



Nutrition and Health Characteristics of Low-Income Populations

Usual Nutrient Intakes

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The U.S. Department of Agriculture implements an array of domestic Food Assistance and Nutrition Programs as a “food safety net” to provide low-income households with access to a healthy diet. Assessment of nutrient intakes helps determine which nutrients are deficient in the diets of target populations. The Nutrition and Health Characteristics of Low-Income Populations study examined longrun average, or “usual” intakes of 10 key nutrients and dietary components: energy intake, vitamin C, iron, zinc, calcium, total fat, saturated fat, cholesterol, sodium, and fiber. Results were estimated for participants in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC), Food Stamp Program (FSP) participants, school-age children, and older adults. In addition to assessing intake adequacy, the study also estimated usual intake distributions for the population subgroups. Because the recommendations for nutrient intake have been under revision, intake distributions are useful for estimating the prevalence of adequate intake under different standards. The study provides a baseline from which to monitor the nutrition and health characteristics of each group over time and to identify priorities for further research.

Methodology

The study used data from the 1988-94 National Health and Nutrition Examination Survey (NHANES-III), applying assessment methodology and Dietary Reference Intakes (DRIs) published by the Institute of Medicine (IOM). The IOM methodology corrects several sources of bias in previous estimates of nutrient adequacy. The study estimated distributions of usual nutrient intakes for all nutrients. Usual intake has a lower variance than 1-day intakes or averages over a small number of days because the usual intake measure excludes the day-to-day variation within individuals’ daily intakes and includes only variation among individuals. Thus, the percentage of individuals falling below a cutoff point (for cutoffs below the mean) is generally lower for usual intakes than for observed intakes or for 2-day averages as used in previous studies.

The estimation of usual intake requires multiple intake days in order to calculate the day-to-day variance for each individual.

Because NHANES collected 2 days of data from only a small nonrandom subsample, the day-to-day variances were obtained using the 2-day recall data from USDA’s 1994-96 Continuing Survey of Food Intakes by Individuals.

The study assessed nutrient adequacy using the Dietary Reference Intakes (DRIs) released starting in 1997 by the Institute of Medicine (IOM, various issues). The DRIs are a set of standards, including the Recommended Daily Allowances (RDAs), Estimated Average Requirements (EARs), Adequate Intakes (AIs), and Tolerable Upper Levels (ULs) of intakes. RDAs represent levels expected to be adequate for 97-98 percent of the population and are for assessing individual intakes. EARs are the levels considered adequate for half the population and for assessing intakes of population groups. For some nutrients with insufficient data, IOM published AIs, which are based on experimental data or observed intake of an apparently healthy population. Finally, the DRIs include ULs, the highest level of continuing daily nutrient intake that is likely to pose no risk of adverse health effects in almost all individuals in the specified life stage group.

The prevalences of adequate intake for vitamin C, zinc, and iron were calculated by the percentage of the population with usual intakes above the EARs. For females ages 9-50, the study used more detailed tables by IOM on the risk of inadequacy at each level of intake to account for the asymmetrical distribution of iron requirements due to menstruation. Because the IOM could not establish an EAR for calcium, the study compared mean calcium intake with the AI. Mean intake above the AI is interpreted as a high prevalence of adequate intake, but the prevalence of inadequate intake cannot be quantified when mean intake is below the AI.

When the study was conducted, DRIs for energy, total fat, saturated fat, cholesterol, sodium, and fiber had not been issued. Earlier dietary recommendations were used to assess the intake of total fat, saturated fat, cholesterol, fiber, and sodium. For energy, the study compared mean intake with the 1989 Recommended Energy Allowance (REA). Since the completion of the study, the IOM has also issued new recommendations for energy, fat, fiber, and sodium.

Vitamin C, Iron, Zinc, and Calcium

Food Stamp Participants. The U.S. population was separated for study purposes into FSP participants and nonparticipants. The FSP income eligibility cutoff (130 percent of poverty level) was used to separate nonparticipants into income-eligible and higher income nonparticipants. By incorporating gender and age, a total of 72 population subgroups were created in the study.

