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Fruit and vegetable consumption and food values: National patterns in the United States by Supplemental Nutrition Assistance Program eligibility and cooking frequency

Julia A. Wolfson, MPP¹ and Sara N. Bleich, PhD¹

¹Department of Health Policy and Management, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD

Abstract

Background—More frequent cooking at home may help improve diet quality and be associated with food values, particularly for individuals participating in the Supplemental Nutrition Assistance Program (SNAP).

Objective—To examine patterns of fruit and vegetable consumption and food values among adults (aged 20 and older) in the United States, by SNAP participation and household cooking frequency.

Methods—Analysis of cross-sectional 24-hour dietary recall data obtained from the National Health and Nutrition Examination Survey 2007-2010 (N=9,560).

Results—A lower percentage of SNAP participants consumed fruit (total: 35% vs. 46%, $p=0.001$; fresh: 30% vs. 41%, $p<0.001$) and vegetables (total: 49% vs. 58%, $p=0.004$; fresh: 35% vs. 47%, $p<0.001$) than those ineligible for SNAP. Among SNAP participants, cooking > 6 times/week was associated with greater vegetable consumption compared to cooking < 2 times/week (175 grams vs. 98 grams, $p=0.003$). SNAP-eligible individuals who cooked 2 times/week were more to report price (medium cookers: 47% vs. 33%, $p=0.001$; high cookers: 52% vs. 40%, $p<0.001$), ease of preparation (medium cookers: 36% vs. 28%, $p=0.002$; high cookers: 36% vs. 24%, $p<0.001$) and how long food keeps (medium cookers: 57% vs. 45%, $p<0.001$; high cookers: 61% vs. 50%, $p<0.001$) as important compared to SNAP-ineligible individuals.

Conclusions—Fruit and vegetable consumption in the United States is low regardless of cooking frequency. Efforts to improve diet quality should consider values on which food purchases are based.

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Corresponding Author (will also handle requests for re-prints): Julia A Wolfson, MPP Department of Health Policy and Management Bloomberg School of Public Health, Johns Hopkins University 624 N. Broadway, Room 592 Baltimore, MD 21205 Tel: 213-359-2915 Fax: 410-614-9046 jwolfso7@jhu.edu.

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INTRODUCTION

In response to persistently high rates of obesity and associated weight-related diseases,¹⁻³ particularly among low-income populations,⁴ the potential for home cooking to improve diet quality is attracting increasing interest in the United States.⁵⁻¹¹ Foods consumed at home and greater cooking frequency are, on average, associated with better diet quality.¹²⁻¹⁴ Although Americans spend less time cooking than in the past,^{10, 15-17} across all income groups people report cooking frequently (5 times/week).¹³

The Supplemental Nutrition Assistance Program (SNAP) provided more than \$75 billion in benefits to approximately 47 million Americans in 2013.¹⁸ As SNAP transitioned from a primary focus on reducing hunger and food insecurity, funding for SNAP education (SNAP-Ed), SNAP's obesity prevention and nutrition education initiative, increased from \$661 thousand when it began in 1992 to \$379 million in 2010.¹⁹ SNAP-Ed aims to help participants make healthy food choices within their limited budget, including increasing fresh fruits and vegetable consumption, a key goal of the *Dietary Guidelines for Americans*.^{20, 21} Encouraging home cooking is a key strategy for achieving this goal, and in addition to other program activities, SNAP-Ed catalogues budget friendly recipes targeted to participants on their website.²² Findings regarding the relationship between SNAP participation and diet quality are mixed; some evidence indicates that SNAP participation improves diet quality,^{23, 24} and increases fruit and vegetable consumption²³ whereas other studies show the opposite.²⁵⁻²⁷

Numerous interventions focus on increasing access to fruits and vegetables, and promoting healthy eating through educational programs including cooking classes.^{6, 28-39} These programs often target low-income Americans who typically consume fewer fruits and vegetables. However, all Americans, regardless of income, do not consume the recommended daily servings of fruits and vegetables.^{27, 40-43} Prior research indicates that cooking frequency, complexity, and confidence are associated with increased fruit and vegetable consumption.⁴⁴⁻⁴⁶ In contrast, other evidence suggests that more time spent cooking is not associated with increased vegetable consumption.⁹

Food values (beliefs which motivate food selections) may, in turn, influence the decision to cook. The values which shape food choices (taste, price, convenience, quality, nutrition)^{47, 48} are similar to commonly cited barriers to healthy home cooking – time, price, convenience and cooking knowledge/skills and confidence.⁴⁹⁻⁵¹ Evidence about whether individual values related to food purchasing differ by cooking frequency is missing from the literature.

