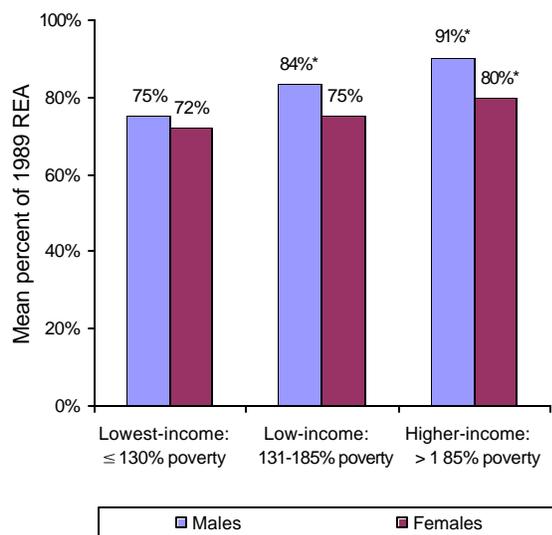
As noted previously, males consumed more energy, relative to the 1989 REA, than females. It is interesting to note, however, that the size of the disparity between males and females was substantially smaller in the lowest-income group than in either of the other income groups (figure 7). In the lowest-income group, males consumed an average of 75 percent of their REA and females consumed an average of 72 percent of theirs—a difference of 3 percentage points. Comparable differences for the low-income group and the higher-income group were 9 percentage points (84% vs. 75%) and 11 percentage points (91% vs. 80%) (statistical significance of gender-based differences not tested).

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



\*Statistically significant difference from lowest-income group at the .05 level or better.  
Note: An estimate of usual intake could not be obtained for the 60-64 year age group.  
Source: NHANES-III, 1988-94.

**Figure 7—Mean usual intake of food energy as a percent of the 1989 Recommended Energy Allowance: Males vs. females**



\*Statistically significant difference from lowest-income group at the .05 level or better.  
Source: NHANES-III, 1988-94.

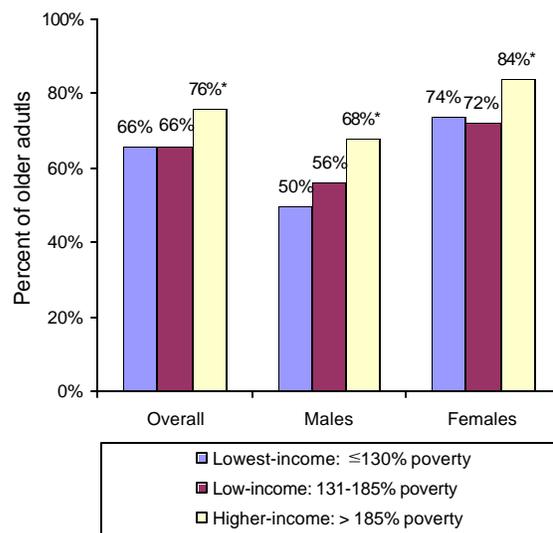
### Vitamin C

Seventy-two percent of all older adults consumed enough vitamin C to satisfy the relevant age-and-gender-specific EAR (table D-14).<sup>8</sup> Overall, the percentage of individuals with adequate vitamin C intakes was substantially lower for males than for females (63% vs. 79%). In addition, the prevalence of adequate intakes was greater among adults 80 and over, in comparison with 60-64-year-olds (79% vs. 70%); however, there was no consistent pattern of increase across the intervening age groups (statistical significance of gender- and age-based differences not tested).

Overall, there was no difference between the lowest-income group and the low-income group in the percentage of older adults with adequate usual intakes of vitamin C (figure 8). However, older adults in the lowest-income group were less likely to consume an adequate amount of vitamin C than those in the higher-income group

<sup>8</sup>Data on mean usual intakes of vitamin C (in mg.) are presented in table D-13 and the full distribution of usual vitamin C intakes is presented in table D-15.

**Figure 8—Percent of older adults with adequate usual intake of vitamin C**



\*Statistically significant difference from lowest-income group at the .05 level or better.  
Source: NHANES-III, 1988-94.

(66% vs. 76%). This difference was observed for both males and females.

As noted, females were substantially more likely than males to consume adequate amounts of vitamin C. As can be seen in figure 8, however, the disparity between males and females is most striking for the lowest-income group. Only 50 percent of the males in this group consumed a diet that provided adequate amounts of vitamin C, compared with 74 percent of females. Disparities between males and females in the other two income groups were smaller but still sizeable.

