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Total nutrient intake, dietary nutrient intake, and dietary quality of U.S. older adults using various food assistance

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Abstract

Objectives:

This project determined and compared the dietary and total (food and dietary supplements) mean usual nutrient intake and proportion meeting recommendations, and dietary quality of U.S. older adults (≥ 60 years) who use food assistance, including the Supplemental Nutrition Assistance Program (SNAP); emergency foods; and community meals or meal delivery; and income-eligible non-participants.

Methods:

Participants ($n=2,581$) of the 2007-2016 National Health and Nutrition Examination Survey self-reported income and food assistance, dietary supplements from an in-home interview and up to two 24-hour recalls which were used in an adaptation of the National Cancer Institute method to estimate mean dietary and total usual nutrient intake, proportion meeting recommendations, and dietary quality indicated by the Healthy Eating Index-2015. *T* tests were used for all comparisons.

Results:

Usual nutrient intake among older adults using food assistance and income-eligible non-participants was low with high risk of inadequacy for over 50% of older adults from dietary sources for vitamins D, E, A, C, calcium and magnesium, and total sources for vitamin D, calcium and magnesium. SNAP participants had a higher risk of not meeting the Estimated Average Requirement for vitamin E from diet compared to other non-SNAP program participants ($P = 0.001$). Dietary quality did not align with the Dietary Guidelines for Americans, with Healthy Eating Index-2015 scores ranging from 56 to 61 out of 100; SNAP-only participants had higher dietary quality compared to multiple program participants ($P = 0.02$).

Conclusions:

Usual nutrient intakes were inadequate and dietary quality was poor among U.S. older adults eligible for food assistance. Risk for inadequacy was lower after inclusion of dietary supplements.

Executive Summary:

Recent suggested provisions in the Agricultural Improvement Act of 2018 would limit the use of Supplemental Nutrition Assistance Program (SNAP) and non-SNAP food assistance programs, consequentially limiting their contributions to dietary intakes of the growing group of qualifying older adults, such as tightening eligibility standards. Other policy proposals would allow (SNAP) benefits to be used to purchase dietary supplements such as multivitamins. Such proposals may be reintroduced in future proposals despite non-enactment. Approximately 66% of older adults over 71 years with a poverty-income-ratio (PIR) $\leq 130\%$ use supplements, representing a potentially important contribution to total *usual* nutrient intake that is often overlooked. The usual dietary intake over time, not on any one day, is linked with health. So, determining usual nutrient and dietary intake and gaps in meeting recommendations and comparisons by food assistance program use is critical to inform nutrition planning for food assistance programs (some specifically directed to older adults) and senior ability to achieve Dietary Reference Intake (DRI) recommendations. Limited information is available regarding the usual nutrient intake from diet alone, nor the total usual intake, from supplements and diet, of U.S. older adults using all types of food assistance; yet these usual intake estimates are critical to inform policy proposals regarding the current use and importance of supplements to dietary recommendation adherence. The usual intakes of older adults using these programs compared with eligible older adults are also limited but salient to inform policy decisions to improve senior health.

This project determined and compared the estimates of mean usual intake of nutrients from food, total nutrients, and dietary quality of U.S. older adults (≥ 60 years) who use food assistance, including SNAP; programs including food banks, soup kitchens, and food pantries; and community/government meals or meal delivery; and the combination of SNAP and non-SNAP programs; and income-eligible non-participants. The proportion of these groups meeting the recommendations by program are also provided to inform policy.

Data from participants ≥ 60 years of the National Health and Nutrition Examination Survey (NHANES) and What We Eat in America (WWEIA) 2007-2016 are used in this cross-sectional secondary analysis. Dietary supplement data from an in-home interview and up to two 24-hour recalls from in-person and phone interviews are used in an adaptation of the National Cancer Institute (NCI) method to estimate mean dietary and total usual nutrient intake, the proportion meeting DRIs, and dietary quality, indicated via the 2015 Healthy Eating Index (HEI-2015, a density-based score quantifying conformance to the 2015 Dietary Guidelines for Americans) with adjustment for within-person variation. Questions from the in-person interview classified food assistance participation and eligibility. Participant and household characteristics from the questionnaire were compared among food assistance participation groups using chi-square to describe their prevalence and identify potential confounders. Multiple *t* tests were used for all comparisons among food assistance participation/participant groups with a Bonferroni-corrected *P* value.

Usual dietary intake of nutrients among older adult food assistance program participants and eligible nonparticipants were low with high risk of inadequate intake for several nutrients. Specifically, when only intake from dietary sources were considered, over 90% did not meet the Estimated Average Requirement (EAR) for vitamins D and E, over 70% for calcium and magnesium and over 50% for vitamins A and C. When intake from all sources (diet and supplements) was considered, the risk of not meeting the EAR was lower for all nutrients; over 60% had intake below the EAR for magnesium and vitamin D and over 50% for calcium, while

less than 50% had intakes below the EAR for the other nutrients assessed. Older adults participating in SNAP had a higher risk of not meeting the EAR for vitamin E from dietary sources alone compared to those that participated in other non-SNAP programs ($P = 0.001$). When stratified by age, SNAP participants between 60-70 years had a higher risk of inadequate intake for vitamin E compared to eligible nonparticipants between 60-70 years from dietary sources alone. When stratified by sex, male SNAP participants had a lower vitamin D intake compared to eligible nonparticipants from all sources ($P = 0.0042$). Female SNAP-only participants had a lower intake of calcium compared to multiple program participants from all sources ($P = 0.006$).

Dietary quality among all assessed groups was poor, ranging from 56 to 61 out of a maximum total score of 100. Overall dietary quality for US older adults participating only in SNAP was higher compared to those participating in multiple programs (HEI=61 and 56 respectively, $P = 0.02$). Older adult SNAP participants had a higher dietary quality component score for total protein foods compared to other non-SNAP participants ($P = 0.0016$), indicating better adherence to the recommendations for total protein foods.

The current study was the first to determine and compare usual intake from dietary and total sources and dietary quality of older adults of various food assistance programs and eligible nonparticipants. The finding that over 50% of the group are at risk of inadequacy considering diet alone for vitamins D, E, A, and C; magnesium; and calcium and that accounting for the contributions of supplements improves these estimates but vitamin D, magnesium, calcium still result in over 50% at risk of inadequacy is new evidence of unmet dietary need for older adults who qualify for SNAP. These findings could provide novel insights into policy considerations for SNAP, provision of certain foods through food assistance for older U.S. adults, calls for actions in improving the dietary nutrient intake of low income older adults, and areas for further research on this unique, at-risk population. Future policies should focus on providing guidance, interventions and education targeting participants of food assistance programs to improve dietary intake and quality along with food security of low income seniors. Further research may expand knowledge of how this population group manages resources for food and supplements.

Introduction

The growing number of food insecure U.S. older adults (≥ 60 years)¹ rely on the food safety net that food assistance programs provide. These programs include large national programs such as the Supplemental Nutrition Assistance Program (SNAP); and smaller, often private programs such as food banks, soup kitchens, food pantries; and others specifically directed to older adults such as community/government meals or meal delivery. Recent policy proposals^{2,3}, however, would limit the use of SNAP and other of these programs. Such programs provide critical energy and nutrients that are often under-consumed⁴ among older adults at high nutritional risk⁵ that support healthy aging and disease prevention including calcium; magnesium; zinc; vitamins A, B6, B12, C, D, E; and folate. Previous studies have evaluated nutrient intakes among older U.S. adults but only a few have considered *usual* dietary intake that mitigate measurement error and reflect dietary intake over time, and no studies have considered inclusion of all of the food assistance programs described within the same sample⁶⁻¹¹. Usual intake estimates also more closely link to health rather than estimates of intake on a single day¹². Restrictions on these programs are likely to result in deficiencies of these nutrients that heighten risk of sickness and decreased life among low-income U.S. older adults along with increasing hardship and food insecurity. However, determination of the dietary impact of these restrictions is impossible without a baseline.

Dietary intake alone is not the only source of nutrients in the population. Dietary supplements represent a significant contribution to total nutrient intake, the summation of intake derived from both dietary sources and supplements⁵. U.S. older adults, apart from pregnant women, are the most prevalent consumers of dietary supplements¹³. Approximately 75% of all older adults over 71 years use supplements, representing an important contribution to total nutrient intake that is often overlooked¹³. Supplements are a financial expense that may represent a barrier for low-income groups who generally use supplements less prevalently, however, most older adults with a poverty-income-ratio $\leq 130\%$ also use supplements at a rate of 66% for those over 71 years¹³. Our previous research has also shown that approximately 4% to 64% of nutrient intake from food insecure adults ≥ 19 years is contributed by supplements⁵. Estimates are expected to be even greater among food insecure older adults compared with those of younger ages because of the more prevalent use in this age group. Yet, supplement contributions to nutrient intakes among U.S. older adults remain unknown.

Dietary supplements are known to contribute to total nutrient intake but their independent links to health are less established compared with the dietary contributions from foods and dietary supplements are also not regulated in a way that guarantees efficacy. The U.S. population is encouraged to meet their nutrient needs through dietary sources as per the U.S. Dietary Guidelines for Americans¹⁴. Recent provisions to the Farm Bill such as H.R. 2-Agriculture Improvement Act of 2018, would allow SNAP benefits to be used to purchase dietary supplements such as multivitamins^{15,16}. Such a policy may divert limited food resources to supplements and away from dietary nutrient sources that also fill energy needs. Yet, critical information on usual nutrient intake from diet, diet and supplements, and dietary quality, by program, multiple program use and eligibility among older low-income U.S. adults to inform policy are currently missing. The proportion of low-income older adults meeting Dietary Reference Intake (DRI) recommendations is also critical to inform programs and policies. Thus, the objectives for this project are: 1) characterize the prevalence of various food assistance

programs use, joint use, and income eligibility (poverty-income-ratio (PIR) ≥ 1.3) but non-use among U.S. older adults and the personal and household characteristics associated with program use including household/adult food security, mean *usual* intake and proportion meeting the DRI recommendations for nutrients from diet and from diet and supplements (total nutrients) and dietary quality using the Healthy Eating Index (HEI)-2015 and 2) determine and compare the relationship of various food assistance program participation, joint participation, or no participation in food assistance programs to dietary quality, usual nutrient intake from diet and total nutrient intake. The following specific comparisons were made: a. SNAP participants vs. income-eligible nonparticipants (could participate in other programs but not SNAP), b. SNAP-only participants vs. multiple-program participants (could include SNAP), c. SNAP participants vs. other program participants (but not SNAP).

Research Methods

Study Design and Survey Measures Collected

This cross-sectional study was a secondary analysis of older adults ≥ 60 years from the National Health and Nutrition Examination Survey (NHANES) 2007-2016. The NHANES is a nationally representative, continuous survey of the non-institutionalized civilian U.S. population using a complex, stratified, multistage probability sampling design¹⁷. Data were collected in three phases. First, an in-person household interview was completed to collect socio-demographic information (sex, age category (60-70 years, ≥ 71 years), race and Hispanic origin, educational attainment, household income), food security (secure, low and very low household and adult food security status over the past 12 months using the U.S. Household Food Security Survey Module where affirmative indications of not having enough resources for the types or amount of food desired are tallied for a total score within ranges indicating food insecurity for adults or households), and food assistance use information (SNAP in the last 12 months; received emergency food from church, food pantry, food bank or soup kitchen in the last 12 months; used community/government meal delivery or meals at senior center in last 12 months), and dietary supplement use in the previous 30-days¹⁸. For each dietary supplement reported, participants showed containers to trained interviewers and reported on frequency, duration and amount taken. About 3 weeks later, a health examination including an in-person 24-hour dietary recall, where intake from foods and dietary supplements were collected, was completed in the Mobile Examination Center. Finally, a second 24-hour dietary recall, including foods and dietary supplement intake, was completed by telephone about 3-10 days after the first recall. Both dietary recalls were collected by trained interviewers using the United States Department of Agriculture (USDA)'s automated multiple-pass method¹⁹ where food, beverage and dietary supplement consumption were recorded. The USDA Food and Nutrient Database for Dietary Studies²⁰ provided nutrient conversion of the recorded foods, beverages and dietary supplement data regarding the 24-hour dietary recalls.

