

Fruit and Vegetable Intake among Adults in 16 States: Results of a Brief Telephone Survey

ABSTRACT

A brief food frequency questionnaire was used to assess daily fruit and vegetable consumption among 23 699 adults in 16 US states sampled in a random-digit dialing telephone survey. Men consumed fewer servings per day (3.3) than did women (3.7). Only 20% of the population consumed the recommended 5 or more daily servings. Intakes varied somewhat by state and were lower among the young and the less educated. Efforts are needed to improve fruit and vegetable consumption among all Americans, especially younger adults and those with lower levels of education. (*Am J Public Health*. 1995;85:236-239)

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Introduction

Because diets rich in fruits and vegetables are associated with a lower risk for chronic diseases, the Year 2000 Objectives for the United States include increasing the intake of fruits and vegetables to five or more servings per day.¹⁻³ To measure progress toward this objective, the Centers for Disease Control and Prevention (CDC) developed a six-item fruit and vegetable questionnaire for use in the Behavioral Risk Factor Surveillance System (BRFSS). The BRFSS questionnaire was evaluated against more extensive methods of dietary assessment, and mean daily fruit and vegetable intakes were generally similar to those estimated by multiple diet records or recalls but lower than those estimated by extensive food frequency questionnaires.⁴ This report describes the intake of fruits and vegetables as reported by survey respondents from the 16 states that included the fruit and vegetable questionnaire in the 1990 BRFSS.

Methods

Data for the BRFSS are collected annually by state health departments, in collaboration with the CDC,⁵ by means of an independent probability sample of each state's adult residents with telephones.⁶ Approximately equal numbers of interviews were conducted each month throughout 1990 in each state except Tennessee (interviews were conducted in January through June). The median cooperation rate (completed interviews divided by the sum of completed interviews and refusals) was 82%.

All respondents were asked (1) "How often do you drink juices such as orange, grapefruit, or tomato?" (2) "Not counting

juice, how often do you eat fruit?" (3) "How often do you eat green salad?" (4) "How often do you eat potatoes (not including french fries, fried potatoes, or potato chips)?" (5) "How often do you eat carrots?" and (6) "Not counting carrots, potatoes, or salad, how many servings of vegetables do you usually eat? For example, a serving of vegetables at both lunch and dinner would be two servings." Carrots were included in the questionnaire because they are strong markers for carotene consumption, possibly important in cancer prevention.⁷

A total of 28 286 people completed the interview. Because abbreviated questionnaires may not capture some common sources of fruits and vegetables among all racial/ethnic groups,^{4,8} we excluded Hispanics ($n = 1311$) and racial/ethnic groups other than Black or White ($n = 1461$). Also excluded were persons not reporting sociodemographic characteristics ($n = 227$), not answering all questions on fruit and vegetable intake ($n = 1572$), and reporting consumption of more than 20 fruits and vegetables daily ($n = 16$). Although nonresponse for all six diet questions varied by age, race, and education,

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TABLE 1—Daily Consumption of Fruits and Vegetables, by Sex and State: Behavioral Risk Factor Surveillance System, 1990