The prevalence of adequate intake of vitamin C was 95 percent or higher for almost all population subgroups through age 13, but was lower for older children and adults (fig. 1). Male Food Stamp Program (FSP) participants were more likely than income-eligible nonparticipants to have adequate vitamin C intake, but for females, the reverse was true. Food stamp participants were less likely than income-eligible nonparticipants to consume adequate zinc, largely due to differences among 9- to 13-year olds and 31- to 50-year-olds.

Over 95 percent of males in all age groups consumed adequate iron, regardless of food stamp status. Among 14- to 18-year-olds, FSP females were more likely than higher income females to have an adequate iron intake, but the reverse was true among females 19-50 years of age. The prevalence of adequate calcium

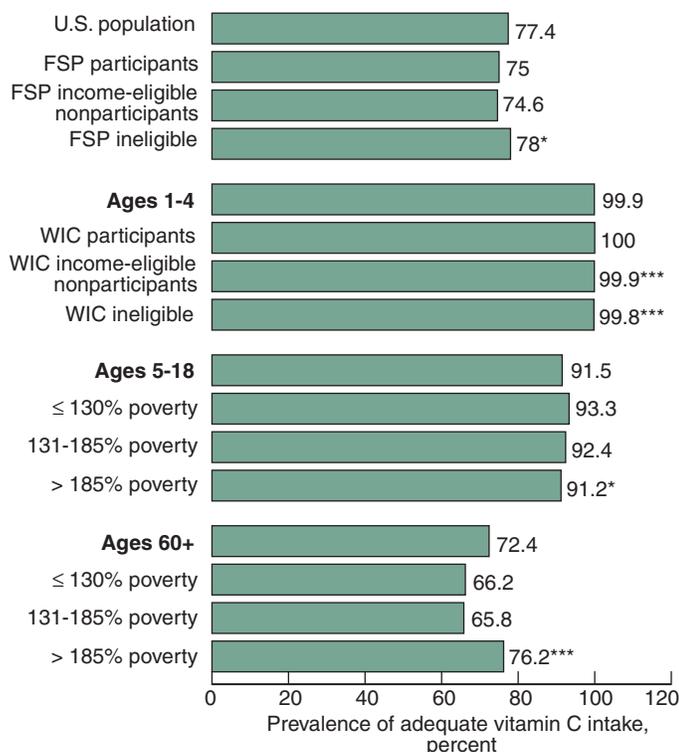
intake was high through age 8 but could not be quantified for older children. Mean calcium intake was significantly lower for food stamp participants than for either income-eligible nonparticipants or higher income nonparticipants (fig. 2).

WIC Children. Children under age 4 were separated by their participation in WIC, and nonparticipants were classified into income-eligible and higher income using the WIC's income cutoff of 185 percent of poverty. Virtually all children ages 1-4 received adequate intakes of vitamin C (fig. 1). The patterns for zinc and iron were similar. There were statistically significant but negligible differences between participants and nonparticipants.

School-Age Children. School-age children and older adults (ages 60 and over) were grouped into three income classes—lowest income (below 130 percent of poverty), low income (greater than 130 and no more than 185 percent of poverty), and higher income (over 185 percent of poverty). The report gives results for these income groups separated by age and gender.