Data from 2007-2016 were combined as the most current appropriate analytic sample with all necessary components. The sample included 9,760 adults ≥ 60 years, 8,598 of which had at least one 24-hour dietary recall, and 2,581 of which were either SNAP participants or had a PIR ≤ 1.3 . Adults who were not SNAP participants and had a PIR ≤ 1.3 were included as eligible non-SNAP participants because federal guidelines use this cut-point as the gross income threshold. Other food assistance programs, including emergency foods and community meals or delivery, have varying or no income eligibility guidelines so no additional criteria for exclusions

were added with regard to these programs. Information from both 24-hour dietary recalls was used to determine nutrient intake from all foods and beverages and to determine dietary quality. Information from both 24-hour dietary recalls from all food, beverages, and dietary supplements and information on dietary supplement use in the past 30-days from the in-person household interview were used for analysis of total intake from all sources. Three types of food assistance programs were of interest in the analysis: SNAP, emergency foods, and community meals or delivery. To address the objectives, three main comparisons were made based on these food assistance programs: a. U.S. older adults who were SNAP participants compared with those that were income-eligible ($PIR \leq 1.3$) nonparticipants in the last 12 months; b. U.S. older adults who only participated in SNAP compared with those that participated in at least 2 of the 3 types of food assistance programs (could include SNAP); and c. U.S. older adults who were SNAP participants compared with those that only participated in any number of the other two non-SNAP programs (emergency foods and/or community meals or delivery but not SNAP).

Statistical Analysis

Satterthwaite-adjusted Wald Chi-square tests for categorical variables were used to compare socio-demographic and food security status among food assistance groups with a two-sided p-value of <0.05 in order to identify confounding factors considered for adjustment in the analysis.

Nutrient distributions for calcium; magnesium; zinc; vitamins A, B6, B12, C, D, E; and folate, including the mean and standard errors, and proportion meeting the DRIs, from food alone and from diet and supplements (except for vitamins A and E) were estimated using an adaptation of the NCI method macros^{12,21-23}. Supplement intake from vitamins A and E is not available in the survey cycles included so total intake analysis was not completed for these two nutrients. The Estimated Average Requirement (EAR), below which intake is considered to be inadequate, was used for all nutrients as the appropriate DRI for groups. The NCI method was applied to estimate the usual, or habitual, intake of nutrients from food, by incorporating dietary information from the first and second dietary recalls and for total nutrients with the addition of the supplement information from both the first and second day dietary recalls and at-home inventory of supplements. Usual intake of nutrients was important because dietary recommendations were created with health goals to be met over the long term. The NCI method can provide estimates of the distribution of usual intake of nutrients for a selected population or subpopulation, assess impact of covariates and mitigate measurement errors from a single day intake data collected in 24-hour dietary recalls^{12,21-23}. Distributions of intake from diet were checked for normality and transformed. Then the within-person variance and between-person variance were estimated, after which the within-person variability were removed using the NCI method to “shrink” the distribution, referred to as the “shrink then add” approach²². Then nutrient intakes from supplements were added allowing users and nonusers to have different means. Based on the results from the chi-square tests and the recommended implementation of the NCI method, day of the week of recalled day, recall sequence (first or second dietary recall), and dietary supplement use were accommodated as covariates in the NCI models. Although socio-demographic characteristics and food security status showed up significantly different between comparison groups (education, household food security, adult food security, emergency food use), they were not adjusted in the NCI models to avoid multi-collinearity issues. Race/ethnicity was also statistically different between comparison groups for two of the three main comparisons. The relationship of race/ethnicity on dietary intake was evaluated by

rerunning NCI analyses with race/ethnicity included as a covariate. Results showed that race/ethnicity was not impactful on the usual intake estimates. To avoid over adjusting the models and to be consistent across analysis for all comparisons, race/ethnicity was not adjusted in the usual intake analysis. All comparisons were analyzed using the full sample and with stratification of sex and age, separately, where sample was large enough to accommodate the differences on these characteristics. The sample was sufficient to detect meaningful differences in nutrient intake and dietary quality using $\alpha=0.05$ and $\beta=0.80$ ²⁴.

The HEI-2015 is a density based score that quantifies dietary conformance with the 2015 Dietary Guidelines for Americans²⁵ that is the sum of scores (max of 100) for 13 components, total fruit (max score 5), whole fruit (max score 5), total vegetables (max score 5), greens and beans (max score 5), whole grains (max score 10), dairy (max score 10), total protein foods (max score 5), seafood and plant proteins (max score 5), and components to consume in moderation: fatty acids (max score 10), refined grains (max score 10), sodium (max score 10), added sugars (max score 10) and saturated fats (max score 10), which were reverse scored²⁵⁻²⁷. Higher scores reflect better diet quality and have been shown to be inversely related with risk of major chronic disease, overweight and obesity, and all-cause mortality^{28,29}. Total and component mean HEI-2015 scores were estimated using the Markov Chain Monte Carlo (MCMC) approach, an extension of the NCI method enabling simultaneous modeling of multiple food groups and nutrients. The selection of covariates for HEI analysis was consistent with the usual intake analysis described above except that race/ethnicity was related to the HEI results, thus was included as a covariate. As a result, covariates adjusted in the analysis included interview recall day of the week, sequence of dietary recall and race/ethnicity. The study sample generated limited sample size for several episodically consumed foods after stratification. In order to meet the recommendations of sample sizes for use of the MCMC approach, the HEI analysis were not stratified by sex or age. Standard errors for HEI-2015 total and component scores and usual nutrient intakes were approximated by Fay's Modified Balanced Repeated Replication technique.

Comparison group differences in percentages and means for usual nutrient intakes and HEI-2015 scores were determined using pairwise t-tests with a Bonferroni-adjusted p-value. All analyses were completed on SAS 9.4.

Results

Characteristics for the groups representing the three main comparisons are presented in **Supplemental Table 1-3**. SNAP participants were younger, less likely to be non-Hispanic white and more likely to be non-Hispanic black; had lower education level, lower household and adult food security; used emergency food more and used dietary supplements less in a 30-day period, compared to income-eligible SNAP nonparticipants. On the other hand, SNAP-only participants were less likely to have PIR between 50% and 100%, and more likely to have PIR above 100% and had higher household and adult food security compared to multiple food assistance program participants. Lastly, SNAP participants were younger, were less likely to be non-Hispanic white and more likely to be non-Hispanic black compared with those who did not participate in SNAP but did participate in other programs.

Results are ordered by comparison a. **Tables 1-1 to 1-7**, comparison b. **Tables 2-1 to 2-7**, and comparison c. **Tables 3-1 to 3-7**. Usual intake of nutrients was low for most individuals who were income-eligible for SNAP, indicated by the low mean usual intake and high percentage of

the group with intakes below the EAR among all comparison groups. Specifically, when only intake from foods and beverages were considered, over 90% did not meet the EAR for vitamins D and E, over 70% did not meet the EAR for calcium and magnesium and over 50% did not meet the EAR for vitamins A and C. When intake from diet and dietary supplements was considered, the risk of not meeting the EAR was lower for all nutrients, but some more than others. Among all groups, over 60% had intakes below the EAR for magnesium and vitamin D and over 50% had intakes below the EAR for calcium, while less than 50% of the groups had intakes below the EAR for the other nutrients assessed: zinc, folate and vitamins B6, B12, and C.

Regarding the results of the comparisons (not stratified), there was only one significant result observed among the three comparisons of dietary and total nutrient intakes. This significant result was for comparison c. SNAP participants vs. other program participants (but not SNAP). The proportion with vitamin E intakes below the EAR was higher for SNAP participants ($P = 0.001$) compared to other program participants (but not SNAP) (**Table 3-1**) for usual intake from dietary sources i.e. foods and beverages alone. No differences were observed for usual nutrient intake and risk of not meeting the EAR for all nutrients assessed (please note vitamin E and A were not evaluated).

When the sample was stratified by sex, there were no differences observed for usual intake from dietary sources and the proportion of the group at risk for inadequate intake for both sexes across all comparisons. However, there were two significant results for intake from all nutrient sources. One was for the comparison a. SNAP participants vs. income-eligible nonparticipants. The usual intake from all sources for vitamin D ($P = 0.004$) (**Table 1-4**) among male SNAP participants was lower compared to income-eligible SNAP nonparticipants. Another significant difference was observed for comparison b. SNAP-only participants vs. multiple-program participants. The usual intake from all sources for calcium ($P = 0.006$) among female SNAP-only participants was lower compared to participants of at least two other programs (**Table 2-4**). There were no differences for the proportion of the group with intakes below the EAR for all the sex-adjusted comparisons.

When the sample was stratified by age, there were no differences observed for the usual total intake from dietary and supplement sources and the proportion of the group at risk for inadequate intake for all ages across all comparisons. However, there was one significant result for nutrient intake from dietary sources regarding the comparison c. SNAP participants vs. other program participants (but not SNAP). SNAP participants between 60 to 70 years had higher risk of not meeting the EAR for vitamin E ($P = 0.0005$) compared to other (non-SNAP) participants (**Table 3-5**) from dietary sources.

The dietary quality for all of the comparison groups were poor, with a total HEI-2015 score ranging from 56 to 61 across all groups. For dietary quality, there were two significant results. Regarding comparison b. SNAP-only participants vs. multiple-program participants, SNAP-only participants had higher overall diet quality (HEI-2015 total score, $P = 0.022$) compared to participants of at least two food assistance programs (**Table 2-7**). Additionally, a significant difference was observed among the groups contrasted in comparison c. SNAP participants vs. other program participants (but not SNAP). SNAP participants had lower HEI-2015 component score for total protein foods ($P = 0.0016$), indicating a lower adherence to DGA protein food recommendations, compared to those participating in other programs (but not SNAP) (**Table 3-7**). No other significant results on HEI-2015 component scores were found.

Discussion

Results from the analysis indicated that usual nutrient intake was poor among older U.S. adults participating in SNAP or eligible for SNAP whether participating in one or more food assistance programs or not. A previous study on the low income older population using NHANES reported lower intake of certain nutrients (calcium, magnesium and vitamin B6) and higher intake of others (vitamin A and C) compared to the results from the current analysis¹. Another study reported very similar estimates of those not meeting the EAR compared with our results which were slightly higher for most nutrients included here except vitamin B12 among SNAP users³⁰. This is likely due to the differences in the dietary analysis methods and the population included. However, estimation of usual intake in this study is a strength. In the current study, the majority of the group were not meeting the recommendations for calcium, magnesium, vitamins A, C, D and E when only intake from dietary sources were considered and the risk persisted for calcium, magnesium and vitamin D even after dietary supplement intake was included.

Previous studies focusing on usual nutrient intake of all U.S. older adults of all income levels found a high risk of inadequacy for magnesium, vitamins D and E³¹. The current analysis found a similar high risk of inadequacy for these nutrients and risk of inadequate intake for additional nutrients, including calcium, vitamins A and C among U.S. older adults using SNAP or eligible for SNAP including those using other types of food assistance and those who were eligible but not participating in SNAP. In general, U.S. older adults share similar nutrient gaps with the younger population, including adults, children and adolescents, but have a lower prevalence as a group in reaching adequate intake and higher nutritional risk for certain nutrients^{32,33}. Specifically, nutrient gaps for calcium, magnesium, vitamin D and potentially vitamin A exist for U.S. adults of all age groups while older adults meet the EAR less for vitamin C, magnesium and vitamin A (specifically for females) compared to the younger population³³. This is consistent with the findings of this current analysis on U.S. older adults who are SNAP participants or are eligible for SNAP but we also found a nutrient gap for vitamin E in our study. The higher risk of inadequate intake among older adults compared to other age groups could be due to changes in diet, dietary behaviors, other eating patterns, and health issues that coincide with older age. Older adults are prone to dehydration, muscle and weight loss, leading to reduced metabolic rates and consequent energy needs³⁴⁻³⁶. However, older adults also have higher nutrient needs because of reduced ability to digest and absorb nutrients from meals and decreased mobility and meal preparation abilities, leading to high risk of inadequacy³⁷⁻³⁹.

The nutrients identified in the current study for older adults participating or eligible for participation in SNAP, have important body functions in maintaining health and disease prevention. Calcium is critical in maintaining bone health, and in preventing fractures and osteoporosis⁴⁰. Vitamin D not only has an important role in calcium homeostasis and bone health but also in immune functions^{40,41}. Older adults, however, have reduced ability to produce vitamin D from sunlight, which in turn leads to decreased absorption of calcium from diet and higher risk for inadequate intake or even deficiency and risks to bone health⁴². Magnesium supports muscle and nerve functions, blood pressure regulation, and immune functions⁴³; older adults may have high risk for inadequate intake of magnesium due to changes in gastrointestinal function and medication use⁴⁴. Vitamin A is essential for immune function, cell growth and vision, and is especially important in preventing certain age-related eye diseases⁴⁵. Vitamin E possesses antioxidant properties, and is involved with immune and anti-inflammatory functions and disease prevention such as cancer, eye disorders and cognitive decline, which are common among older

adults⁴⁶. Lastly, vitamin C is an antioxidant with anti-inflammatory functions that are important in immune function (preventing infections and illness such as the common cold), and prevention and treatment of cardiovascular disease, cancer, tissue health and wound repair²⁶. When older adults participating or eligible for participation in SNAP and other food assistance programs are at high risk of inadequate intake of these nutrients, they are also prone to decreased health status and heightened chronic disease risks associated with these nutrients.