### Iron

Overall, close to 100 percent of older adults, both male and female, consumed adequate amounts of iron (table D-17).<sup>9</sup> Nonetheless, older adults in the lowest-income group were significantly less likely than older adults in the other two income groups to consume an ad-

<sup>9</sup>Data on mean usual intakes of iron (in mg.) are presented in table D-16 and the full distribution of usual iron intakes is presented in table D-18.

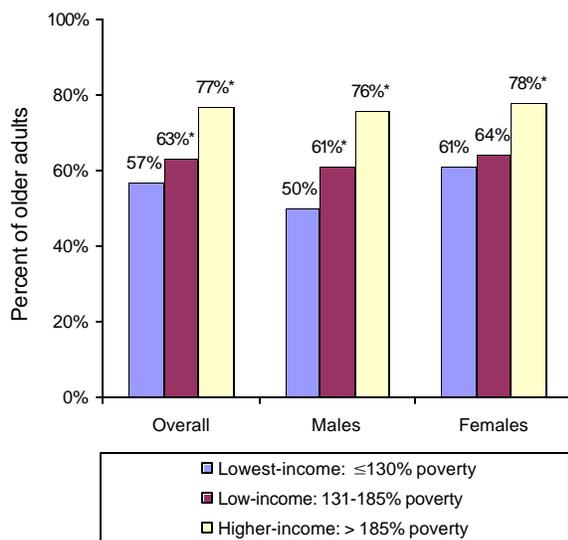
equate amount of iron (96% vs. 98% and 100%). This trend was noted for both males and females; however, among males, the difference between the lowest-income group and the low-income group was not statistically significant.

## Zinc

Roughly 7 out of 10 older adults had adequate usual intakes of zinc (table D- 20).<sup>10</sup> However, older adults in the lowest-income group were significantly less likely than older adults in either of the other income groups to consume adequate amounts of zinc (57% vs. 63% and 77%) (figure 9). This trend was observed for both males and females, although the difference between the lowest-income group and the low-income group was not significant for females. In addition, significant differences between the lowest-income group and both of the other income groups were observed for virtually all gender-and-age subgroups (table D-20).

<sup>10</sup>Data on mean usual intakes of zinc (in mg.) are presented in table D-19 and the full distribution of usual zinc intakes is presented in table D-21.

**Figure 9—Percent of older adults with adequate usual intake of zinc**



\*Statistically significant difference from lowest-income group at the .05 level or better.  
Source: NHANES-III, 1988-94.

## Calcium

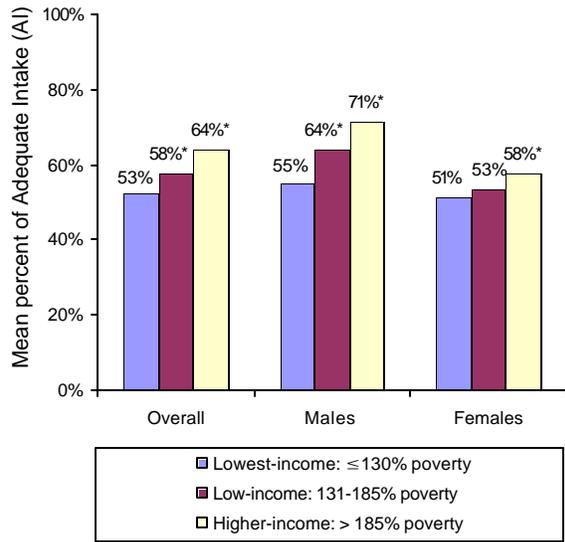
As noted in the introduction to this section, it is not possible to determine the percentage of older adults with adequate intakes of calcium because EARs for calcium have not been established. Therefore, in comparing calcium intakes across groups, the analysis examined mean intakes, expressed as a percentage 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 consumed by older adults provided 61 percent of gender-and age-specific AIs for calcium (table D-23).<sup>11</sup> Mean usual intake, as a percent of the relevant AI, was substantially greater for males than for females (68% vs. 56%) (statistical significance of gender-based difference not tested).