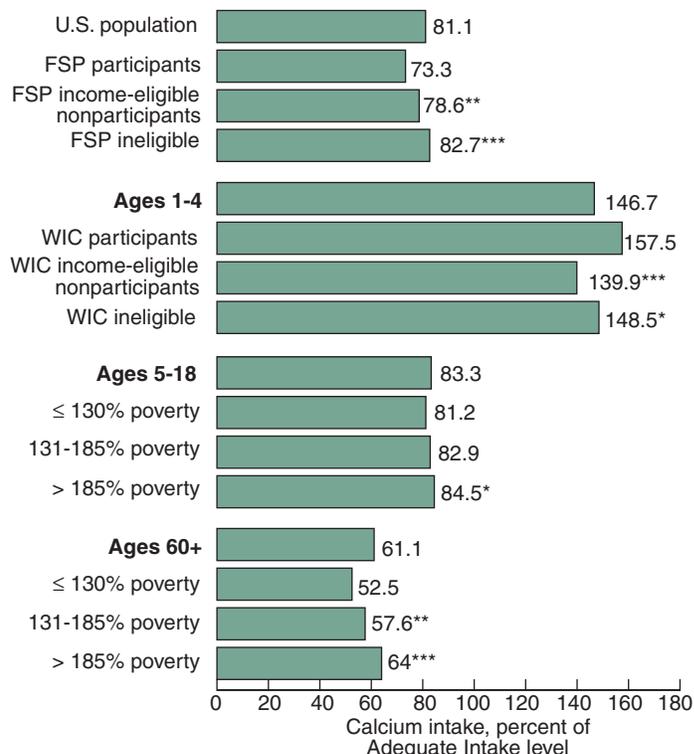
Over 95 percent of all children ages 5-8 and 9-13 consumed adequate vitamin C, while about 8 out of 10 children ages 14-18 did so (fig. 1). For some age subgroups, prevalence of adequate intake was lower among higher income children than lowest

Figure 1
Older Americans at highest risk of inadequate vitamin C intake



*Significantly different from program participants or lowest income group at 0.05 level.
 **Significantly different from program participants or lowest income group at 0.01 level.
 ***Significantly different from program participants or lowest income group at 0.001 level
 Source: National Health and Nutrition Examination Survey, 1988-94.

Figure 2
Calcium intake below Adequate Intake levels for school-age children, older adults



*Significantly different from program participants or lowest income group at 0.05 level.
 **Significantly different from program participants or lowest income group at 0.01 level.
 ***Significantly different from program participants or lowest income group at 0.001 level
 Source: National Health and Nutrition Examination Survey, 1988-94.

income children. The pattern was similar for zinc. Only 6 out of 10 girls ages 14-18 in the higher income group consumed adequate zinc, compared with 81 percent for the lowest income and 100 percent for the low income.

While prevalence of adequate iron intake was above 95 percent for most school-age children, only 8 out of 10 higher income girls ages 14-18 consumed adequate iron, significantly less than lowest income girls ages 14-18 (92 percent).

Mean calcium intake was above the AI for children ages 1-4 but below the AI for most groups of older children (fig. 2). Mean intake of lowest income boys was significantly lower than for low- and higher income boys, whereas mean intake was actually higher for lowest income girls ages 14-18 than for their low-income counterparts.

Older Adults. About 7 out of 10 adults over age 60 consumed adequate vitamin C, but older adults with incomes at or below 130 percent of poverty were significantly less likely to have adequate intakes than those with higher income (fig. 1). The pattern was similar for zinc. Nearly 99 percent of older adults had adequate usual intake of iron, with small differences among income groups or age-sex groups. Prevalence of adequate calcium intake could not be quantified for older adults (fig. 2). Lowest income older adults had significantly lower mean calcium intake than their low-income counterparts.

Energy, Fat, Saturated Fat, Sodium, Fiber, and Cholesterol

There was no difference in energy intake as a percentage of the 1989 REA between FSP males and their income-eligible nonparticipating counterparts. However, FSP girls ages 9 and older and women ages 19-30 had higher energy intake than their income-eligible nonparticipating counterparts. The pattern reversed among women ages 31-50. For older adults, lowest income men and women had lower energy intake than those with higher income.

WIC children consumed more energy as a percentage of the 1989 REA than income-eligible and higher income nonparticipating children. Among school-age children, energy intake was significantly higher for lowest income girls than other girls but the opposite was observed for boys.