The primary purpose of this descriptive study is to examine patterns of fruit and vegetable consumption among U.S. adults by SNAP status and cooking frequency. We additionally describe differences in food purchase values by SNAP status and cooking frequency. The key contributions of this study are updating prior estimates of fruit and vegetable consumption by SNAP status and examination of whether this relationship is modified by cooking frequency. A better understanding in this area may identify modifiable behavioral

targets to increase the frequency of cooking at home, particularly among low-income Americans who are eligible for SNAP.

METHODS

Data and design

Data was obtained by combining two waves of data collection (2007-2008 and 2009-2010) from the National Health and Nutrition Examination Survey (NHANES). The NHANES is a cross-sectional, nationally representative, population-based survey designed to collect information on the health status, nutritional intake and health-related behaviors of the U.S. population. Participants are selected based on a multi-stage, clustered, probability sampling strategy.⁵² A complete description of data-collection procedures and analytic guidelines are available elsewhere (www.cdc.gov/nchs/nhanes.htm). Analysis was restricted to data from 2007-2010 based on the availability of key variables of interest.

Study Sample

The study sample included adults aged 20 and older with complete and reliable single 24-hour dietary recalls (as determined by the NHANES staff). Survey respondents were excluded if they were pregnant or had diabetes at the time of data collection (N=1,491) due to differences in dietary requirements for these groups compared to the general population. We also excluded individuals from analysis who lacked complete information on the key independent variables of interest (defined in detail below): nine individuals who responded with a cooking frequency greater than 7 days, 112 individuals with missing values for cooking frequency, and nine individuals with missing information on SNAP status were excluded from analysis. Missingness for both cooking frequency and SNAP status represented 0.01% of the total sample. The final analytic sample included 9,560 adults all of whom had complete cooking frequency, SNAP status and dietary recall data.

Measures

Cooking Frequency Status—Cooking frequency was assessed by the survey question, “During the past seven days, how many times did you or someone else in your family cook food for dinner or supper at home?” Household cooking frequency was categorized into three groups based on the definition in the existing literature:^{11, 13} low (0 to 1 times, N=802), medium (2 to 5 times, N=3,704) and high (6 to 7 times, N=5,063).

SNAP Status—SNAP eligibility is determined by having a household income \leq 130% of the federal poverty level (FPL) and \$2000 in countable assets.⁵³ Consistent with prior literature, SNAP status was defined three ways based on self-reported SNAP participation and self-reported household income: 1) receiving SNAP; 2) income-eligible but not receiving SNAP; and 3) income-ineligible for SNAP.⁵⁴

Fruit and Vegetable Consumption—Fruits and vegetables were defined two ways; 1) total fruits/vegetables including raw, fresh, frozen, canned, dried and pickled, 2) fresh fruits/vegetables including only raw or cooked from raw. White potatoes and sauces (e.g. tomato sauce) were excluded from the vegetable category. White potatoes and tomato sauce

comprise almost half of average daily vegetable consumption in the U.S.⁴² Potatoes and tomato sauce are associated with higher intake of sodium and total calories.⁴² By excluding potatoes and tomato sauce from our analysis we restrict our vegetable category to other vegetables associated with higher fiber and low caloric intake, the increased consumption of which is recommended by the *Dietary Guidelines for Americans*.²¹ For complete fruit and vegetable definitions see Appendix A.

Food Purchase Values—Food purchase values were based on responses to questions assessing the importance of several domains (price, nutrition, taste, ease of food preparation, how well food keeps) related to food purchasing. Thus, food purchase values refer to how important the above are to individuals when making decisions about what food to purchase. Response categories to these survey questions were very important, somewhat important, not too important, or not at all important. Food purchase values were dichotomized as very important vs. otherwise based on the cut points in the data. Twenty percent of individuals in the dataset were excluded from the analysis due to missing information for all food values. The outcomes of fruit and vegetable consumption (percent of people consuming and volume of consumption) did not differ systematically between individuals with complete food values data and those without with the exception of the percent of people consuming total fruit (which was higher in the group with complete information on food values, $p=0.01$).

Socioeconomic and Demographic Study Covariates—Covariates for this analysis included gender, race/ethnicity (non-Hispanic white, non-Hispanic Black, Hispanic, other), age (20-44, 45-64, 65), education (<high school, high school or GED, >high school), marital status (married, not currently married), employment status (not employed, part time (1-34 hours), and full time (>35 hours)), country of birth (US born, born in another country), household size, (1-3 person household, 4 person household) and household food security. Household food security is measured in NHANES via an 18-question questionnaire and then categorized (by the NHANES staff) based on those measures into four categories: full, marginal, low and very low food security.⁵⁵ For this analysis, the low and very low categories were collapsed based on cut points in the data.