| State | Men | | | Women | | | Total | | |
|----------------|-----------------|---------------|----------------------------------|-----------------|---------------|----------------------------------|-----------------|---------------|----------------------------------|
| | Median Servings | Mean Servings | Five or More Servings per Day, % | Median Servings | Mean Servings | Five or More Servings per Day, % | Median Servings | Mean Servings | Five or More Servings per Day, % |
| California | 3.4 (0.1) | 3.8 (0.1) | 18.9 (2.7) | 3.7 (0.1) | 4.0 (0.1) | 24.3 (3.0) | 3.6 (0.1) | 3.9 (0.1) | 21.7 (2.0) |
| Colorado | 3.3 (0.1) | 3.6 (0.1) | 16.1 (2.9) | 3.8 (0.1) | 4.1 (0.1) | 24.2 (3.2) | 3.6 (0.1) | 3.8 (0.1) | 20.3 (2.2) |
| Hawaii | 3.5 (0.3) | 3.9 (0.3) | 23.7 (4.6) | 3.7 (0.2) | 4.0 (0.2) | 24.7 (4.7) | 3.6 (0.2) | 3.9 (0.2) | 24.2 (3.4) |
| Idaho | 3.2 (0.1) | 3.4 (0.1) | 12.1 (2.8) | 3.6 (0.1) | 3.8 (0.1) | 18.9 (2.6) | 3.4 (0.2) | 3.6 (0.1) | 15.6 (1.9) |
| Illinois | 2.8 (0.2) | 3.2 (0.2) | 14.1 (3.1) | 3.4 (0.2) | 3.6 (0.1) | 17.3 (3.0) | 3.1 (0.1) | 3.4 (0.1) | 15.7 (2.1) |
| Iowa | 3.1 (0.2) | 3.3 (0.2) | 14.1 (3.1) | 3.6 (0.2) | 3.9 (0.1) | 21.6 (3.1) | 3.4 (0.1) | 3.6 (0.1) | 18.0 (2.1) |
| Kentucky | 3.0 (0.2) | 3.2 (0.2) | 15.8 (3.1) | 3.6 (0.1) | 3.9 (0.1) | 22.1 (2.7) | 3.3 (0.1) | 3.5 (0.1) | 19.1 (2.1) |
| Maryland | 3.4 (0.1) | 3.6 (0.2) | 16.3 (3.4) | 3.7 (0.2) | 3.9 (0.1) | 22.1 (3.2) | 3.5 (0.1) | 3.7 (0.1) | 19.4 (2.4) |
| Missouri | 3.1 (0.2) | 3.6 (0.2) | 17.0 (3.4) | 3.6 (0.1) | 3.9 (0.1) | 22.0 (3.2) | 3.4 (0.1) | 3.8 (0.1) | 19.6 (2.4) |
| Nebraska | 2.9 (0.2) | 3.2 (0.1) | 12.7 (2.7) | 3.8 (0.2) | 4.0 (0.1) | 25.6 (3.2) | 3.4 (0.1) | 3.6 (0.1) | 19.5 (2.1) |
| New York | 3.4 (0.3) | 3.8 (0.2) | 20.5 (4.3) | 4.0 (0.2) | 4.1 (0.2) | 23.3 (3.7) | 3.8 (0.2) | 4.0 (0.1) | 22.0 (2.9) |
| North Dakota | 2.8 (0.1) | 3.1 (0.1) | 11.5 (3.0) | 3.6 (0.1) | 3.8 (0.1) | 19.7 (2.9) | 3.2 (0.1) | 3.4 (0.1) | 15.6 (2.1) |
| Ohio | 3.3 (0.2) | 3.7 (0.2) | 18.0 (3.8) | 3.7 (0.2) | 3.8 (0.2) | 21.9 (3.4) | 3.5 (0.1) | 3.8 (0.1) | 20.1 (2.5) |
| South Carolina | 3.3 (0.1) | 3.5 (0.2) | 16.2 (3.1) | 3.7 (0.1) | 3.8 (0.1) | 22.9 (2.8) | 3.5 (0.1) | 3.7 (0.1) | 19.7 (2.1) |
| Tennessee | 3.4 (0.3) | 3.6 (0.2) | 18.5 (3.8) | 3.9 (0.2) | 4.0 (0.2) | 26.7 (3.6) | 3.6 (0.1) | 3.8 (0.1) | 22.7 (2.7) |
| West Virginia | 3.1 (0.1) | 3.3 (0.1) | 14.5 (2.5) | 3.7 (0.1) | 3.8 (0.1) | 21.1 (2.4) | 3.4 (0.1) | 3.6 (0.1) | 17.9 (1.7) |
| Total | 3.3 (0.06) | 3.6 (0.08) | 17.5 (1.2) | 3.7 (0.06) | 3.9 (0.06) | 22.6 (1.2) | 3.5 (0.04) | 3.8 (0.04) | 20.2 (0.9) |

Note. Numbers in parentheses are the half widths of the 95% confidence intervals.

exclusion of nonresponders had little effect on the percentage of individuals who were more than 65 years of age (20.6% prior to exclusion vs 20.4% after exclusion) or Black (9.3% vs 9.1%), had less than a high school education (17.0% vs 16.8%), or were unmarried (58.0% vs 58.1%).

SUDAAN was used in all analyses to take into account the complex sample design.⁹ We calculated subgroup-specific mean and median daily consumption and the percentage of respondents consuming five or more daily servings. To estimate the prevalence odds ratios for consuming five or more servings of fruits and vegetables, we used multiple logistic regression.¹⁰ Indicator variables for age (18 to 24, 25 to 34, 35 to 44, 45 to 54, 55 to 64, ≥ 65 years), race (White, Black), marital status (married, unmarried), and education (less than high school, high school, greater than high school) were used to provide estimates of the prevalence odds for people in various categories relative to those in a reference category after adjustment for other variables.^{9,11}

Results

The overall median number of daily servings of all fruits and vegetables was 3.5. Intake was somewhat higher for women (3.7 servings) than for men (3.3 servings) (Table 1). State-specific medians ranged from 3.1 (Illinois) to 3.8 (New

York). There was little seasonal variation in total intake; medians ranged from 3.4 in October to 3.6 in May and July (data not shown). Overall, 20.2% of the total population reported consuming five or more fruits and vegetables each day. A higher proportion of women than men reported consuming five or more fruits or vegetables per day (22.6% vs 17.5%); the state-specific prevalences ranged from 15.6% (Idaho and North Dakota) to 24.2% (Hawaii).