The current study examined the usual intake of nutrients including intake from dietary supplements for the first time among older U.S. adults. Compared with nutrient intake from foods and beverages alone, the risk of not meeting the EAR from total nutrient sources was lower. Specifically, 6 (calcium, magnesium, vitamins A, C, D and E) out of 10 nutrients assessed among all groups had over 50% of the group not meeting the EAR when only dietary sources were considered while only 3 out of 8 nutrients had over 50% of the group below the EAR after including dietary supplements. The nutrients where over 50% of the group still had usual intakes below the EAR (calcium, magnesium and vitamin D), all had decreased percentages compared to the percentage below the EAR when usual intake from dietary sources alone were considered. This finding is consistent with previous research evaluating the usual intake of nutrients for older adults of all income levels³¹. However, the current study found a higher percentage of the assessed group with intake below the EAR compared to the previous study³¹. This is likely because the current study focused on low income older adult food assistance participants or eligible nonparticipants, who have limits on resources to obtain foods that meet nutrient recommendations compared to older adults of all income levels. Nevertheless, in the current study, risk of inadequate nutrient intake appeared to be lower and nutrient gaps reduced after dietary supplements were accounted for in the usual intake estimates.

Another important consideration is that dietary supplement use might be associated with “healthful behaviors”. Previous research has shown characteristics such as age, sex, education status, income level and health-related behaviors are associated with dietary supplement use and ultimately nutrient intake of different populations^{13,33}. For example, those who use dietary supplements are likely to be more health conscious than those who do not, meaning those who only receive nutrient intake from diet alone may represent a group with more persistent nutrient gaps and who are more difficult to reach with both dietary or supplement interventions. Other factors regarding dietary supplements may also impact the group that are users. Dietary supplements are not regulated for efficacy and their independent link to health are not well-established. Furthermore, compared to dietary sources, dietary supplement use could lead to higher risk of exceeding the upper level (UL) that is safe for nutrient intake, which could lead to toxicity and associated health concerns. Therefore, further research on characteristics of older U.S. adults who are eligible for SNAP and how they manage resources for foods and dietary supplements are needed to better understand the role of dietary supplements in meeting nutrient requirements.

Dietary quality was another outcome of the current study. To our knowledge, the current research was the first to compare dietary quality of SNAP participants with other food assistance participants among older adults. Total dietary quality across all of the groups in the study ranged from 56 to 61 on a scale with a maximum of 100. If 100 is considered as a letter grade of A+, the scores for dietary quality among older adults eligible for food assistance in this study would have received a grade of F to D-⁴⁷. However, this range of scores is similar to the dietary quality of all

Americans in 2013-2014 of 59 but still lower than the score for Americans ages 65 and older of 66⁴⁸. Previous research by Leung et al. compared dietary outcomes for U.S. adult (20-65 years) SNAP participants and eligible nonparticipants and found SNAP participants had lower diet quality compared to nonparticipants⁴. The current study did not find any differences in dietary quality among older adult SNAP participants and income-eligible nonparticipants. On the other hand, previous research documenting the total dietary quality for all U.S. older adults showed a higher dietary quality ranging from 58 to 68 out of 100 based on varying weight status⁴⁹. When looking at dietary components, scores for dairy, fatty acids, and sodium were particularly low for all groups in the current study results. Dairy is a nutrient dense food and good source high quality protein. It is also linked to improved bone health and nutrient intake^{14,50}, outcomes for which older adults are already at high risk of not achieving and are specifically at heightened risk of osteoporosis. The low fatty acid component score may challenge the ability to maintain a healthy ratio of unsaturated and saturated fats and is also important in the context of chronic disease; evidence suggests that replacing saturated fats with unsaturated fats is linked with lower risk of cardiovascular disease (CVD) and improved blood lipid profile¹⁴. Lastly, the low component score for sodium indicates poor adherence to DGA recommendations for sodium. Consuming a diet low in sodium is beneficial for blood pressure, blood lipid profiles, and reduced risk for CVD¹⁴. Low scores on dairy, fatty acids and sodium dietary quality components among the older adults eligible for SNAP show that meeting the DGA recommendations for these particular dietary components are a challenge that could contribute to adverse dietary and health outcomes.

The usual nutrient intake and dietary quality of older adults using various food assistance programs and income-eligible nonparticipants were compared in the current analysis. Considering the various comparisons made (3) for both usual nutrient intake from diet and from all sources as well as dietary quality, and stratifications for nutrient intake comparisons by sex and age, there were only six differences among the groups observed. First that SNAP participants had higher risk of not meeting the vitamin E EAR regarding the usual intake from dietary sources compared to other program participants. Second, when examined by sex, male SNAP participants had lower total usual intake of vitamin D compared to eligible nonparticipants and third, that female SNAP-only participants had lower total usual intake of calcium compared to participants of multiple programs. Fourth, after stratifying by age group, a higher proportion of SNAP participants between ages 60 and 70 years did not meet the vitamin E EAR from all nutrient sources compared to other (non-SNAP) program participants. Fifth, regarding dietary quality, SNAP-only participants had higher total dietary quality compared to participants of multiple programs and sixth, that SNAP participants met DGA recommendations for protein food intake less compared to other (non-SNAP) participants. These findings highlight further critical nutrients for senior health that differ among groups by food assistance program use or eligibility including vitamin E for all and among those ages 60-70 years, vitamin D for men, calcium for women, and overall dietary quality and protein intake.

The results may be applied by integrating them into nutrition education programming for low-income older Americans delivered through SNAP Education (SNAP-Ed)⁵¹⁻⁵³. SNAP-Ed provides evidence-based nutrition education and obesity prevention programming based on the DGAs to SNAP participants, income-eligible non-participants, and individuals residing in communities with a significant low-income population⁵⁴. The education can be tailored to emphasize food sources of nutrients that are lacking in the diets of low-income older Americans.

Furthermore, the information may be tailored for certain cultural diets and for variations in diets by race/ethnicity or other characteristics. Results may also be helpful to inform food pantries and senior meal delivery programs to ensure the inclusion of foods rich in the nutrients identified in this study as gaps such as dairy foods, high quality protein foods, whole grains, and vegetables. For example, results may inform policies that recommend or require that menus include certain foods that are dense in one or more of these nutrients (calcium, magnesium, vitamins A, C, D, and E) or that achieve certain nutrient totals for menus may apply the results. Further research on characteristics of older U.S. adults who are eligible for SNAP and how they manage resources for foods and DS are needed to better understand role of DS in meeting nutrient requirements.

Strengths of the current study are the novelty of focusing on dietary outcomes of older adults by food assistance program participation and the estimation of usual intake using rigorous methods from both dietary and total nutrient sources along with diet quality for estimating dietary intake. The adapted NCI method used in the current study mitigated measurement error, reduced within-person variance and generated habitual intake of nutrients from up to two 24 hour dietary recalls for the population^{12,22}. There are also limitations of the current study. The vitamin A and E dietary supplement data was not available for the included survey years of NHANES. Thus, we could not estimate the usual intake from all dietary sources for these two nutrients for all comparisons. Additionally, we were not able to stratify analysis for sex and age for all comparisons due to the small sample size for some specific comparisons. Participation in SNAP tends to be underreported in national surveys and this underreporting may mean that the results do not truly represent SNAP participants nor those eligible SNAP nonparticipants. Finally, the data are cross-sectional and do not address the impact of food assistance programs on nutrient intake and dietary quality.

Food security has been a public health concern in the U.S. and the prevalence of food insecurity is growing faster among older adults compared to that of the general population^{1,55}. Food insecure older adults rely heavily on various food assistance programs to meet critical nutritional needs and maintain quality of life and health status. There was no previous literature on the usual intake of nutrients from total sources nor the risk of inadequate intake from total sources by various food assistance program participation among US older adults. The current study fills this gap and provides knowledge of the dietary outcomes of this at-risk population and crucial evidence to inform future policy decisions regarding funding for food assistance programs. Knowledge of the difference that supplements make for older adults who are income-eligible or using various food assistance programs in meeting nutrient gaps is also important to policy proposals considering allowing the use of SNAP benefits to purchase nutritional supplements. Causality cannot be inferred from the results of this study due to the cross-sectional study design but the associations discovered through this research are critical to understanding current food assistance program contributions to nutrient intake and dietary quality. Results of this study highlight the high nutrition risk of older adults even when receiving various food assistance programs. Future policies should focus on providing guidance, interventions and education targeting participants of food assistance programs to improve dietary intake and quality along with food security of the low income population. Further investigation may reveal how low-income older adults manage resources or trade-off expenses to purchase both food and supplements.

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Appendix 1

Supplemental Table 1. Sociodemographic characteristics and comparison of U.S. low-income older adult Supplemental Nutrition Assistance Program (SNAP) participants and SNAP eligible nonparticipants over 60 years as drawn from NHANES during 2007 - 2016¹

Characteristics		SNAP participants (n=713)		SNAP eligible nonparticipants (n=1868)		P – value ²
		n	%	n	%	
Sex						0.08
	Male	304	35.6	882	39.5	
	Female	409	64.4	986	60.5	
Age						0.0006
	60-70	460	63.9	1008	52.6	
	70+	253	36.1	860	47.4	
Race/Ethnicity						0.0001
	Non-Hispanic white	185	45.5	745	61.7	
	Non-Hispanic black	255	26.2	358	13.3	
	Hispanic	221	19.8	639	17.8	
	Other	52	8.4	126	7.1	
Education						0.0063
	Less than high school	420	51.5	929	41.6	
	High School Grad/GED	134	22.7	430	26.6	
	Some college or associate degree	121	20.5	364	23.7	
	College or above	36	5.3	141	8.1	
PIR ³						n/a
	0% to 50%	79	10.0	222	9.6	
	50% to 100%	307	44.9	827	42.6	
	100% to 130%	107	16.7	819	47.9	
	Above 130%	157	28.4	0	0	
Household Food Security						<.0001
	Secure	326	49.8	1112	65.2	
	Low	280	36.1	547	24.9	
	Very low	104	14.1	208	9.8	
Adult Food Security						<.0001
	Secure	327	49.8	1116	65.3	
	Low	273	35.8	531	23.9	
	Very low	110	14.3	220	10.8	
Emergency Food						0.040
	Yes	176	23.4	320	17.5	
	No	537	76.6	1546	82.5	

Community Meals/Meal Deliveries						0.32
	Yes	90	12.6	267	14.7	
	No	623	87.4	1601	85.3	
Dietary Supplement Use (in the past 30 days)						0.022
	Yes	347	52.9	1034	59.7	
	No	366	47.1	834	40.3	

¹ Age ≥ 60 years. ² Rao-Scott F adjusted chi-square tests were used to compare socio-demographic and food security status among food assistance groups with two-sided p-value of <0.05. ³ Poverty-income-ratio. Mean PIR was 126% for SNAP participants and 92% for eligible nonparticipants. Chi-square test cannot be completed due to frequency of 0 for at least one of the categories.

Supplemental Table 2. Sociodemographic characteristics and comparisons of U.S. low-income older adults participating in the Supplemental Nutrition Assistance Program (SNAP) only and those participating in multiple programs among those over 60 years old as drawn from NHANES during 2007 - 2016¹

Characteristics		SNAP-only participants (n=486)		At least 2 programs participants (n=321)		P – value ²
		n	%	n	%	
Sex						0.52
	Male	205	35.8	142	37.9	
	Female	281	64.2	179	62.1	
Age						0.53
	60-70	312	62.8	190	59.4	
	70+	174	37.2	131	40.6	
Race/Ethnicity						0.91
	Non-Hispanic white	119	45.0	100	46.7	
	Non-Hispanic black	170	25.2	106	26.4	
	Hispanic	158	21.0	93	18.6	
	Other	39	8.8	22	8.3	
Education						0.91
	Less than high school	281	50.1	190	52.8	
	High School Grad/GED	91	23.4	61	23.0	
	Some college or associate degree	89	21.5	51	18.7	
	College or above	24	5.1	18	5.4	
PIR ³						0.013
	0% to 50%	56	10.3	34	10.0	
	50% to 100%	197	41.6	166	54.7	
	above 100%	187	48.1	104	35.3	
Household Food Security						<.0001
	Secure	249	54.7	106	34.5	
	Low	186	34.9	133	40.2	
	Very low	48	10.4	82	25.3	
Adult Food Security						<.0001
	Secure	249	54.7	107	34.6	
	Low	179	24.4	131	39.3	
	Very low	55	10.9	83	26.1	
Dietary Supplement Use (in the past 30 days)						0.68
	Yes	243	47.7	152	54.2	
	No	243	52.3	169	45.8	

Combinations of programs ⁴						n/a
	SNAP + emergency foods	0	0	176	76.7	
	SNAP + community meals	0	0	90	41.3	
	Emergency foods + community meals	0	0	133	52.1	
	SNAP + Emergency foods + community meals	0	0	39	23.5	

¹ Age ≥ 60 years. ² Rao-Scott F adjusted chi-square tests were used to compare socio-demographic and food security status among food assistance groups with two-sided p-value of <0.05. ³ Poverty income ratio. Mean PIR was 126% for SNAP participants and 92% for eligible nonparticipants. Mean PIR was 133% for SNAP only participants and 100% for multiple program participants. ⁴ Chi-square test cannot be completed due to frequency of 0 for at least one of the categories. The sample represented in the various combinations of programs are not mutually exclusive and an individual may be included in multiple categories, therefore, the percentages will add to greater than 100%.