On average, older adults in the lowest-income group consumed a significantly smaller percentage of the calcium AI than older adults in either of the other income groups. The mean calcium intake of older adults in the lowest-income group, expressed as a percentage of the AI, was 53 percent (figure 10). Comparable statistics for the low-income and higher-income groups were 58 percent and 64 percent, respectively. This pattern was observed for both males and females. However, as noted in several preceding analyses, the difference between the lowest-income and low-income females was not statistically significant.

<sup>11</sup>Data on mean usual intakes of calcium (in mg.) are presented in table D-22 and the full distribution of usual calcium intakes is presented in table D-24.

**Figure 10—Mean usual intake of calcium as a percent of Adequate Intake: Older adults**



\*Statistically significant difference from lowest-income group at the .05 level or better.  
Source: NHANES-III, 1988-94.

### 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 among older adults and general information on the number and types of supplements taken.

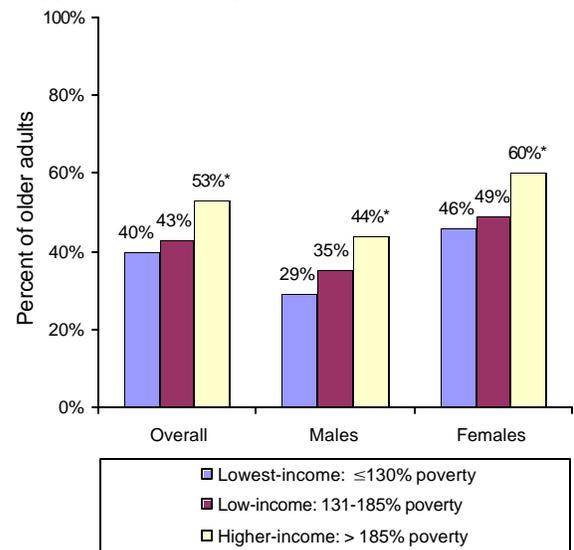
NHANES-III respondents were asked whether they used vitamin or mineral supplements during the preceding month. If supplements were used, respondents were asked to show the actual bottles or jars to interviewers so the type of supplement and associated dosage information could be recorded. Respondents 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, 48 percent of older adults reported using some type of dietary supplement during the past month (table D-25). Supplement use was greater among females than males (53% vs. 40%) (statistical significance of gender-based difference not tested).

There was no difference between the lowest-income group and the low-income group in the use of dietary supplements. However, older adults in the lowest income group—the group least likely to consume adequate nutrients from foods—were significantly less likely than those in the higher-income group to use supplements (figure 11). Forty percent of all older adults in the lowest-income group reported supplement use, compared with 53 percent of older adults in the higher-income group. This pattern was observed for both males and females.

Among older adults who reported use of dietary supplements in the past month, 56 percent used one supplement, 23 percent used two supplements, and 21 percent used three or more supplements (table D-26). Patterns were similar for males and females.

**Figure 11—Percent of older adults using dietary supplements in the past month**



\*Statistically significant difference from lowest-income group at the .05 level or better.  
Source: NHANES-III, 1988-94.

Overall, there was no difference between the lowest-income group and the low-income group in the number of supplements used. In comparison with the higher-income group, however, older adults in the lowest-income group were less likely to use three or more supplements (17% vs. 24%). This was true for both males and females.

The most common type of supplement used by older adults was a multi-vitamin-and-mineral combination. Forty-six percent of all older adults who used supplements reported using a multi-vitamin-and-mineral combination (table D-28). Such supplements are likely to include vitamin C, iron, and zinc—three of the four minerals examined in the preceding section. Calcium is also likely to be included in a multi-vitamin-and-mineral combination, but generally at levels well below other minerals, relative to the AIs.

While the multi-vitamin-and-mineral combination was the most common type of supplement used, overall, use of this type of supplement was significantly lower among the lowest-income older adults, compared with higher-income older adults (38% vs. 49%). This pattern was observed for both males and females. Among females, the difference in reported use of multi-vitamin-and-mineral combinations was also significant for the lowest-income vs. low-income comparison (38% vs. 50%).

Overall, the second most common type of supplement was a single vitamin supplement. Higher-income older adults, both male and female, were more likely than their counterparts in the lowest-income group to use a single vitamin supplement; however, the disparities were smaller than those observed for multi-vitamin-and-mineral supplements.

Isolated between-group differences were observed for reported use of other types of supplements, but none were significant in the

overall analysis or in either of the gender-specific analyses.