Analysis

All analyses used appropriate survey weights to account for the unequal probability of being selected due to the complex sampling strategy employed by NHANES, non-response or incomplete dietary recall data and whether the dietary recall was recorded on a weekend or weekday. The “svyset” and “svy” STATA commands were used to adjust for weights, primary sampling units and strata in order to account for the complex survey design. Analyses were performed using STATA, version 12 (StataCorp, L.P. College Station, TX). Multivariate logistic models, adjusted for the covariates described above, were used to estimate the relationship between SNAP status and the probability of consuming any fruits and vegetables (total or fresh). Next, an interaction term between cooking frequency and SNAP status was added to see if cooking frequency modifies the probability of consuming fruits or vegetables. Generalized linear models including the interaction between SNAP status and cooking frequency and covariates described above were then used to examine the

relationship between household cooking frequency, SNAP status and volume of fruit and vegetable consumption (among consumers).

Finally, SNAP participants and income eligible non-participants were combined into one category to compare SNAP eligible (<130% FPL) and SNAP ineligible (>130% FPL) individuals. Multivariate logistic models including an interaction term between cooking frequency and SNAP eligibility were estimated with the food values as outcomes measures. All covariates were included based on prior literature, regardless of significance.^{11, 44} We additionally replicated the above analyses with pregnant women and individuals with diabetes included in the sample. Significance of all differences between groups was considered at $p<0.05$, and all tests were two-sided. Tables and figures report predicted probabilities or predicted means based on the adjusted models.

RESULTS

Table 1 presents the characteristics of the study sample overall and by SNAP participation status. Among American adults 20 years or older in 2007-2010, 9 percent received SNAP benefits, 11 percent were eligible to participate in SNAP but did not, and 80 percent were ineligible to participate in SNAP. Nine percent of SNAP participants, 11 percent of eligible non-participants and 7 percent of ineligible non-participants cooked dinner 0-1 times/week. Two-thirds (62%) of SNAP participants cooked dinner 6-7 times/week compared with 46 percent of ineligible non-participants. SNAP participants were more likely to be female, younger, and were more likely to be from households with four or more members.

Table 2 presents the predicted percent of adults who consume any fruits and vegetables by SNAP status. Compared to those ineligible for SNAP, fewer SNAP participants consumed fruit (total: 35% vs. 46%, $p=0.001$; fresh: 30% vs. 41%, $p<0.001$) and vegetables (total: 49% vs. 58%, $p=0.001$; fresh: 35% vs. 47%, $p<0.001$). SNAP participants were also less likely to consume fruits (total: 35% vs. 41%, $p=0.03$; fresh: 30% vs. 36%, $p=0.04$) and vegetables (total: 49% vs. 55%, $p=0.04$; fresh: 35% vs. 44%, $p=0.004$) than income eligible non-participants. Eligible non-participants were less likely to consume fruit (total: 41% vs. 46%, $p=0.03$; fresh: 36% vs. 41%, $p=0.04$) than ineligible non-participants.

The predicted percent of adults who consume fresh vegetables by household cooking frequency and SNAP status is presented in **Figure 1**. Among medium (37% vs. 47%, $p=0.02$) and high (35% vs. 47%, $p=0.001$) cooking frequency households, SNAP participants were less likely to consume fresh vegetables than those ineligible for SNAP. Among eligible non-participants, medium household cooking frequency was associated with greater probability of fresh vegetable consumption than high cooking frequency (49% vs. 40%, $p=0.04$).

Table 3 reports the volume of fruit and vegetable consumption (among those who consumed any fruits or vegetables) by SNAP and cooking status. There were few notable differences in total or fresh fruit consumption by SNAP status or household cooking frequency. Compared to low cooking frequency, high cooking frequency was associated with greater consumption of vegetables among SNAP participants (175 grams vs. 98 grams, $p=0.003$). Among

income-ineligible non-participants, high household cooking frequency was associated with greater consumption of total vegetables compared to low cooking frequency (163 grams vs. 124 grams, $p=0.001$) and medium cooking frequency households (163 grams vs. 142 grams, $p=0.02$).

High household cooking frequency was also associated greater consumption of fresh vegetables than individuals living in low (112 grams vs. 84 grams, $p=0.01$) and medium (112 grams vs. 99 grams, $p=0.02$) cooking frequency households among income-ineligible non-participants. Among households with high cooking frequency, income eligible non-participants consumed less total vegetables than SNAP participants (143 grams vs. 175 grams, $p=0.05$) and ineligible non-participants consumed more fresh vegetables than SNAP participants (112 grams vs. 80 grams, $p=0.001$) and income eligible non-participants (112 grams vs. 91 grams, $p=0.02$) among households that cooked with high frequency.