Supplemental Table 3. Sociodemographic characteristics and comparisons of U.S. low-income older adults participating in Supplemental Nutrition Assistance Program (SNAP) and those participating in other programs (not SNAP) among those over 60 years old as drawn from NHANES during 2007 - 2016¹

Characteristics		SNAP participants (n=713)		Other programs participants (n=493)		P – Value ²
		n	%	n	%	
Sex						0.79
	Male	304	35.6	211	34.7	
	Female	409	64.4	282	65.3	
Age						<.0001
	60-70	460	63.9	230	46.4	
	70+	253	36.1	263	53.6	
Race/Ethnicity						0.0072
	Non-Hispanic white	185	45.5	202	61.6	
	Non-Hispanic black	255	26.2	109	15.7	
	Hispanic	221	19.8	154	16.5	
	Other	52	8.4	28	6.2	
Education						0.24
	Less than high school	420	51.5	254	43.0	
	High School Grad/GED	134	22.7	111	25.9	
	Some college or associate degree	121	20.5	97	24.2	
	College or above	36	5.3	31	6.9	
PIR ³						0.51
	0% to 50%	79	10.0	63	9.7	
	50% to 100%	307	44.9	250	50.2	
	above 100%	264	45.1	180	40.1	
Household Food Security						0.27
	Secure	326	49.8	214	48.3	
	Low	280	36.1	179	31.9	
	Very low	104	14.1	100	19.8	
Adult Food Security						0.11
	Secure	327	49.8	214	48.3	
	Low	273	35.8	169	29.6	
	Very low	110	14.3	110	22.2	
Dietary Supplement Use (in the past 30 days)						0.071
	Yes	347	52.9	279	60.1	
	No	366	47.1	214	39.9	
Emergency Food						<.0001

	Yes	176	23.4	320	62.9	
	No	537	76.6	173	37.1	
Community Meals/Meal Deliveries						<.0001
	Yes	90	12.6	267	52.9	
	No	623	87.4	226	47.1	

¹ Age ≥ 60 years. ² Rao-Scott F adjusted chi-square tests were used to compare socio-demographic and food security status among food assistance groups with two-sided p-value of <0.05. ³ Poverty income ratio. Mean PIR was 126% for SNAP participants and 92% for eligible nonparticipants. Mean PIR was 126% for SNAP participants and 89% for other program (non-SNAP) participants.

Appendix 2

Table 1-1: Usual intake from food among Supplemental Nutrition Assistance Program (SNAP) participants and eligible nonparticipants in U.S. low-income older adults over 60 years as drawn from NHANES during 2007 - 2016¹

Nutrient	Daily Recommended Intake	Usual Intake from food					
		Mean (SE)			% not meeting EAR (SE)		
		SNAP users (N=713)	SNAP eligible non-users (N=1868)	p-value ²	SNAP users (N=713)	SNAP eligible non-users (N=1868)	p-value ²
Calcium, mg (EAR) ³	800-1,000	787.3 (27.7)	792.7 (15.3)	0.90	72.0 (3.4)	73.0 (1.8)	0.85
Magnesium, mg (EAR) ⁴	265-350	242.9 (6.0)	253.0 (3.1)	0.27	73.8 (2.4)	71.1 (1.2)	0.46
Zinc, mg (EAR) ⁵	6.8-9.4	9.3 (0.2)	9.4 (0.2)	0.80	35.1 (2.9)	37.4 (1.7)	0.61
Vitamin A, mcg (EAR) ⁶	500-625	552.2 (23.5)	592.5 (15.8)	0.30	56.0 (3.6)	53.0 (2.2)	0.60
Folate, mcg (EAR)	320	443.2 (14.6)	459.8 (9.4)	0.48	23.2 (3.7)	21.7 (3.0)	0.82
Vitamin B6, mg (EAR) ⁷	1.3-1.4	1.6 (0.04)	1.7 (0.03)	0.14	33.8 (3.5)	32.8 (1.9)	0.85
Vitamin B12, mcg (EAR)	2	4.3 (0.2)	4.2 (0.1)	0.74	6.3 (2.4)	7.9 (1.7)	0.69
Vitamin C, mg (EAR) ⁸	60-75	71.0 (4.5)	71.0 (2.1)	1.0	54.7 (3.9)	55.1 (2.0)	0.95
Vitamin D, mcg (EAR)	10	4.3 (0.2)	4.4 (0.1)	0.74	95.7 (1.4)	97.0 (0.7)	0.54
Vitamin E, mg (EAR)	12	6.0 (0.3)	6.8 (0.2)	0.10	98.9 (0.8)	94.4 (1.0)	0.01

¹age ≥60. ²Statistical significance was determined as p<0.005. Estimates were adjusted for day of the week of recalled day, recall sequence and supplement use. ³EAR of calcium are 800mg for men 60-70 years of age and 1,000mg for women years of age and adults over 70 years of age. ⁴EAR of magnesium are 350mg for men over 60 years and 265mg for women over 60 years. ⁵EAR of zinc are 9.4mg for men over 60 years and 6.8mg for women over 60 years. ⁶EAR of vitamin A are 625mcg for men over 60 years and 500mcg for women over 60 years. ⁷EAR of vitamin B6 are 1.4mg for men over 60 years and 1.3mg for women over 60 years. ⁸EAR of vitamin C are 75mg for men over 60 years and 60mg for women over 60 years.

Table 1-2: Total usual intake from diet and supplements among Supplemental Nutrition Assistance Program (SNAP) participants and eligible nonparticipants of U.S. low-income older adults over 60 years as drawn from NHANES during 2007 - 2016¹

	Total usual nutrient intake
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Nutrient	Daily Recommended Intake	Mean (SE)			% not meeting EAR (SE)		
		SNAP users (N=713)	SNAP eligible non-users (N=1868)	p-value ²	SNAP users (N=713)	SNAP eligible non-users (N=1868)	p-value ²
Calcium, mg (EAR) ³	800-1,000	938.8 (29.6)	985.2 (17.4)	0.32	58.0 (3.1)	56.0 (1.7)	0.68
Magnesium, mg (EAR) ⁴	265-350	263.1 (8.2)	285.3 (4.7)	0.084	67.8 (2.4)	62.3 (1.3)	0.14
Zinc, mg (EAR) ⁵	6.8-9.4	12.5 (0.5)	14.8 (0.4)	0.01	29.8 (2.8)	29.2 (1.5)	0.89
Vitamin A, mcg (EAR) ⁶	500-625	--	--	--	--	--	--
Folate, mcg (EAR)	320	629.5 (25.9)	680.0 (15.8)	0.22	18.0 (3.3)	17.0 (2.3)	0.85
Vitamin B6, mg (EAR) ⁷	1.3-1.4	4.2 (0.7)	4.7 (0.4)	0.65	28.3 (3.2)	25.7 (1.6)	0.59
Vitamin B12, mcg (EAR)	2	62.5 (14.1)	91.6 (11.0)	0.23	5.0 (2.0)	6.0 (1.3)	0.76
Vitamin C, mg (EAR) ⁸	60-75	134.6 (12.6)	173.6 (11.2)	0.089	43.0 (3.2)	40.0 (2.1)	0.56
Vitamin D, mcg (EAR)	10	11.6 (1.1)	20.0 (2.0)	0.0070	66.4 (2.4)	60.8 (1.9)	0.18
Vitamin E, mg (EAR)	12	--	--	--	--	--	--

¹age ≥60 years. ²Statistical significance was determined as p<0.00625. Estimates were adjusted for day of the week of recalled day, recall sequence and supplement use. ³EAR of calcium are 800mg for men 60-70 years of age and 1,000mg for women years of age and adults over 70 years of age. ⁴EAR of magnesium are 350mg for men over 60 years and 265mg for women over 60 years. ⁵EAR of zinc are 9.4mg for men over 60 years and 6.8mg for women over 60 years. ⁶EAR of vitamin A are 625mcg for men over 60 years and 500mcg for women over 60 years. ⁷EAR of vitamin B6 are 1.4mg for men over 60 years and 1.3mg for women over 60 years. ⁸EAR of vitamin C are 75mg for men over 60 years and 60mg for women over 60 years.

Table 1-3: Usual intake from food among Supplemental Nutrition Assistance Program (SNAP) participants and eligible nonparticipants in U.S. low-income older adults over 60 years **by sex** as drawn from NHANES during 2007 - 2016¹

		Usual Intake from food					
Nutrient	Daily Recommended Intake	Mean (SE)			% not meeting EAR (SE)		
		SNAP users	SNAP eligible non-users	p-value ²	SNAP users	SNAP eligible non-users	p-value ²
Male							

Calcium, mg (EAR) ³	800-1000	912.0 (70.5)	850.7 (27.3)	0.55	52.0 (5.9)	38.0 (3.2)	0.12
Magnesium, mg (EAR)	350	260.6 (27.1)	267.1 (20.7)	0.89	76.2 (4.7)	75.7 (6.8)	0.96
Zinc, mg (EAR)	9.4	10.9 (0.5)	11.0 (0.3)	0.90	37.7 (6.1)	39.1 (3.1)	0.88
Vitamin A, mcg (EAR)	625	543.6 (44.4)	610.3 (26.4)	0.34	67.0 (5.2)	60.0 (3.2)	0.40
Folate, mcg (EAR)	320	503.6 (31.0)	513.1 (15.5)	0.84	17.0 (4.7)	12.0 (3.3)	0.52
Vitamin B6, mg (EAR)	1.4	1.81 (0.09)	1.99 (0.07)	0.24	28.8 (5.4)	25.4 (3.1)	0.69
Vitamin B12, mcg (EAR)	2	4.9 (0.3)	4.7 (0.3)	0.73	4.0 (2.5)	4.5 (2.0)	0.91
Vitamin C, mg (EAR)	60	82.2 (8.1)	76.6 (4.7)	0.66	58.0 (5.3)	57.9 (4.3)	0.99
Vitamin D, mcg (EAR)	10	5.0 (0.5)	4.7 (0.2)	0.68	91.1 (3.1)	96.4 (1.1)	0.23
Vitamin E, mg (EAR)	12	6.7 (0.5)	7.6 (0.3)	0.25	98.5 (2.1)	93.4 (2.2)	0.21
Female							
Calcium, mg (EAR)	1000	722.9 (21.6)	755.1 (17.2)	0.39	85.0 (2.5)	82.0 (2.5)	0.54
Magnesium, mg (EAR)	265	224.5 (6.8)	234.8 (3.3)	0.32	75.4 (3.9)	69.2 (1.6)	0.28
Zinc, mg (EAR)	6.8	8.5 (0.3)	8.4 (0.2)	0.84	30.1 (4.8)	33.2 (2.9)	0.69
Vitamin A, mcg (EAR)	500	555.9 (31.0)	580.1 (21.6)	0.64	48.0 (6.1)	48.0 (3.0)	1.0
Folate, mcg (EAR)	320	411.3 (16.3)	425.5 (11.1)	0.60	26.4 (5.3)	27.9 (3.5)	0.86
Vitamin B6, mg (EAR)	1.3	1.5 (0.06)	1.5 (0.04)	1.0	36.3 (6.9)	37.3 (2.9)	0.92
Vitamin B12, mcg (EAR)	2	4.0 (0.2)	3.9 (0.1)	0.74	7.1 (4.0)	9.2 (2.3)	0.74
Vitamin C, mg (EAR)	75	65.5 (4.7)	67.4 (2.9)	0.80	52.5 (4.9)	53.7 (2.6)	0.87
Vitamin D, mcg (EAR)	10	4.0 (0.2)	4.2 (0.1)	0.51	98.1 (0.9)	97.5 (0.7)	0.70
Vitamin E, mg (EAR)	12	5.6 (0.3)	6.4 (0.2)	0.11	99.3 (0.6)	95.2 (1.0)	0.010

¹age ≥60. ²Statistical significance was determined as p<0.005. Estimates were adjusted for day of the week of recalled day, recall sequence and supplement use. ³EAR of calcium are 800mg for men 60-70 years of age and 1,000mg for adults over 70 years of age.