Frequencies of consumption varied among the six fruit and vegetable items (Table 2). For men, median daily consumption was highest for vegetables other than green salad, carrots, and potatoes. Women were somewhat more likely than men to consume fruit. Median fruit and vegetable intake increased with age and education and was somewhat higher in Whites than in Blacks (Table 3). Among men, intake was somewhat higher in those who were married. Among both sexes, the adjusted odds of eating five or more fruits and vegetables per day were less clearly related to race and marital status. The adjusted odds increased with age and education, although some of the confidence intervals overlapped.

Discussion

It is somewhat difficult to compare findings among studies because investigators have used many different methods to

collect and analyze dietary data. However, our observation that the median intake was 3.5 servings per day and that only about one in five US adults is consuming the minimum recommended number of fruits and vegetables is consistent with results of previous studies.¹²⁻¹⁴ Patterson et al. examined 24-hour-recall data from the second National Health and Nutrition Survey (1976 to 1980) and found that, on any given day, US mean intakes of fruit and vegetables (including french fries) were 1.1 and 1.8 servings, respectively.¹² Only 9% of adults 19 to 74 years of age consumed 3 or more servings of vegetables and 2 or more servings of fruits or fruit juices. However, 19% consumed any combination of 5 or more fruits and vegetables (B. H. Patterson, written communication, November 1993). Using food record data from the 1985 Continuing Survey of Food Intake among Individuals for US women 19 to 50 years of age, Cleveland et al. found that the mean daily frequency of intake was 2.9: 0.7 for fruits and 2.2 for vegetables (including french fries and mixtures).¹³ The 1991 five-a-day for better health baseline study, a telephone food frequency survey of US adults, indicated that the median number of daily servings of fruits and vegetables (not including french fries) was 3.4 and that only 23% of adults consumed 5 or more servings.¹⁴

In the current study, higher intakes were reported in New York, Tennessee,

TABLE 2—Frequency of Consumption of Specific Fruits and Vegetables, by Sex: Behavioral Risk Factor Surveillance System, 1990

| | Less than Once per Month or Never, % | 1–3 Times per Month, % | 1–2 Times per Week, % | 3–6 Times per Week, % | 1–2 Times per Day, % | 2 or More Times per Day, % | Daily Consumption, No. of Servings | |
|---------------------------|---|------------------------------|-----------------------------|-----------------------------|----------------------------|----------------------------------|---------------------------------------|--------|
| | | | | | | | Mean | Median |
| Men (n = 9977) | | | | | | | | |
| Fruit juice | 8.7 | 10.7 | 20.3 | 16.8 | 38.9 | 4.6 | 0.7 | 0.6 |
| Fruits | 4.1 | 9.8 | 24.5 | 22.2 | 33.8 | 5.5 | 0.7 | 0.6 |
| Green salad | 5.7 | 10.2 | 30.9 | 33.5 | 18.4 | 1.2 | 0.5 | 0.4 |
| Potatoes, not fried | 3.7 | 14.1 | 45.5 | 28.6 | 7.3 | 0.7 | 0.3 | 0.3 |
| Carrots | 15.1 | 28.1 | 37.0 | 13.9 | 5.3 | 0.5 | 0.2 | 0.1 |
| Other vegetables | 1.2 | 1.9 | 11.2 | 19.5 | 45.4 | 20.7 | 1.1 | 1.0 |
| Women (n = 13 722) | | | | | | | | |
| Fruit juice | 9.8 | 9.0 | 17.0 | 15.2 | 44.0 | 5.0 | 0.7 | 0.7 |
| Fruits | 2.8 | 6.0 | 16.7 | 20.4 | 43.9 | 10.2 | 0.8 | 1.0 |
| Green salad | 5.1 | 7.6 | 26.3 | 35.6 | 23.9 | 1.5 | 0.5 | 0.4 |
| Potatoes, not fried | 4.1 | 14.6 | 44.7 | 28.8 | 7.5 | 0.4 | 0.3 | 0.3 |
| Carrots | 13.1 | 23.3 | 36.4 | 18.4 | 8.3 | 0.6 | 0.3 | 0.1 |
| Other vegetables | 1.0 | 1.1 | 8.0 | 14.7 | 48.8 | 26.4 | 1.2 | 1.0 |