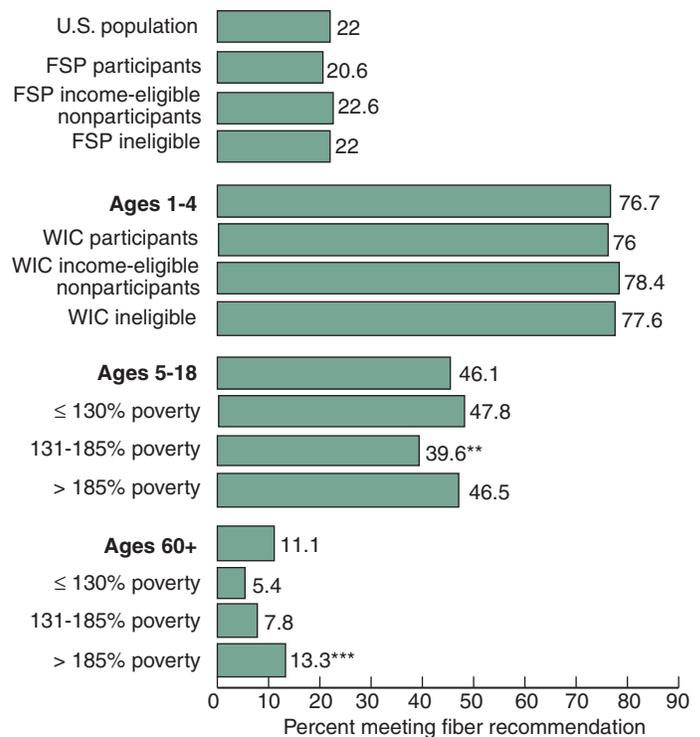
Twenty-three percent of Americans ages 2 and above met the Dietary Guideline limiting total fat to no more than 30 percent of caloric intake, and 25 percent of Americans met the Guideline limiting saturated fat to less than 10 percent of food energy. Twenty-two percent of Americans ages 2 and above met the dietary recommendation for dietary fiber (“age plus 5” up to 25 grams per day) (fig. 3), and 20 percent met the recommendation for sodium (2,400 milligrams per day). Sixty-eight percent of Americans met the Dietary Guideline for cholesterol intake (300 mg per day or less).

The recently issued DRIs include the Acceptable Macronutrient Distribution Range (AMDR) of 25-35 percent for total fat, AIs of 19 grams of total fiber for children and up to 38 grams for teen boys and adult men, and UL of 2,300 mg per day for sodium. These DRIs specify stricter standards for fiber and sodium, so future analysis is likely to show a lower percentage of Americans meeting the new DRIs than those meeting the earlier recommendations. The AMDR for fat is more lenient than the Dietary Guideline, however, so a higher proportion is likely to meet this DRI than met the Guideline.