Table 1-4: Total usual intake from diet and supplements among Supplemental Nutrition Assistance Program (SNAP) participants and eligible nonparticipants of U.S. low-income older adults over 60 years **by sex** as drawn from NHANES during 2007 - 2016¹

		Total usual nutrient intake					
Nutrient	Daily Recommended Intake	Mean (SE)			% not meeting EAR (SE)		
		SNAP users	SNAP eligible non-users	p-value ²	SNAP users	SNAP eligible non-users	p-value ²
Male							
Calcium, mg (EAR) ³	800-1000	1008.6 (77.3)	962.1 (31.7)	0.68	45.0 (6.1)	49.0 (3.2)	0.67
Magnesium, mg (EAR)	350	277.6 (23.5)	295.7 (15.9)	0.64	70.7 (5.4)	66.6 (6.4)	0.72
Zinc, mg (EAR)	9.4	13.3 (0.7)	15.7 (0.6)	0.054	34.1 (5.6)	31.4 (2.5)	0.74
Vitamin A, mcg (EAR)	625	--	--	--	--	--	--
Folate, mcg (EAR)	320	650.9 (45.0)	705.8 (23.8)	0.42	15.0 (4.5)	9.0 (2.6)	0.39
Vitamin B6, mg (EAR)	1.4	3.7 (0.7)	5.1 (0.7)	0.30	26.9 (5.0)	20.6 (2.3)	0.40
Vitamin B12, mcg (EAR)	2	47.7 (19.4)	86.0 (18.3)	0.29	4.0 (2.2)	4.0 (1.6)	1.0
Vitamin C, mg (EAR)	60	142.5 (22.4)	152.6 (13.0)	0.77	48.8 (5.1)	44.0 (4.1)	0.59
Vitamin D, mcg (EAR)	10	9.5 (0.9)	16.3 (1.5)	0.0042	69.9 (4.3)	65.1 (2.5)	0.47
Vitamin E, mg (EAR)	12	--	--	--	--	--	--
Female							
Calcium, mg (EAR)	1000	904.6 (25.2)	1000.6 (22.8)	0.040	67.0 (2.6)	61.0 (2.0)	0.18
Magnesium, mg (EAR)	265	248.2 (10.3)	271.9 (6.5)	0.16	66.8 (3.8)	59.5 (1.6)	0.20
Zinc, mg (EAR)	6.8	12.1 (0.8)	14.3 (0.5)	0.088	25.4 (4.5)	26.0 (2.4)	0.93
Vitamin A, mcg (EAR)	500	--	--	--	--	--	--
Folate, mcg (EAR)	320	619.2 (33.9)	663.7 (19.5)	0.41	20.0 (4.8)	21.0 (2.8)	0.90
Vitamin B6, mg (EAR)	1.3	4.4 (1.1)	4.4 (0.5)	1.0	28.8 (5.6)	28.8 (2.4)	1.0
Vitamin B12, mcg (EAR)	2	70.8 (20.6)	95.2 (11.5)	0.45	6.0 (3.0)	6.0 (1.7)	1.0
Vitamin C, mg (EAR)	75	130.9 (15.7)	187.4 (15.1)	0.058	40.0 (4.0)	38.0 (2.5)	0.76
Vitamin D, mcg (EAR)	10	12.8 (1.6)	22.4 (2.9)	0.59	64.3 (3.6)	58.2 (2.3)	0.30

Vitamin E, mg (EAR)	12	--	--	--	--	--	--
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¹age ≥60 years. ²Statistical significance was determined as p<0.00625. Estimates were adjusted for day of the week of recalled day, recall sequence and supplement use. ³EAR of calcium are 800mg for men 60-70 years of age and 1,000mg for adults over 70 years of age.

Table 1-5: Usual intake from food among Supplemental Nutrition Assistance Program (SNAP) participants and eligible nonparticipants in U.S. low-income older adults over 60 years **by age group** as drawn from NHANES during 2007 - 2016 ¹

		Usual Intake from food					
Nutrient	Daily Recommended Intake	Mean (SE)			% not meeting EAR (SE)		
		SNAP users	SNAP eligible non-users	p-value ²	SNAP users	SNAP eligible non-users	p-value ²
60-70							
Calcium, mg (EAR) ³	800-1,000	814.2 (37.4)	815.4 (23.6)	0.98	67.0 (4.0)	66.0 (2.8)	0.88
Magnesium, mg (EAR) ⁴	265-350	251.9 (8.7)	268.4 (6.0)	0.25	71.2 (3.1)	66.3 (2.1)	0.34
Zinc, mg (EAR) ⁵	6.8-9.4	9.4 (0.3)	10.0 (0.3)	0.30	34.9 (3.4)	35.0 (2.1)	0.99
Vitamin A, mcg (EAR) ⁶	500-625	567.2 (31.2)	567.1 (24.6)	1.0	56.0 (4.2)	58.0 (2.8)	0.77
Folate, mcg (EAR)	320	452.0 (19.1)	478.2 (15.1)	0.43	22.9 (3.9)	21.0 (4.6)	0.82
Vitamin B6, mg (EAR) ⁷	1.3-1.4	1.6 (0.06)	1.8 (0.06)	0.084	32.3 (4.5)	32.2 (2.7)	0.99
Vitamin B12, mcg (EAR)	2	4.2 (0.3)	4.3 (0.2)	0.84	7.7 (2.7)	10.0 (2.4)	0.64
Vitamin C, mg (EAR) ⁸	60-75	70.0 (6.0)	68.0 (3.4)	0.83	56.8 (4.9)	58.8 (3.3)	0.80
Vitamin D, mcg (EAR)	10	4.2 (0.3)	4.3 (0.2)	0.84	95.5 (1.7)	96.9 (1.1)	0.61
Vitamin E, mg (EAR)	12	6.1 (0.4)	7.2 (0.3)	0.11	99.0 (0.7)	92.2 (1.8)	0.0099
70+							
Calcium, mg (EAR)	1,000	748.5 (29.2)	770.9 (20.0)	0.64	82.0 (4.7)	81.0 (2.9)	0.89
Magnesium, mg (EAR) ⁴	265-350	228.7 (6.9)	236.5 (4.1)	0.47	79.8 (3.0)	77.0 (1.9)	0.56
Zinc, mg (EAR) ⁵	6.8-9.4	9.3 (0.5)	8.9 (0.2)	0.58	34.0 (4.7)	40.3 (2.9)	0.40
Vitamin A, mcg (EAR) ⁶	500-625	531.3 (36.7)	619.7 (21.5)	0.12	55 (8.2)	47 (2.9)	0.49
Folate, mcg (EAR)	320	432.1 (25.3)	440.0 (11.8)	0.83	19.9 (7.9)	23.5 (4.2)	0.76

Vitamin B6, mg (EAR) ⁷	1.3-1.4	1.5 (0.07)	1.6 (0.04)	0.36	34.0 (5.7)	33.9 (3.3)	0.99
Vitamin B12, mcg (EAR)	2	4.5 (0.2)	4.2 (0.2)	0.43	3.5 (2.8)	6.1 (2.6)	0.61
Vitamin C, mg (EAR) ⁸	60-75	74.0 (5.9)	74.8 (3.1)	0.93	50.1 (5.3)	51.2 (2.7)	0.89
Vitamin D, mcg (EAR)	10	4.6 (0.3)	4.4 (0.2)	0.68	96.9 (2.1)	97.0 (0.9)	0.97
Vitamin E, mg (EAR)	12	5.9 (0.3)	6.5 (0.2)	0.22	98.5 (1.5)	96.0 (1.1)	0.32

¹age ≥60 years. ²Statistical significance was determined as p<0.005. Estimates were adjusted for day of the week of recalled day, recall sequence and supplement use. ³EAR of calcium are 800mg for men 60-70 years of age and 1,000mg for women years of age and adults over 70 years of age. ⁴EAR of magnesium are 350mg for men over 60 years and 265mg for women over 60 years. ⁵EAR of zinc are 9.4mg for men over 60 years and 6.8mg for women over 60 years. ⁶EAR of vitamin A are 625mcg for men over 60 years and 500mcg for women over 60 years. ⁷EAR of vitamin B6 are 1.4mg for men over 60 years and 1.3mg for women over 60 years. ⁸EAR of vitamin C are 75mg for men over 60 years and 60mg for women over 60 years.

Table 1-6: Total usual intake from diet and supplements among Supplemental Nutrition Assistance Program (SNAP) participants and eligible nonparticipants of U.S. low-income older adults over 60 years **by age group** as drawn from NHANES during 2007 - 2016¹

		Total usual nutrient intake					
Nutrient	Daily Recommended Intake	Mean (SE)			% not meeting EAR (SE)		
		SNAP users	SNAP eligible non-users	p-value ²	SNAP users	SNAP eligible non-users	p-value ²
60-70							
Calcium, mg (EAR) ³	800-1,000	960.0 (42.4)	976.4 (28.8)	0.81	54.0 (3.8)	53.0 (2.6)	0.87
Magnesium, mg (EAR) ⁴	265-350	275.5 (11.7)	296.8 (7.5)	0.26	65.3 (3.0)	58.7 (2.1)	0.19
Zinc, mg (EAR) ⁵	6.8-9.4	12.4 (0.6)	14.1 (0.6)	0.14	30.0 (3.3)	28.2 (2.1)	0.74
Vitamin A, mcg (EAR) ⁶	500-625	--	--	--	--	--	--
Folate, mcg (EAR)	320	648.0 (32.5)	688.3 (23.1)	0.46	19.0 (3.8)	16.0 (3.6)	0.67
Vitamin B6, mg (EAR) ⁷	1.3-1.4	4.0 (0.6)	4.4 (0.5)	0.71	27.3 (4.2)	25.2 (2.2)	0.75
Vitamin B12, mcg (EAR)	2	57.2 (14.0)	80.0 (17.0)	0.45	7.0 (2.2)	8.0 (1.9)	0.80
Vitamin C, mg (EAR) ⁸	60-75	120.7 (11.3)	160.0 (17.7)	0.16	44.0 (4.4)	45.0 (3.4)	0.90

Vitamin D, mcg (EAR)	10	12.4 (1.6)	17.7 (1.7)	0.096	66.7 (3.0)	63.9 (2.9)	0.62
Vitamin E, mg (EAR)	12	--	--	--	--	--	--
70+							
Calcium, mg (EAR)	1,000	909.9 (28.8)	998.5 (24.7)	0.084	66.0 (4.3)	61.0 (2.2)	0.44
Magnesium, mg (EAR) ⁴	265-350	242.8 (7.5)	273.0 (7.8)	0.039	73.2 (2.8)	66.8 (1.9)	0.16
Zinc, mg (EAR) ⁵	6.8-9.4	12.8 (1.0)	15.6 (0.7)	0.089	28.2 (3.9)	30.8 (2.3)	0.67
Vitamin A, mcg (EAR) ⁶	500-625	--	--	--	--	--	--
Folate, mcg (EAR)	320	601.2 (30.0)	671.3 (21.2)	0.16	14.0 (5.9)	18.0 (2.8)	0.65
Vitamin B6, mg (EAR) ⁷	1.3-1.4	4.4 (1.2)	5.0 (0.7)	0.75	28.0 (4.3)	26.8 (2.4)	0.86
Vitamin B12, mcg (EAR)	2	71.9 (32.8)	104.6 (14.6)	0.50	3.0 (2.0)	4.0 (1.8)	0.78
Vitamin C, mg (EAR) ⁸	60-75	160.5 (36.3)	189.0 (13.9)	0.58	40.0 (4.0)	36.0 (2.4)	0.52
Vitamin D, mcg (EAR)	10	10.2 (0.7)	22.6 (3.4)	0.0091	66.2 (3.5)	57.5 (2.3)	0.12
Vitamin E, mg (EAR)	12	--	--	--	--	--	--

¹age ≥60 years. ²Statistical significance was determined as p<0.00625. Estimates were adjusted for day of the week of recalled day, recall sequence and supplement use. ³EAR of calcium are 800mg for men 60-70 years of age and 1,000mg for women years of age and adults over 70 years of age. ⁴EAR of magnesium are 350mg for men over 60 years and 265mg for women over 60 years. ⁵EAR of zinc are 9.4mg for men over 60 years and 6.8mg for women over 60 years. ⁶EAR of vitamin A are 625mcg for men over 60 years and 500mcg for women over 60 years. ⁷EAR of vitamin B6 are 1.4mg for men over 60 years and 1.3mg for women over 60 years. ⁸EAR of vitamin C are 75mg for men over 60 years and 60mg for women over 60 years.