Figure 2 reports the predicted percentage of adults who consider price, nutrition, taste, ease of preparation and how long food keeps as being very important when making food decisions by cooking frequency and SNAP eligibility. Here, SNAP participants and income eligible non-participants have been combined to form one “SNAP eligible” category. Among all groups, 75-78% reported taste as being very important. Compared to SNAP ineligible individuals, price was more important to SNAP eligible individuals in medium (47% vs. 33%, $p=0.001$) and high (52% vs. 40%, $p<0.001$) cooking frequency households. Increased cooking frequency was associated with greater importance placed on nutrition among SNAP eligible (low vs. high cooking frequency: 55% vs. 65%, $p=0.05$) and SNAP ineligible (medium vs. high cooking frequency: 53% vs. 63%, $p<0.001$) individuals. SNAP eligible individuals also placed greater importance on ease of preparation (medium cookers: 36% vs. 28%, $p=0.002$; high cookers: 36% vs. 24%, $p<0.001$) and how long food keeps (medium cookers: 57% vs. 45%, $p<0.001$; high cookers: 61% vs. 50%, $p<0.001$) compared to SNAP ineligible individuals.

In separate analyses we re-estimated the above analyses with pregnant women and diabetics included in the sample ($N=11,028$). The results described above were robust, and yielded results that were substantively similar to the results presented above. These analyses are available upon request.

DISCUSSION

This study examined fruit and vegetable consumption and food values among American adults, by SNAP status and cooking frequency. SNAP participants were least likely to consume any fruits or vegetables compared to those not participating in the program, regardless of cooking frequency. Frequent cooking (>6 times/week) was associated with increased volume of consumption of fresh vegetables only among those ineligible for SNAP.

Consistent with prior literature, this study shows that regardless of SNAP participation status, Americans are not consuming the recommended amount of fruits and vegetables,^{21, 27, 43} and that lower-income and SNAP participation are associated with lower fruit and vegetable consumption.^{25, 26, 40, 41} The study findings are also consistent with prior

studies showing that the positive correlation between home cooking and diet quality is not as strong or consistent among lower-income, SNAP eligible individuals as in higher-income populations.^{45, 56}

While fruit and vegetable consumption is low overall, these results show few differences by SNAP status suggesting that income may not be a primary barrier to produce consumption. Rather, our examination of values influencing food purchase decisions, like prior research, suggests that price, perishability, and ease of preparation are particularly important to those eligible for SNAP.⁴⁸ Therefore, the identification of strategies to increase fruit and vegetable consumption, particularly among Americans eligible for the SNAP program, should consider a reduced emphasis on ‘fresh’ –commonly promoted in programs such as the *Let's Move* campaign among others^{47, 60, 61} – and an increased emphasis on non-fresh alternatives (e.g., canned, frozen, dried) as they may be less expensive, easier to use, and be less perishable.

SNAP should consider exploring policy changes to incentivize healthy home cooking among participants. For example, SNAP benefits can currently be used at farmer's markets and, in some states may be doubled when used for fresh, locally grown fruits and vegetables.⁵⁷ Applying these incentives to non-fresh alternatives at supermarkets (e.g., frozen) may help to increase produce use in household cooking. The SNAP benefit structure could be modified so that the Thrifty Food Plan includes alternative fruits and vegetables requiring less time and preparation. SNAP-Ed could expand to teach comprehensive cooking skills education including how to navigate the grocery store, budgeting, meal planning, safe storage, and quick and easy cooking techniques.

The present study has several limitations. First, the data are cross-sectional, so associations but not causal inferences can be made. The reliance on self-reported data for the single 24-hour dietary recall may introduce bias due to underreporting and unreliability resulting from recall and social desirability bias. Furthermore, single 24-hour dietary recalls are reliable on a group level, not on an individual level. The analysis of the association between food values, cooking frequency and SNAP eligibility could have been subject to self selection bias as there were some statistically significant differences along many of the study covariates between the approximately 80% of the study sample with complete food values data and the approximately 20% of the sample excluded from that analysis due to missing food values data. Fruit and vegetable consumption may be underestimated due to our relatively conservative categorization fruits and vegetables. In addition, SNAP participation is underestimated in the NHANES compared to USDA national estimates, which also could have biased our results towards the null. The cooking measure only reports frequency of cooking dinner; the frequency of cooking other meals and whether the fruits and vegetables consumed were cooked at home is unknowable due to limitations of the data. And, importantly, the interpretation of cooking could vary widely across the study population.⁵⁸ Finally, the associations observed between SNAP participation and fruit and vegetable consumption (as well as the importance of food values) may be biased towards the null due to self-selection into the SNAP program. Specifically, SNAP participants and non-participants may differ by unobserved characteristics that are also related to their fruit and vegetable consumption and cooking habits.⁵⁹ SNAP participants are often worse off than

non-participants with regard to financial and nutritional need,⁶⁰ and SNAP participation has previously been found to be associated with greater food insecurity and worse diet quality.^{61, 62}

CONCLUSION

In conclusion, Americans consume far fewer fruits and vegetables than recommended. Consumption of fresh produce is especially low among SNAP participants, regardless of cooking frequency. Among higher-income populations, greater cooking frequency is associated with increased consumption of total and fresh vegetables. Low-income populations eligible for SNAP consider price, ease of preparation and perishability of food items as very important to their food purchase decisions. Efforts to shift the balance from consumption of foods away from home to more home cooked meals and increased produce consumption should consider the contexts and constraints in which food choices take place.