TABLE 3—Daily Consumption of Fruits and Vegetables, by Sociodemographic Characteristics: Behavioral Risk Factor Surveillance System, 1990

| | Men | | | Women | | |
|---------------------------|--|----------------------------------|----------------------------------|--|----------------------------------|----------------------------------|
| | Median Servings (Half Width of 95% CI) | Five or More Servings per Day | | Median Servings (Half Width of 95% CI) | Five or More Servings per Day | |
| | | % | Odds Ratio ^a (95% CI) | | % | Odds Ratio ^a (95% CI) |
| Age, y | | | | | | |
| 18–24 | 2.8 (0.17) | 13.8 | 1.0 Referent | 3.0 (0.20) | 14.1 | 1.0 Referent |
| 25–34 | 3.0 (0.12) | 14.2 | 0.91 (0.63, 1.33) | 3.4 (0.12) | 17.4 | 1.12 (0.82, 1.53) |
| 35–44 | 3.3 (0.14) | 14.7 | 0.93 (0.64, 1.35) | 3.6 (0.11) | 20.6 | 1.35 (0.99, 1.85) |
| 45–54 | 3.5 (0.14) | 19.7 | 1.3 (0.91, 2.00) | 3.8 (0.13) | 23.2 | 1.72 (1.23, 2.39) |
| 55–64 | 3.5 (0.22) | 17.9 | 1.3 (0.83, 1.90) | 4.1 (0.18) | 26.6 | 2.23 (1.56, 3.17) |
| 65+ | 4.0 (0.14) | 24.0 | 2.0 (1.33, 2.92) | 4.2 (0.12) | 28.9 | 2.72 (1.99, 3.72) |
| Race | | | | | | |
| White | 3.3 (0.08) | 16.9 | 1.0 Referent | 3.7 (0.06) | 21.9 | 1.0 Referent |
| Black | 3.0 (0.22) | 14.4 | 0.91 (0.65, 1.28) | 3.5 (0.18) | 17.2 | 0.89 (0.69, 1.14) |
| Education | | | | | | |
| Less than high school | 3.0 (0.18) | 15.1 | 1.0 Referent | 3.5 (0.14) | 17.4 | 1.0 Referent |
| High school | 3.2 (0.12) | 14.4 | 1.14 (0.83, 1.56) | 3.6 (0.10) | 18.2 | 1.31 (1.04, 1.66) |
| Some college ^b | 3.3 (0.14) | 14.8 | 1.20 (0.84, 1.70) | 3.6 (0.10) | 22.5 | 1.90 (1.47, 2.45) |
| College graduate | 3.6 (0.12) | 21.6 | 1.90 (1.36, 2.65) | 4.0 (0.16) | 27.8 | 2.46 (1.90, 3.17) |
| Marital status | | | | | | |
| Married | 3.4 (0.08) | 17.3 | 1.0 Referent | 3.7 (0.08) | 22.4 | 1.0 Referent |
| Not married | 3.1 (0.12) | 15.6 | 1.00 (0.90, 1.10) | 3.6 (0.08) | 20.0 | 0.87 (0.74, 1.02) |

^aOdds of consuming 5 or more servings per day among people with given sociodemographic characteristics, adjusted for age, race, education, and marital status (when appropriate).

^bIncludes technical school.

and several western states, and lower intakes were reported in Illinois, Idaho, and North Dakota. The US Department of Agriculture¹⁵ has reported that fruit and vegetable intakes are lowest in the South and highest in the West, with variation due primarily to fruit consumption. Because only 16 states were included

in our study, however, meaningful regional comparisons are not possible. Our findings that fruit and vegetable intake were higher in women than men, increased with both age and education, and were only slightly different in Blacks and Whites are consistent with results of other studies.^{12–14}

The limitations of this study include those inherent in any study involving self-reported data. Also, the BRFSS does not include institutionalized people or those living in households without telephones. Our cooperation rate of 82% is of concern because diets of nonresponders may differ from those of responders.

Several dietary assessment issues must be considered in the interpretation of our results. Estimates of nutrient or food intake vary by method of assessment. Detailed food frequency methods tend to produce higher estimates of food intake than do food records or recalls.¹⁶ A longer food frequency list may therefore lead to higher estimates than do shorter lists.¹⁷ Food records and recalls, however, may underestimate intake.¹⁸ The BRFSS instrument, a short food frequency questionnaire, assumes that only one serving is consumed at each occasion for all food items except "other vegetables." As mentioned earlier, the BRFSS questionnaire has produced estimates of daily servings similar to those of multiple records and recalls but lower than those of extensive food frequency questionnaires.⁴ Although respondents may define fruits and vegetables differently, previous research has shown that the magnitude of the correspondence between the BRFSS estimates and reference methods does not vary consistently by age, sex, or education.⁴

In this population-based study of US adults from 16 states, only about one in five adults reported intake of five or more fruits and vegetables per day. The five-a-day for better health baseline study showed that, although awareness of the "5-a-day" recommendation was strongly associated with higher consumption,¹⁴ only 8% of the population was aware of this recommendation. More effective means of educating the population and providing environmental and institutional support to encourage increased consumption of fruits and vegetables are needed if we are to achieve this year 2000 goal.

Special efforts may be needed to increase intake among younger adults and those who are less educated. □

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