Table 1-7. Mean Healthy Eating Index-2015 (HEI-2015) total and component scores among U.S. older adult Supplemental Nutrition Assistance Program (SNAP) participants and eligible nonparticipants over 60 years as drawn from the NHANES 2007–2016¹

HEI-2015 component (maximum score)	SNAP participants (n=713)		SNAP eligible nonparticipants (n=1868)		P – Value ²
	Mean	SE	Mean	SE	
Total Score (100)	59.4	0.9	58.6	0.8	0.51
Total Fruits (5)	3.2	0.2	3.0	0.08	0.35
Whole Fruits (5)	3.7	0.1	3.3	0.1	0.0047
Total Vegetables (5)	3.8	0.1	3.7	0.09	0.46
Greens and Beans (5)	3.3	0.6	3.0	0.3	0.65
Whole Grains (10)	3.2	0.04	3.4	0.2	0.33
Dairy (10)	5.7	0.3	5.4	0.2	0.41

Total Protein Foods (5)	4.8	0.06	4.9	0.03	0.14
Seafood and Plant Proteins (5)	4.3	0.2	4.2	0.2	0.72
Fatty Acids (10)	4.8	0.3	4.9	0.2	0.78
Refined Grains (10)	5.8	0.3	6.0	0.2	0.58
Sodium (10)	3.5	0.2	3.7	0.2	0.48
Added Sugars (10)	7.2	0.3	7.0	0.2	0.58
Saturated Fats (10)	6.2	0.3	6.3	0.2	0.78

¹Age ≥ 60 years. ²Statistical significance for total score was set as $P < 0.05$. Statistical significance for component scores was determined as $P < 0.00385$ to adjust for multiple comparisons using Bonferroni method. Estimates were adjusted for day of the week of recalled day, recall sequence, race/ethnicity and supplement use.

Table 2-1. Usual intake from food among U.S. older adults over 60 years participating in the Supplemental Nutrition Assistance Program (SNAP) only and those participating in at least 2 other programs as drawn from the NHANES 2007-2016¹

		Usual Intake from food					
Nutrient	Daily Recommended Intake	Mean (SE)			% not meeting EAR (SE)		
		SNAP-only (n=486)	At least 2 programs (n=321)	p-value ²	SNAP-only (n=486)	At least 2 programs (n=321)	p-value ²
Calcium, mg (EAR) ³	800-1,000	755.5 (27.7)	855.8 (44.2)	0.055	76.0 (3.3)	66.0 (4.4)	0.070
Magnesium, mg (EAR) ⁴	265-350	240.7 (8.1)	250.9 (8.2)	0.38	75.3 (3.2)	71.0 (3.3)	0.35
Zinc, mg (EAR) ⁵	6.8-9.4	9.2 (0.3)	9.8 (0.4)	0.23	36.9 (3.2)	31.8 (4.2)	0.33
Vitamin A, mcg (EAR) ⁶	500-625	536.1 (26.8)	595.0 (38.1)	0.21	58.0 (4.2)	51.0 (5.3)	0.30
Folate, mcg (EAR)	320	428.0 (16.1)	469.8 (21.7)	0.12	27.4 (3.3)	17.0 (5.5)	0.11
Vitamin B6, mg (EAR) ⁷	1.3-1.4	1.6 (0.05)	1.6 (0.07)	1.0	24.1 (4.4)	35.2 (4.0)	0.062
Vitamin B12, mcg (EAR)	2	4.2 (0.2)	4.5 (4.1)	0.94	5.4 (3.1)	8.0 (2.9)	0.54
Vitamin C, mg (EAR) ⁸	60-75	69.0 (4.6)	78.2 (7.4)	0.29	56.4 (4.2)	51.6 (4.6)	0.44
Vitamin D, mcg (EAR)	10	4.2 (0.3)	4.8 (0.4)	0.23	97.4 (1.2)	93.0 (3.1)	0.19
Vitamin E, mg (EAR)	12	5.9 (0.3)	6.5 (0.4)	0.23	99.3 (0.6)	94.9 (2.3)	0.065

¹age ≥ 60 years. ²Statistical significance was determined as $p < 0.005$ to adjust for multiple comparisons using Bonferroni method. Estimates were adjusted for day of the week of recalled day, recall sequence, and supplement use. ³EAR of calcium are 800mg for men 60-70 years of age and 1,000mg for women years of age and adults over 70 years of age. ⁴EAR of magnesium are 350mg for men over 60 years and 265mg for women over 60 years. ⁵EAR of zinc are 9.4mg for men over 60 years and 6.8mg for women over 60 years. ⁶EAR of vitamin A are 625mcg for men over 60 years and 500mcg for women over 60

years. ⁷EAR of vitamin B6 are 1.4mg for men over 60 years and 1.3mg for women over 60 years. ⁸EAR of vitamin C are 75mg for men over 60 years and 60mg for women over 60 years.

Table 2-2. Total usual nutrient intake among U.S. older adults over 60 years participating in the Supplemental Nutrition Assistance Program (SNAP) only and those participating in at least 2 other programs as drawn from the NHANES 2007-2016¹

		Total usual nutrient intake					
Nutrient	Daily Recommended Intake	Mean (SE)			% not meeting EAR (SE)		
		SNAP-only (n=486)	At least 2 programs (n=321)	p-value ²	SNAP-only (n=486)	At least 2 programs (n=321)	p-value ²
Calcium, mg (EAR) ³	800-1,000	899.8 (35.9)	1019.9 (44.5)	0.036	62.0 (3.6)	53.0 (3.3)	0.066
Magnesium, mg (EAR) ⁴	265-350	264.7 (12.0)	261.8 (8.4)	0.84	68.4 (3.3)	66.8 (3.2)	0.73
Zinc, mg (EAR) ⁵	6.8-9.4	12.7 (0.8)	12.1 (0.7)	0.57	30.3 (3.3)	28.3 (4.1)	0.70
Vitamin A, mcg (EAR) ⁶	500-625	--	--	--	--	--	--
Folate, mcg (EAR)	320	633.1 (37.0)	604.5 (25.6)	0.53	22.0 (3.1)	14.0 (4.9)	0.17
Vitamin B6, mg (EAR) ⁷	1.3-1.4	4.8 (1.0)	3.1 (0.6)	0.15	28.3 (4.0)	30.5 (3.8)	0.69
Vitamin B12, mcg (EAR)	2	66.5 (20.3)	46.0 (12.3)	0.39	5.0 (3.0)	6.0 (2.3)	0.79
Vitamin C, mg (EAR) ⁸	60-75	147.7 (19.2)	105.4 (9.7)	0.050	43.0 (3.7)	46.0 (4.3)	0.60
Vitamin D, mcg (EAR)	10	11.5 (1.4)	15.2 (1.6)	0.082	67.8 (2.9)	62.5 (2.7)	0.18
Vitamin E, mg (EAR)	12	--	--	--	--	--	--

¹age ≥60 years. ²Statistical significance was determined as p<0.00625 to adjust for multiple comparisons using Bonferroni method. Estimates were adjusted for day of the week of recalled day, recall sequence, and supplement use. ³EAR of calcium are 800mg for men 60-70 years of age and 1,000mg for women years of age and adults over 70 years of age. ⁴EAR of magnesium are 350mg for men over 60 years and 265mg for women over 60 years. ⁵EAR of zinc are 9.4mg for men over 60 years and 6.8mg for women over 60 years. ⁶EAR of vitamin A are 625mcg for men over 60 years and 500mcg for women over 60 years. ⁷EAR of vitamin B6 are 1.4mg for men over 60 years and 1.3mg for women over 60 years. ⁸EAR of vitamin C are 75mg for men over 60 years and 60mg for women over 60 years.

Table 2-3. Usual intake from food among U.S. older adults over 60 years **by sex** participating in the Supplemental Nutrition Assistance Program (SNAP) only and those participating in at least 2 other programs as drawn from the NHANES 2007-2016¹

Usual Intake from food	
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Nutrient	Daily Recommended Intake	Mean (SE)			% not meeting EAR (SE)		
		SNAP-only	At least 2 programs	p-value ²	SNAP-only	At least 2 programs	p-value ²
Male							
Calcium, mg (EAR) ³	800-1000	869.3 (59.8)	938.7 (102.2)	0.56	54.0 (7.0)	54.0 (6.0)	1.0
Magnesium, mg (EAR)	350	283.8 (14.7)	271.4 (16.2)	0.57	77.7 (4.5)	79.9 (5.5)	0.76
Zinc, mg (EAR)	9.4	11.0 (0.6)	10.2 (0.8)	0.42	34.8 (6.9)	49.3 (6.2)	0.12
Vitamin A, mcg (EAR)	625	556.8 (53.3)	577.1 (54.7)	0.79	65.0 (6.0)	64.0 (6.7)	0.92
Folate, mcg (EAR)	320	504.3 (33.4)	501.0 (36.8)	0.95	17.0 (4.8)	18.0 (6.6)	0.91
Vitamin B6, mg (EAR)	1.4	1.9 (0.1)	1.7 (0.1)	0.16	24.2 (6.6)	37.6 (5.4)	0.12
Vitamin B12, mcg (EAR)	2	4.7 (0.3)	4.8 (0.6)	0.88	2.9 (2.0)	9.8 (4.2)	0.14
Vitamin C, mg (EAR)	60	84.6 (10.1)	82.8 (13.5)	0.92	55.8 (8.0)	59.9 (6.4)	0.69
Vitamin D, mcg (EAR)	10	4.6 (0.5)	5.7 (0.8)	0.24	94.8 (2.2)	86.5 (7.1)	0.27
Vitamin E, mg (EAR)	12	7.0 (0.5)	6.7 (0.7)	0.73	98.7 (2.2)	93.9 (5.0)	0.38
Female							
Calcium, mg (EAR)	1000	698.9 (29.4)	798.9 (32.7)	0.02	87.0 (3.5)	77.0 (4.1)	0.057
Magnesium, mg (EAR)	265	218.6 (7.8)	237.2 (9.7)	0.12	78.9 (4.7)	67.9 (4.3)	0.078
Zinc, mg (EAR)	6.8	8.2 (0.4)	9.5 (0.5)	0.037	34.1 (4.0)	19.2 (7.1)	0.059
Vitamin A, mcg (EAR)	500	526.3 (33.2)	602.2 (51.1)	0.26	52.0 (6.5)	42.0 (8.7)	0.34
Folate, mcg (EAR)	320	388.6 (18.1)	448.1 (22.6)	0.035	33.7 (4.1)	16.5 (9.0)	0.072
Vitamin B6, mg (EAR)	1.3	1.4 (0.05)	1.6 (8.1)	0.98	40.0 (6.4)	32.5 (7.4)	0.43
Vitamin B12, mcg (EAR)	2	3.9 (0.2)	4.3 (0.5)	0.44	7.6 (5.4)	5.8 (3.7)	0.78
Vitamin C, mg (EAR)	75	61.8 (4.7)	74.3 (7.3)	0.14	56.6 (5.3)	44.7 (7.2)	0.17
Vitamin D, mcg (EAR)	10	4.0 (0.3)	4.2 (0.3)	0.63	98.4 (1.4)	97.4 (1.2)	0.58
Vitamin E, mg (EAR)	12	5.4 (0.3)	6.4 (0.4)	0.040	99.6 (0.4)	96.7 (1.8)	0.10

¹age ≥60 years. ²Statistical significance was determined as p<0.005 to adjust for multiple comparisons using Bonferroni method. Estimates were adjusted for day of the week of recalled day, recall sequence, and supplement use. ³EAR of calcium are 800mg for men 60-70 years of age and 1,000mg for adults over 70 years of age.

Table 2-4. Total usual intake among U.S. older adults over 60 years **by sex** participating in the Supplemental Nutrition Assistance Program (SNAP) only and those participating in at least 2 other programs as drawn from the NHANES 2007-2016¹

		Total usual nutrient intake					
Nutrient	Daily Recommended Intake	Mean (SE)			% not meeting EAR (SE)		
		SNAP-only	At least 2 programs	p-value ²	SNAP-only	At least 2 programs	p-value ²
Male							
Calcium, mg (EAR) ³	800-1000	974.0 (72.2)	1022.1 (103.1)	0.70	47.0 (7.2)	48.0 (5.7)	0.91
Magnesium, mg (EAR)	350	301.2 (15.9)	277.9 (16.5)	0.31	71.2 (4.7)	77.8 (5.4)	0.36
Zinc, mg (EAR)	9.4	14.3 (1.0)	11.2 (0.7)	0.012	30.2 (5.8)	44.7 (5.3)	0.066
Vitamin A, mcg (EAR)	625	--	--	--	--	--	--
Folate, mcg (EAR)	320	695.5 (55.3)	576.6 (42.5)	0.089	15.0 (4.6)	17.0 (6.1)	0.79
Vitamin B6, mg (EAR)	1.4	3.9 (0.7)	2.8 (0.7)	0.27	22.6 (6.1)	34.1 (5.5)	0.16
Vitamin B12, mcg (EAR)	2	53.0 (24.2)	40.8 (21.9)	0.71	3.0 (1.9)	7.0 (3.0)	0.26
Vitamin C, mg (EAR)	60	164.6 (30.5)	98.7 (15.8)	0.056	44.7 (7.7)	56.1 (6.2)	0.25
Vitamin D, mcg (EAR)	10	8.6 (1.1)	15.1 (2.9)	0.038	73.4 (4.2)	63.1 (6.3)	0.17
Vitamin E, mg (EAR)	12	--	--	--	--	--	--
Female							
Calcium, mg (EAR)	1000	865.2 (33.8)	1012.2 (43.1)	0.006	70.0 (3.6)	58.0 (3.7)	0.018
Magnesium, mg (EAR)	265	246.0 (14.1)	250.7 (11.1)	0.79	70.0 (4.9)	61.8 (4.9)	0.23
Zinc, mg (EAR)	6.8	11.9 (1.0)	12.6 (1.1)	0.63	27.7 (4.2)	16.7 (6.7)	0.15
Vitamin A, mcg (EAR)	500	--	--	--	--	--	--
Folate, mcg (EAR)	320	601.5 (47.5)	618.9 (41.7)	0.78	25.0 (4.3)	13.0 (8.0)	0.17
Vitamin B6, mg (EAR)	1.3	5.3 (1.6)	3.2 (0.9)	0.25	30.8 (5.5)	28.2 (7.0)	0.76

Vitamin B12, mcg (EAR)	2	74.0 (30.2)	49.1 (15.4)	0.46	6.0 (4.0)	4.6 (3.1)	0.78
Vitamin C, mg (EAR)	75	139.8 (24.9)	108.4 (12.4)	0.26	42.0 (5.0)	38.5 (6.8)	0.67
Vitamin D, mcg (EAR)	10	13.1 (2.2)	15.2 (2.1)	0.48	64.7 (4.4)	61.8 (3.7)	0.61
Vitamin E, mg (EAR)	12	--	--	--	--	--	--

¹age ≥60 years. ²Statistical significance was determined as p<0.00625 to adjust for multiple comparisons using Bonferroni method. Estimates were adjusted for day of the week of recalled day, recall sequence, and supplement use. ³EAR of calcium are 800mg for men 60-70 years of age and 1,000mg for adults over 70 years of age.