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JAW conceived of the study and developed the hypotheses. JAW performed the statistical analysis. JAW and SNB contributed to the interpretation of the study findings. JAW drafted the manuscript and both authors contributed to the final draft. JAW had full access to all the data and takes responsibility for the integrity of the data and the accuracy of the analysis. The authors gratefully acknowledge the work of Seanna Vine, MPH in compiling the data set.

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APPENDIX A

Total Fruit

Includes raw, fresh, frozen, canned, in syrup, dried (w or w/out sugar), chips, apple sauce, sweetened, pickled, spiced, juice packed. Juice, pie-filling, fried, battered, maraschino cherries, fruit in other dishes (e.g. ambrosia, relish, fruit salads. fruit cocktails) are not included.

Fresh Fruit

Fruits included above with fresh or raw in the description.

Total Vegetables

Includes raw, cooked (w or w/out added fat), fresh/frozen/raw/canned, salads with no dressing or cheese, dried/dehydrated, peas, olives, corn, pickled. The NHANES category of starchy vegetables (white potatoes, cassava), chips, anything with sauce, cheese or dressing, candied, casserole, battered, fried, soup, juice, stuffed, scalloped, creamed, soufflé, yeast, fritters, anything with meat, pasta or egg, catsup, salsa, aspic are not included.

Fresh Vegetables

Anything included above with the words raw, cooked from fresh (w or w/out fat added), or stewed from fresh.

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Highlights

- We analyzed NHANES data on fruit and vegetable consumption and food values in the US.
- Fewer SNAP participants consumed fruit and vegetables than non-participants.
- Higher cooking frequency is associated with greater vegetable consumption.
- How long food keeps and ease of preparation are important for low-income individuals.
- SNAP participants consume little fresh produce regardless of cooking frequency.