Intake Distributions

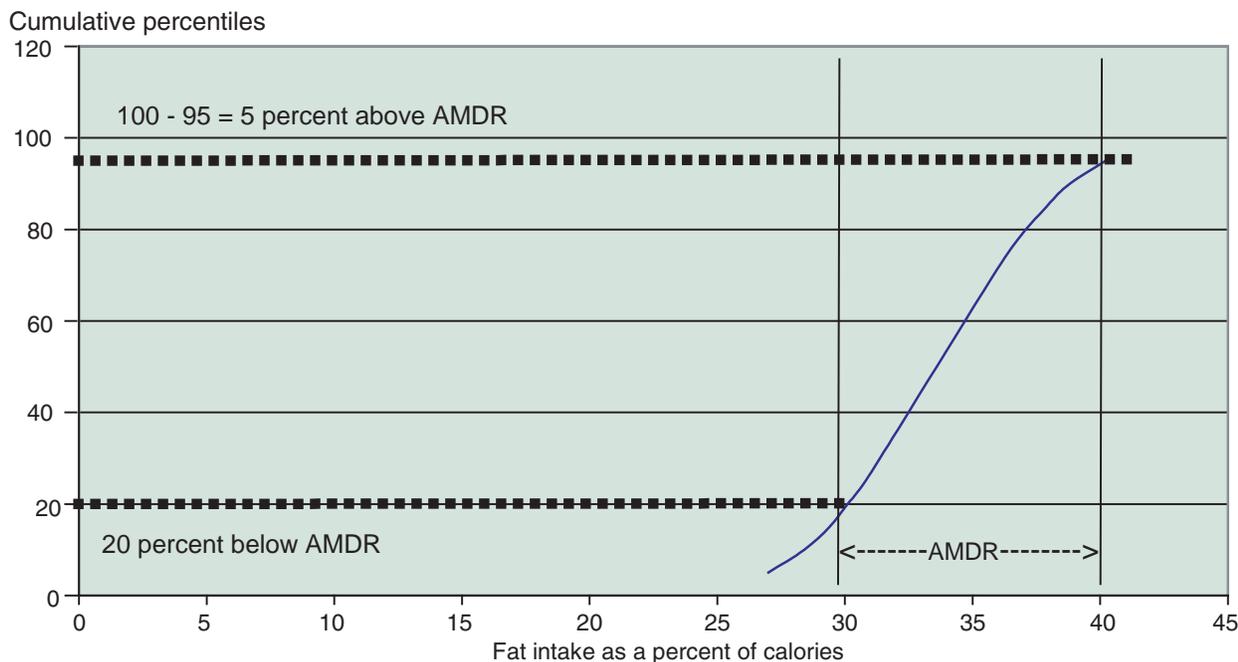
Usual intake distributions are reported for 5th, 10th, 15th, 25th, 50th, 75th, 85th, 90th, and 95th percentiles. The distributions allow researchers to estimate the effect of a change in intake standards on the prevalence of adequate intake. For example, the IOM’s AMDR for fat was issued when the analysis was completed so that it was not used in the study. The usual intake distribution shows that about 5 percent of WIC children age 2-4 exceeded the 40 percent upper AMDR for children (fig. 4), and about 20 percent of them fell below the 30 percent lower bound of the AMDR. Note that only those falling below the lower bound of

Figure 3
Most Americans do not meet “age-plus-five” recommendation for fiber



*Significantly different from program participants or lowest income group at 0.05 level.
 **Significantly different from program participants or lowest income group at 0.01 level.
 ***Significantly different from program participants or lowest income group at 0.001 level
 Source: National Health and Nutrition Examination Survey, 1988-94.

Figure 4
One in four WIC children falls outside Acceptable Macronutrient Distribution Range



WIC = Special Supplemental Nutrition Program for Women, Infants, and Children
 Source: National Health and Nutrition Examination Survey, 1988-94

the AMDR meet the Dietary Guideline of fat intake of no more than 30 percent of calories.

Conclusions

Younger children were more likely to have adequate intake of vitamin C, zinc, and calcium than older children and adults. In many cases lower income individuals and food assistance recipients were less likely to have adequate intake than higher income individuals, but in some cases, the reverse was true.

Further research is needed to reconcile the high prevalence of adequate iron intake with biochemical indicators, which show a somewhat lower prevalence of adequate iron status.

Adherence to guidelines for fat, saturated fat, and sodium intake was low. Future analysis is likely to show a higher percentage of the population with fat intakes within the IOM’s less restrictive Acceptable Macronutrient Distribution Ranges for fat, but lower percentages meeting the AI for total fiber and the UL for sodium.

For more information, see www.ers.usda.gov/publications/efan04014-1, 04014-2, 04014-3, 04014-4

NOTE: These studies were not designed to assess program impacts. Do not interpret any reported differences between program participants and nonparticipants as impacts of food assistance programs.

Information Sources

Institute of Medicine, Food and Nutrition Board (2004). *Dietary Reference Intakes for Water, Potassium, Sodium, Chloride, and Sulfate*. Washington, DC: National Academy Press.

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