Table 2-5. Usual intake from food among U.S. older adults over 60 years **by age group** participating in the Supplemental Nutrition Assistance Program (SNAP) only and those participating in at least 2 other programs as drawn from the NHANES 2007-2016¹

Nutrient	Daily Recommended Intake	Usual Intake from food					
		Mean (SE)			% not meeting EAR (SE)		
		SNAP-only	At least 2 programs	p-value ²	SNAP-only	At least 2 programs	p-value ²
60-70							
Calcium, mg (EAR) ³	800-1,000	790.1 (44.3)	958.3 (76.7)	0.059	69.0 (5.2)	55.0 (5.2)	0.058
Magnesium, mg (EAR) ⁴	265-350	255.2 (14.6)	261.4 (11.0)	0.73	70.9 (4.8)	65.6 (4.5)	0.42
Zinc, mg (EAR) ⁵	6.8-9.4	9.2 (0.5)	10.6 (0.6)	0.074	27.0 (4.4)	28.3 (5.7)	0.86
Vitamin A, mcg (EAR) ⁶	500-625	568.1 (36.1)	642.8 (71.1)	0.35	56.0 (4.6)	50.0 (7.2)	0.48
Folate, mcg (EAR)	320	457.9 (25.7)	494.5 (29.4)	0.35	26.0 (3.6)	14.1 (5.0)	0.054
Vitamin B6, mg (EAR) ⁷	1.3-1.4	1.7 (0.9)	1.7 (0.1)	1.0	33.0 (5.0)	30.0 (6.8)	0.72
Vitamin B12, mcg (EAR)	2	4.2 (0.3)	5.0 (0.8)	0.35	6.6 (4.1)	8.5 (3.6)	0.73
Vitamin C, mg (EAR) ⁸	60-75	71.0 (8.6)	75.2 (9.5)	0.74	55.1 (6.9)	53.0 (7.5)	0.84
Vitamin D, mcg (EAR)	10	4.2 (0.4)	5.3 (0.7)	0.17	96.0 (2.1)	89.0 (5.7)	0.25
Vitamin E, mg (EAR)	12	6.2 (0.4)	6.7 (0.6)	0.49	99.3 (0.9)	94.1 (3.1)	0.11
70+							

Calcium, mg (EAR)	1,000	744.4 (37.4)	765.8 (51.3)	0.74	82.0 (6.1)	80.0 (6.5)	0.82
Magnesium, mg (EAR) ⁴	265-350	227.1 (8.1)	237.5 (12.2)	0.48	80.8 (3.4)	77.2 (5.1)	0.56
Zinc, mg (EAR) ⁵	6.8-9.4	9.3 (0.6)	9.0 (0.7)	0.75	33.6 (5.1)	37.1 (9.3)	0.74
Vitamin A, mcg (EAR) ⁶	500-625	506.5 (36.5)	585.7 (53.3)	0.22	60.0 (6.8)	44.0 (16.6)	0.37
Folate, mcg (EAR)	320	411.1 (22.8)	437.7 (40.7)	0.57	25.2 (5.9)	13.7 (14.3)	0.46
Vitamin B6, mg (EAR) ⁷	1.3-1.4	1.5 (6.5)	1.6 (0.1)	0.99	34.0 (7.0)	39.0 (6.5)	0.60
Vitamin B12, mcg (EAR)	2	4.4 (0.3)	4.1 (0.4)	0.55	3.1 (3.3)	5.6 (6.6)	0.74
Vitamin C, mg (EAR) ⁸	60-75	71.8 (5.8)	81.0 (12.9)	0.52	51.9 (5.3)	49.1 (7.3)	0.76
Vitamin D, mcg (EAR)	10	4.6 (0.3)	4.4 (0.4)	0.69	98.3 (2.2)	96.9 (1.9)	0.63
Vitamin E, mg (EAR)	12	5.8 (0.3)	6.5 (0.7)	0.36	99.4 (0.7)	95.7 (4.0)	0.36

¹age ≥60 years. ²Statistical significance was determined as p<0.005 to adjust for multiple comparisons using Bonferroni method. Estimates were adjusted for day of the week of recalled day, recall sequence, and supplement use. ³EAR of calcium are 800mg for men 60-70 years of age and 1,000mg for women years of age and adults over 70 years of age. ⁴EAR of magnesium are 350mg for men over 60 years and 265mg for women over 60 years. ⁵EAR of zinc are 9.4mg for men over 60 years and 6.8mg for women over 60 years. ⁶EAR of vitamin A are 625mcg for men over 60 years and 500mcg for women over 60 years. ⁷EAR of vitamin B6 are 1.4mg for men over 60 years and 1.3mg for women over 60 years. ⁸EAR of vitamin C are 75mg for men over 60 years and 60mg for women over 60 years.

Table 2-6. Total usual intake from food among U.S. older adults over 60 years **by age group** participating in the Supplemental Nutrition Assistance Program (SNAP) only and those participating in at least 2 other programs as drawn from the NHANES 2007-2016¹

		Total usual nutrient intake					
Nutrient	Daily Recommended Intake	Mean (SE)			% not meeting EAR (SE)		
		SNAP-only	At least 2 programs	p-value ²	SNAP-only	At least 2 programs	p-value ²
60-70							
Calcium, mg (EAR) ³	800-1,000	934.0 (51.5)	1098.4 (72.7)	0.066	55.0 (5.2)	43.0 (3.9)	0.066
Magnesium, mg (EAR) ⁴	265-350	287.5 (20.5)	274.6 (12.6)	0.59	64.0 (4.8)	61.3 (5.0)	0.70
Zinc, mg (EAR) ⁵	6.8-9.4	12.7 (0.8)	13.3 (1.3)	0.69	30.5 (4.1)	25.6 (6.0)	0.50
Vitamin A, mcg (EAR) ⁶	500-625	--	--	--	--	--	--

Folate, mcg (EAR)	320	707.0 (55.1)	625.3 (46.3)	0.26	20.0 (4.0)	12.0 (5.1)	0.22
Vitamin B6, mg (EAR) ⁷	1.3-1.4	5.4 (1.1)	3.6 (1.2)	0.27	26.8 (4.3)	26.2 (6.8)	0.94
Vitamin B12, mcg (EAR)	2	71.6 (21.3)	47.1 (19.6)	0.40	6.0 (3.4)	6.8 (3.1)	0.86
Vitamin C, mg (EAR) ⁸	60-75	133.3 (16.5)	110.3 (15.7)	0.31	40.3 (6.0)	46.2 (7.8)	0.55
Vitamin D, mcg (EAR)	10	12.7 (2.5)	16.5 (2.2)	0.25	67.6 (5.1)	56.4 (4.4)	0.097
Vitamin E, mg (EAR)	12	--	--	--	--	--	--
70+							
Calcium, mg (EAR)	1,000	874.1 (45.1)	990.1 (63.9)	0.14	69.0 (5.4)	61.0 (5.4)	0.30
Magnesium, mg (EAR) ⁴	265-350	242.8 (8.6)	248.4 (12.2)	0.71	73.3 (3.4)	72.3 (4.6)	0.86
Zinc, mg (EAR) ⁵	6.8-9.4	13.3 (1.4)	11.5 (0.8)	0.27	27.8 (4.4)	30.1 (7.9)	0.80
Vitamin A, mcg (EAR) ⁶	500-625	--	--	--	--	--	--
Folate, mcg (EAR)	320	566.2 (36.3)	611.9 (50.3)	0.46	20.0 (4.7)	10.0 (10.7)	0.39
Vitamin B6, mg (EAR) ⁷	1.3-1.4	4.9 (1.6)	2.8 (0.6)	0.22	28.8 (5.5)	32.3 (5.6)	0.66
Vitamin B12, mcg (EAR)	2	75.3 (44.7)	56.6 (21.4)	0.71	3.0 (3.0)	2.0 (4.1)	0.84
Vitamin C, mg (EAR) ⁸	60-75	186.6 (51.0)	102.0 (15.1)	0.11	40.0 (4.4)	44.9 (6.6)	0.54
Vitamin D, mcg (EAR)	10	9.9 (1.0)	16.3 (2.9)	0.039	68.6 (4.6)	60.9 (4.6)	0.24
Vitamin E, mg (EAR)	12	--	--	--	--	--	--

¹age ≥60 years. ²Statistical significance was determined as $p < 0.00625$ to adjust for multiple comparisons using Bonferroni method. Estimates were adjusted for day of the week of recalled day, recall sequence, and supplement use. ³EAR of calcium are 800mg for men 60-70 years of age and 1,000mg for women years of age and adults over 70 years of age. ⁴EAR of magnesium are 350mg for men over 60 years and 265mg for women over 60 years. ⁵EAR of zinc are 9.4mg for men over 60 years and 6.8mg for women over 60 years. ⁶EAR of vitamin A are 625mcg for men over 60 years and 500mcg for women over 60 years. ⁷EAR of vitamin B6 are 1.4mg for men over 60 years and 1.3mg for women over 60 years. ⁸EAR of vitamin C are 75mg for men over 60 years and 60mg for women over 60 years.

Table 2-7. Mean Healthy Eating Index-2015 (HEI-2015) total and component scores among U.S. older adults over 60 years participating in the Supplemental Nutrition Assistance Program (SNAP) only and those participating in at least 2 other programs as drawn from the NHANES 2007-2016¹

	SNAP-only participants (n=481)	At least 2 programs participants (n=321)	

HEI-2015 component (maximum score)	Mean	SE	Mean	SE	<i>P</i> – Value ²
Total Score (100)	61.4	1.3	56.1	1.9	0.022
Total Fruits (5)	3.4	0.3	2.8	0.3	0.16
Whole Fruits (5)	3.9	0.2	3.2	0.3	0.054
Total Vegetables (5)	3.9	0.2	3.6	0.2	0.29
Greens and Beans (5)	3.5	0.2	2.9	0.5	0.27
Whole Grains (10)	3.5	0.3	3.0	0.3	0.24
Dairy (10)	5.6	0.4	5.8	0.3	0.69
Total Protein Foods (5)	4.9	0.05	4.8	0.1	0.37
Seafood and Plant Proteins (5)	4.5	0.2	3.7	0.3	0.027
Fatty Acids (10)	4.9	0.3	4.6	0.4	0.55
Refined Grains (10)	6.0	0.4	6.0	0.4	1.0
Sodium (10)	3.5	0.3	3.7	0.4	0.69
Added Sugars (10)	7.5	0.3	6.3	0.4	0.017
Saturated Fats (10)	6.3	0.4	5.7	0.4	0.29

¹Age ≥ 60 years. ²Statistical significance for total score was set as $P < 0.05$. Statistical significance for component scores was determined as $P < 0.00385$ to adjust for multiple comparisons using Bonferroni method. Estimates were adjusted for day of the week of recalled day, recall sequence, race/ethnicity and supplement use.