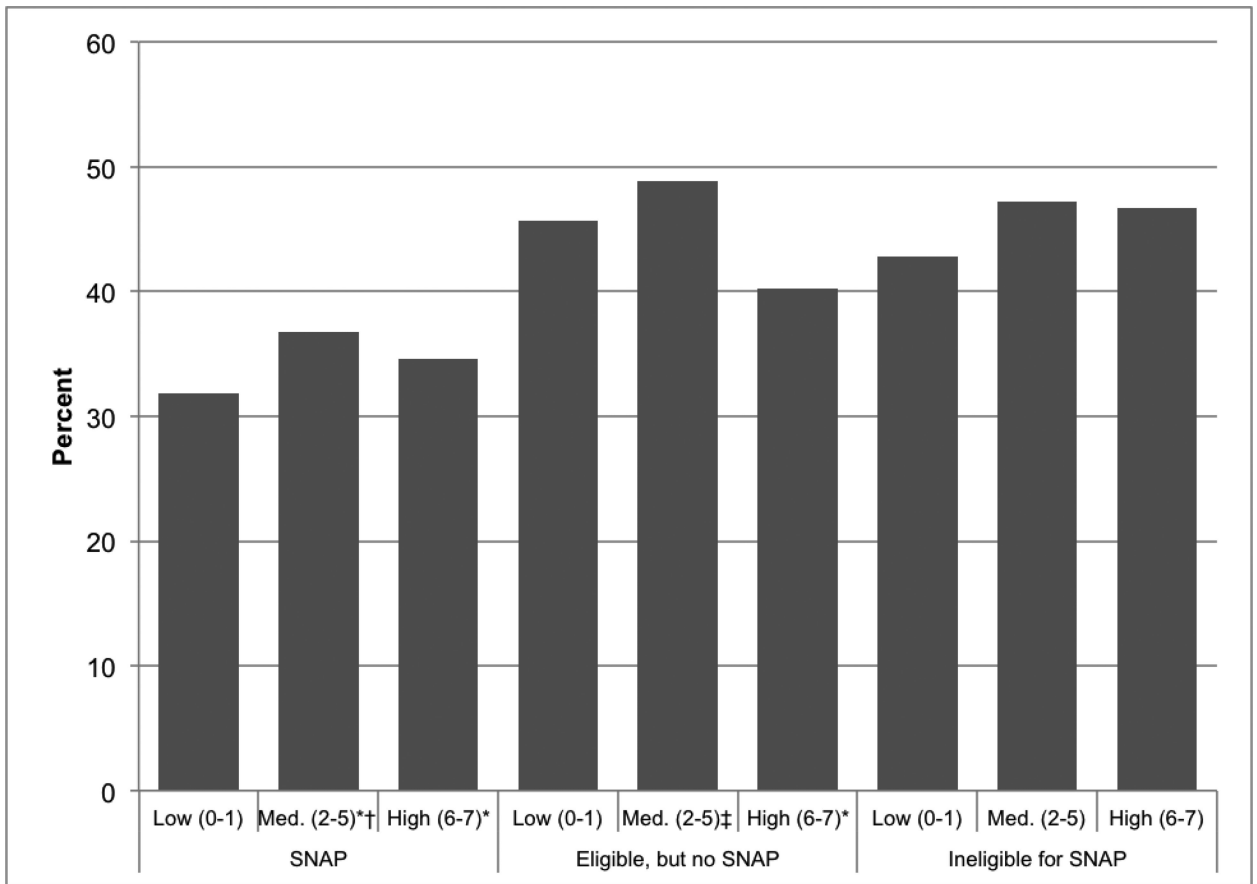


FIGURE 1.

Predicted percent of adults who consume fresh vegetables^a by household cooking frequency^b and SNAP participation status, NHANES 2007-2010.

Note: Multivariate regression was used to adjust for age, sex, race/ethnicity, marital status, employment status, if born in the US, household size, and household food security.

^a “Fresh vegetables includes *only* raw or cooked from raw vegetables (excluding white potatoes).

^b Household cooking frequency defined at days/week someone in the household cooked dinner. * Difference from those ineligible for SNAP within cooking frequency categories significant at $p < 0.05$ † Difference between SNAP participants and income eligible non-participants within cooking frequency categories significant at $p < 0.05$ ‡ Difference from high cookers within SNAP status significant at $p < 0.05$

§ Difference between low and medium cookers within SNAP status significant at $p < 0.05$

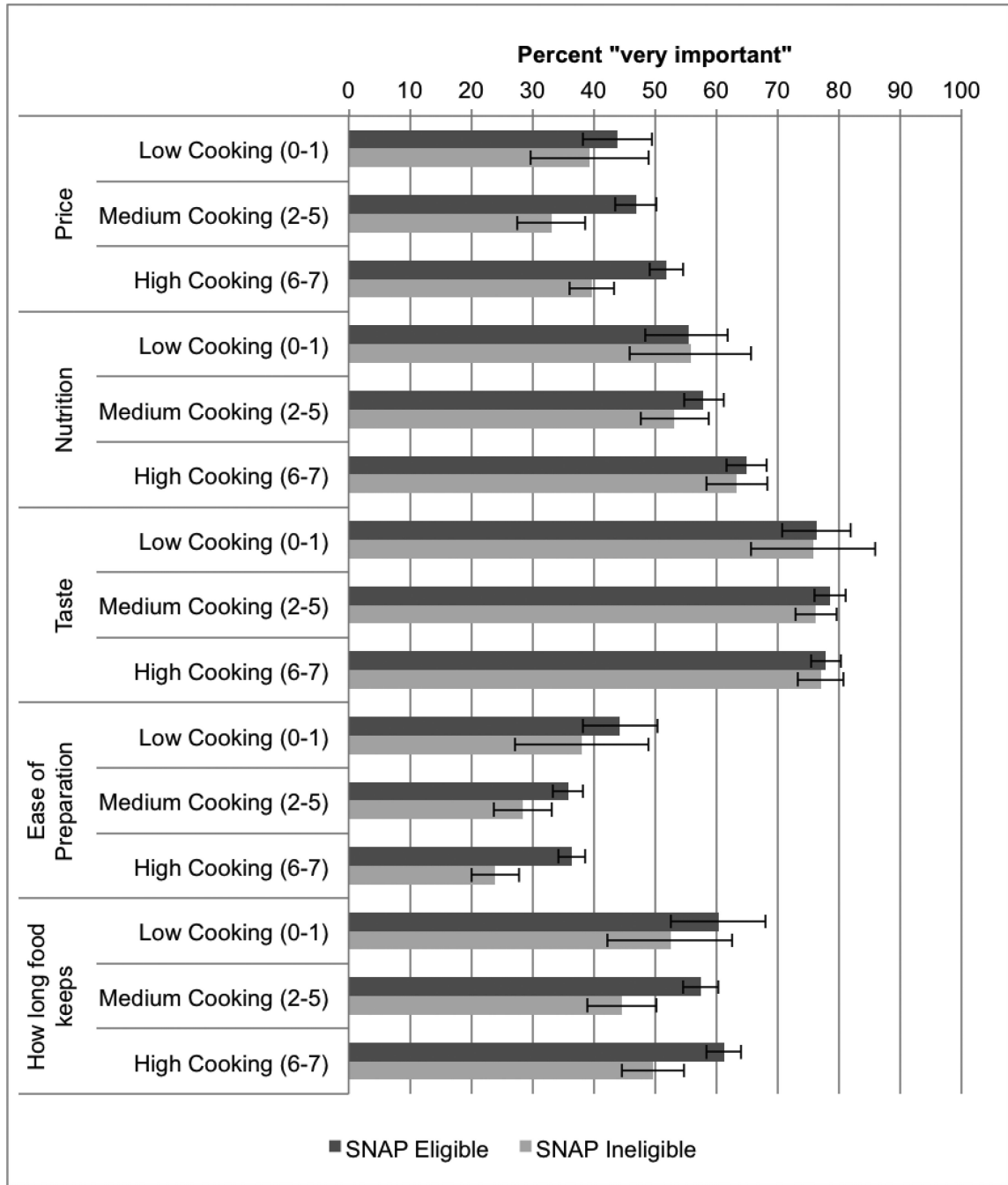


FIGURE 2. Predicted percent of adults who identify the following values as “very important” when making food purchase decisions by SNAP eligibility^a and household cooking frequency^b, NHANES 2007-2010.

Note: Multivariate regression was used to adjust for age, sex, race/ethnicity, marital status, employment status, if born in the US, household size, and household food security. Bars indicate 95% confidence intervals.

^a SNAP participants and income-eligible non-participants were combined to form one “SNAP eligible” category

^bHousehold cooking frequency defined as days/week someone in the household cooked dinner

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TABLE 1

Characteristics of US adults (aged ≥ 20 y) in the National Health and Nutrition Examination Survey (NHANES) 2007-2010¹

	TOTAL	Received SNAP	Eligible, but no SNAP	Ineligible for SNAP	P for diff
Total [n (%)]	9560 (100)	1,191 (9)	1,576 (11)	6,793 (80)	
Cooking Dinner Frequency [n (%)]					
Low (0-1 times/week)	802 (8)	86 (9)	147 (11)	569 (7)	<0.001
Medium (2-5 times/week)	3,698 (44)	352 (30)	466 (33)	2,881 (47)	
High (6-7 times/week)	5,060 (48)	753 (62)	964 (56)	3,343 (46)	
Cooking dinner frequency [mean (SE)]	5.02 (0.05)	5.43 (0.10)	5.15 (0.11)	4.96 (0.06)	<0.001
Meals not prepared at home [mean (SE)]	3.82 (0.07)	2.65 (0.15)	3.06 (0.14)	4.07 (0.07)	<0.001
Sex [n (%)]					
Female	4,855 (52)	683 (60)	814 (54)	3,358 (51)	<0.001
Male	4,705 (48)	508 (40)	762 (46)	3,435 (49)	
Race-ethnicity [n (%)]					
Non-Hispanic white	4,737 (71)	477 (49)	657 (54)	3,603 (75)	<0.001
Non-Hispanic black	1,739 (11)	264 (22)	232 (12)	1,243 (9)	
Hispanic	2,648 (13)	391 (24)	595 (27)	1,662 (10)	
Other	436 (6)	59 (5)	92 (7)	285 (6)	
Age [n (%)]					
20-44 y	4,306 (49)	716 (66)	758 (59)	2,832 (46)	<0.001
45-64 y	3,144 (36)	337 (27)	441 (24)	2,366 (38)	
65 y	2,110 (15)	138 (6)	377 (17)	1,595 (16)	
Marital status [n (%)]					
Currently married	4,971 (55)	393 (30)	632 (35)	3,946 (60)	<0.001
Not currently married	4,586 (45)	798 (70)	944 (65)	2,844 (40)	
Employment status [n (%)]					
Not employed	4,059 (37)	722 (61)	819 (50)	2,518 (32)	<0.001
Part time (1-34 hours)	1,264 (15)	155 (13)	253 (18)	856 (15)	
Full time (>35 hours)	4,016 (48)	304 (25)	473 (32)	3,239 (53)	
Country of Birth [n (%)]					
Born in the United States	7,104 (84)	871 (81)	965 (69)	5,268 (86)	<0.001
Born in another country	2,455 (16)	320 (19)	611 (31)	1,524 (14)	
Household Size [n (%)]					
1, 2 or 3 person household	5,856 (65)	544 (45)	882 (58)	4,430 (68)	<0.001
4 or greater person household	3,704 (35)	647 (55)	694 (42)	2,363 (32)	
Food Security [n (%)]					
Full food security	6,800 (79)	425 (36)	839 (57)	5,546 (87)	<0.001
Marginal food security	1,000 (8)	201 (16)	245 (13)	554 (6)	
Low/ very low food security	1,758 (13)	565 (48)	492 (30)	701 (7)	

²Healthy weight [BMI (kg/m²) 18.5-24.99], Overweight (BMI 25-29.99), Obese (BMI ≥ 30)

¹Percentage of US population estimated with survey weights to adjust for unequal probability of sampling

TABLE 2

Predicted percent of adults who consume any fruits and vegetables by SNAP participation status, NHANES 2007-2010.

	TOTAL	Received SNAP	Eligible, but no SNAP	Ineligible for SNAP
	Mean ± SEM ¹	Mean ± SEM	Mean ± SEM	Mean ± SEM
Percent Consuming Any Fruit				
Total ^a	44.5 ± 1.2	34.9 ± 2.5 [*]	40.7 ± 2.5 ^{* †}	46.1 ± 1.2
Fresh ^b	39.6 ± 1.1	29.7 ± 2.3 [*]	36.4 ± 2.3 ^{* †}	41.2 ± 1.2
Percent Consuming Any Vegetables ^c				
Total ^a	57.0 ± 1.1	49.4 ± 2.2 [*]	54.5 ± 1.8 [†]	58.2 ± 1.2
Fresh ^b	45.3 ± 1.1	35.3 ± 2.3 [*]	43.9 ± 2.2 [†]	46.6 ± 1.2

Note: Multivariate regression was used to adjust for age, sex, race/ethnicity, marital status, employment status, if born in the US, household size, and household food security; S.E.M. = standard error of the mean.

^aTotal" category includes raw, fresh, frozen, canned, dried and pickled fruits or vegetables.

^b"Fresh" category includes *only* raw or cooked from raw fruits or vegetables.

^cVegetables exclude white potatoes.

^{*}Difference from those ineligible for SNAP significant at p<0.05

[†]Difference between SNAP participants and income eligible non-participants significant at p<0.05

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TABLE 3

Predicted overall energy consumption (kcal), and fruit and vegetable consumption (grams) among adults by household cooking frequency^a and SNAP participation status (aged ≥ 20 y), NHANES 2007-2010

	ALL	Received SNAP	Eligible, but no SNAP	Ineligible for SNAP
	Mean ± SEM	Mean ± SEM	Mean ± SEM	Mean ± SEM
Grams of total fruit ^b (g/day)				
Overall	203 ± 4	201 ± 15	186 ± 12	206 ± 4
Low cooking frequency (0-1)	198 ± 11	237 ± 22 [‡]	156 ± 22 [‡]	200 ± 13
Medium cooking frequency (2-5)	194 ± 6 [‡]	207 ± 30	164 ± 8 ^{*‡}	197 ± 7
High cooking frequency (6-7)	211 ± 6	194 ± 11 [*]	207 ± 16	213 ± 5
Grams of fresh fruit ^c (g/day)				
Overall	178 ± 4	171 ± 14	167 ± 10	179 ± 5
Low cooking frequency (0-1)	175 ± 10	194 ± 33	131 ± 20 [*]	180 ± 11
Medium cooking frequency (2-5)	173 ± 6	184 ± 29	146 ± 9 ^{*‡}	176 ± 7
High cooking frequency (6-7)	181 ± 6	158 ± 12 [*]	184 ± 16	182 ± 6
Grams of total vegetables ^{b, d} (g/day)				
Overall	150 ± 4	152 ± 11	141 ± 7	151 ± 5
Low cooking frequency (0-1)	126 ± 7 [‡]	98 ± 17 [‡]	159 ± 19 [‡]	124 ± 8 [‡]
Medium cooking frequency (2-5)	141 ± 3 [‡]	133 ± 12	137 ± 10	142 ± 4 [‡]
High cooking frequency (6-7)	162 ± 7	175 ± 18	143 ± 10 [‡]	163 ± 8
Grams of fresh vegetables ^{c, d} (g/day)				
Overall	102 ± 3	86 ± 7 [*]	100 ± 6	105 ± 4
Low cooking frequency (0-1)	87 ± 9 [‡]	63 ± 21	121 ± 20	84 ± 10 [‡]
Medium cooking frequency (2-5)	100 ± 3	97 ± 14	108 ± 10	99 ± 3 [‡]
High cooking frequency (6-7)	108 ± 4	80 ± 6 [*]	91 ± 7 [*]	112 ± 5

Note: Multivariate regression was used to adjust for age, sex, race/ethnicity, marital status, employment status, if born in the US, household size, and household food security; S.E.M. = standard error of the mean.

§ Difference between low and medium cookers within SNAP status significant at p<0.05

^a Household cooking frequency defined at days/week someone in the household cooked dinner.

^b "Total" category include raw, fresh, frozen, canned, dried and pickled fruits or vegetables. Fruit and vegetable intake (all and fresh) calculated only among consumers.

^c "Fresh" category includes *only* raw or cooked from raw fruits or vegetables.

^d Vegetables exclude white potatoes.

* Difference from those ineligible for SNAP within cooking frequency categories significant at p<0.05

‡ Difference between SNAP participants and income eligible non-participants within cooking frequency categories significant at p<0.05

[‡]Difference from high cookers within SNAP status significant at $p < 0.05$

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