Table 3-1. Usual intake from food among U.S. older adults over 60 years participating in the Supplemental Nutrition Assistance Program (SNAP) and those participating in other programs (but not SNAP) as drawn from the NHANES 2007-2016¹

		Usual Intake from food					
Nutrient	Daily Recommended Intake	Mean (SE)			% not meeting EAR (SE)		
		SNAP participants (n=713)	Other non-SNAP programs (n=493)	p-value ²	SNAP participants (n=713)	Other non-SNAP program (n=493)	p-value ²
Calcium, mg (EAR) ³	800-1,000	787.3 (27.7)	770.4 (23.3)	0.64	72.0 (3.4)	76.0 (3.1)	0.38
Magnesium, mg (EAR) ⁴	265-350	242.9 (6.0)	249.5 (8.2)	0.52	73.8 (23.7)	71.4 (2.7)	0.51
Zinc, mg (EAR) ⁵	6.8-9.4	9.3 (0.2)	9.6 (0.3)	0.41	35.1 (2.9)	38.4 (3.5)	0.47
Vitamin A, mcg (EAR) ⁶	500-625	552.2 (23.5)	579.0 (23.1)	0.42	56.0 (3.6)	53.0 (3.4)	0.54
Folate, mcg (EAR)	320	443.2 (14.6)	450.0 (19.9)	0.78	23.3 (3.7)	17.2 (9.0)	0.53
Vitamin B6, mg (EAR) ⁷	1.3-1.4	1.6 (0.04)	1.7 (0.07)	0.22	33.8 (3.5)	30.3 (4.2)	0.52
Vitamin B12, mcg (EAR)	2	4.3 (0.2)	4.1 (0.2)	0.48	6.3 (2.4)	8.2 (2.5)	0.58
Vitamin C, mg (EAR) ⁸	60-75	70.0 (4.8)	72.8 (9.9)	0.80	55.6 (4.2)	55.3 (6.9)	0.97

Vitamin D, mcg (EAR)	10	4.3 (0.2)	4.6 (0.2)	0.29	95.7 (1.4)	96.2 (1.4)	0.80
Vitamin E, mg (EAR)	12	6.0 (0.3)	6.8 (0.3)	0.06	98.8 (0.8)	92.9 (1.6)	0.001

¹age ≥60 years. ²Statistical significance was determined as p<0.005 to adjust for multiple comparisons using Bonferroni method. Estimates were adjusted for day of the week of recalled day, recall sequence, and supplement use. ³EAR of calcium are 800mg for men 60-70 years of age and 1,000mg for women years of age and adults over 70 years of age. ⁴EAR of magnesium are 350mg for men over 60 years and 265mg for women over 60 years. ⁵EAR of zinc are 9.4mg for men over 60 years and 6.8mg for women over 60 years. ⁶EAR of vitamin A are 625mcg for men over 60 years and 500mcg for women over 60 years. ⁷EAR of vitamin B6 are 1.4mg for men over 60 years and 1.3mg for women over 60 years. ⁸EAR of vitamin C are 75mg for men over 60 years and 60mg for women over 60 years.

Table 3-2. Total usual intake from food among U.S. older adults over 60 years participating in the Supplemental Nutrition Assistance Program (SNAP) and those participating in other programs (but not SNAP) as drawn from the NHANES 2007-2016 ¹

		Total usual nutrient intake					
Nutrient	Daily Recommended Intake	Mean (SE)			% not meeting EAR (SE)		
		SNAP (n=713)	Other non-SNAP programs (n=493)	p-value ²	SNAP (n=713)	Other non-SNAP program (n=493)	p-value ²
Calcium, mg (EAR) ³	800-1,000	938.8 (29.6)	949.0 (36.3)	0.83	58.0 (3.1)	60.0 (3.3)	0.66
Magnesium, mg (EAR) ⁴	265-350	263.1 (8.2)	280.2 (10.5)	0.20	67.8 (2.4)	63.9 (2.9)	0.30
Zinc, mg (EAR) ⁵	6.8-9.4	12.5 (0.5)	15.0 (0.8)	0.0082	29.8 (2.8)	30.7 (2.9)	0.82
Vitamin A, mcg (EAR) ⁶	500-625	--	--	--	--	--	--
Folate, mcg (EAR)	320	629.5 (25.9)	653.1 (31.6)	0.56	18.0 (3.3)	14.0 (7.1)	0.61
Vitamin B6, mg (EAR) ⁷	1.3-1.4	4.2 (0.7)	5.4 (0.9)	0.29	28.3 (3.2)	24.2 (3.5)	0.39
Vitamin B12, mcg (EAR)	2	62.5 (14.1)	93.6 (24.9)	0.28	5.0 (2.0)	6.0 (1.8)	0.71
Vitamin C, mg (EAR) ⁸	60-75	141.2 (18.8)	122.1 (27.6)	0.53	42.9 (3.5)	45.3 (4.5)	0.66
Vitamin D, mcg (EAR)	10	11.6 (1.1)	17.9 (2.6)	0.026	66.4 (2.4)	61.4 (4.0)	0.28
Vitamin E, mg (EAR)	12	--	--	--	--	--	--

¹age ≥60 years. ²Statistical significance was determined as p<0.00625 to adjust for multiple comparisons using Bonferroni method. Estimates were adjusted for day of the week of recalled day, recall sequence, and supplement use. ³EAR of calcium are 800mg for men 60-70 years of age and 1,000mg for women years of age and adults over 70 years of age. ⁴EAR of magnesium are 350mg for men over 60 years and

265mg for women over 60 years. ⁵EAR of zinc are 9.4mg for men over 60 years and 6.8mg for women over 60 years. ⁶EAR of vitamin A are 625mcg for men over 60 years and 500mcg for women over 60 years. ⁷EAR of vitamin B6 are 1.4mg for men over 60 years and 1.3mg for women over 60 years. ⁸EAR of vitamin C are 75mg for men over 60 years and 60mg for women over 60 years.

Table 3-3. Usual intake from food among U.S. older adults over 60 years **by sex** participating in the Supplemental Nutrition Assistance Program (SNAP) and those participating in other programs (but not SNAP) as drawn from the NHANES 2007-2016 ¹

		Usual Intake from food					
Nutrient	Daily Recommended Intake	Mean (SE)			% not meeting EAR (SE)		
		SNAP	Other non-SNAP programs	p-value ²	SNAP	Other non-SNAP program	p-value ²
Male							
Calcium, mg (EAR) ³	800-1000	912.0 (70.5)	833.9 (42.3)	0.34	52.0 (5.9)	62.0 (4.5)	0.18
Magnesium, mg (EAR)	350	278.2 (12.7)	290.7 (14.6)	0.53	78.5 (3.9)	75.1 (4.5)	0.58
Zinc, mg (EAR)	9.4	10.9 (0.5)	11.9 (0.7)	0.25	37.7 (6.1)	38.5 (5.5)	0.92
Vitamin A, mcg (EAR)	625	543.6 (44.4)	702.2 (46.8)	0.014	67.0 (5.2)	51.0 (4.8)	0.024
Folate, mcg (EAR)	320	503.6 (31.0)	551.2 (47.1)	0.40	17.0 (4.7)	9.0 (9.2)	0.44
Vitamin B6, mg (EAR)	1.4	1.8 (0.09)	2.1 (0.2)	0.17	28.8 (5.4)	20.6 (6.3)	0.32
Vitamin B12, mcg (EAR)	2	4.9 (0.3)	5.0 (0.4)	0.84	4.0 (2.5)	7.1 (4.0)	0.51
Vitamin C, mg (EAR)	60	82.2 (8.1)	85.2 (11.5)	0.83	58.0 (5.3)	55.0 (6.9)	0.73
Vitamin D, mcg (EAR)	10	5.0 (4.7)	5.2 (0.3)	0.73	91.2 (3.1)	93.6 (2.7)	0.54
Vitamin E, mg (EAR)	12	6.7 (0.5)	8.2 (0.7)	0.082	98.5 (2.1)	88.1 (5.8)	0.093
Female							
Calcium, mg (EAR)	1000	722.9 (21.6)	742.9 (24.6)	0.54	85.0 (2.5)	84.0 (3.6)	0.82
Magnesium, mg (EAR)	265	224.5 (6.8)	229.4 (7.0)	0.62	75.4 (3.9)	72.1 (3.2)	0.51
Zinc, mg (EAR)	6.8	8.5 (0.3)	8.4 (0.3)	0.81	30.1 (4.8)	35.0 (5.3)	0.49
Vitamin A, mcg (EAR)	500	555.9 (31.0)	516.7 (25.3)	0.33	48.0 (6.1)	55.0 (4.5)	0.27
Folate, mcg (EAR)	320	411.3 (16.3)	403.2 (13.6)	0.70	26.4 (5.4)	24.6 (8.4)	0.86

Vitamin B6, mg (EAR)	1.3	1.5 (0.06)	1.5 (0.06)	1.0	36.3 (6.9)	35.1 (5.6)	0.89
Vitamin B12, mcg (EAR)	2	4.0 (0.2)	3.6 (0.1)	0.074	7.1 (4.0)	7.8 (3.1)	0.89
Vitamin C, mg (EAR)	75	65.5 (4.7)	58.9 (4.9)	0.33	52.5 (4.9)	61.8 (5.0)	0.18
Vitamin D, mcg (EAR)	10	4.0 (0.2)	4.3 (0.2)	0.42	98.1 (0.9)	97.0 (1.3)	0.49
Vitamin E, mg (EAR)	12	5.6 (0.3)	6.1 (0.3)	0.24	99.3 (0.6)	95.9 (1.5)	0.036

¹age ≥60 years. ²Statistical significance was determined as p<0.005 to adjust for multiple comparisons using Bonferroni method. Estimates were adjusted for day of the week of recalled day, recall sequence, and supplement use. ³EAR of calcium are 800mg for men 60-70 years of age and 1,000mg for adults over 70 years of age.

Table 3-4. Total usual intake from food among U.S. older adults over 60 years **by sex** participating in the Supplemental Nutrition Assistance Program (SNAP) and those participating in other programs (but not SNAP) as drawn from the NHANES 2007-2016 ¹

		Total usual nutrient intake					
Nutrient	Daily Recommended Intake	Mean (SE)			% not meeting EAR (SE)		
		SNAP	Other non-SNAP programs	p-value ²	SNAP	Other non-SNAP program	p-value ²
Male							
Calcium, mg (EAR) ³	800-1000	1008.6 (77.3)	920.4 (56.6)	0.36	45.0 (6.1)	54.0 (5.1)	0.26
Magnesium, mg (EAR)	350	292.1 (13.7)	312.9 (13.0)	0.27	73.7 (4.1)	67.8 (3.6)	0.28
Zinc, mg (EAR)	9.4	13.3 (0.7)	16.6 (1.4)	0.036	31.6 (4.9)	34.1 (5.6)	0.75
Vitamin A, mcg (EAR)	625	--	--	--	--	--	--
Folate, mcg (EAR)	320	650.9 (45.0)	709.7 (43.1)	0.35	15.0 (4.5)	8.0 (7.5)	0.49
Vitamin B6, mg (EAR)	1.4	3.7 (0.7)	8.1 (2.5)	0.091	26.9 (5.0)	16.7 (5.4)	0.17
Vitamin B12, mcg (EAR)	2	47.7 (19.4)	90.3 (33.0)	0.27	4.0 (2.2)	6.0 (3.0)	0.59
Vitamin C, mg (EAR)	60	142.5 (22.4)	154.3 (28.0)	0.74	48.8 (5.1)	44.0 (7.1)	0.58
Vitamin D, mcg (EAR)	10	9.5 (0.9)	19.3 (4.7)	0.042	69.9 (4.3)	66.1 (6.4)	0.62
Vitamin E, mg (EAR)	12	--	--	--	--	--	--
Female							

Calcium, mg (EAR)	1000	904.6 (25.2)	970.4 (42.8)	0.19	67.0 (2.6)	63.0 (3.6)	0.37
Magnesium, mg (EAR)	265	248.2 (10.3)	264.6 (14.2)	0.35	66.8 (3.8)	63.3 (3.4)	0.49
Zinc, mg (EAR)	6.8	12.1 (0.8)	14.2 (0.9)	0.082	25.4 (4.5)	27.7 (4.1)	0.71
Vitamin A, mcg (EAR)	500	--	--	--	--	--	--
Folate, mcg (EAR)	320	619.2 (33.9)	630.0 (40.1)	0.84	20.0 (4.8)	19.0 (6.5)	0.90
Vitamin B6, mg (EAR)	1.3	4.4 (1.1)	3.9 (0.7)	0.64	28.8 (5.6)	27.8 (4.6)	0.89
Vitamin B12, mcg (EAR)	2	70.8 (20.6)	95.3 (27.3)	0.47	6.0 (3.0)	5.0 (2.3)	0.75
Vitamin C, mg (EAR)	75	130.9 (15.7)	131.4 (16.2)	0.98	40.0 (4.0)	45.0 (4.8)	0.42
Vitamin D, mcg (EAR)	10	12.8 (1.6)	17.2 (2.4)	0.13	64.3 (3.6)	58.7 (3.9)	0.29
Vitamin E, mg (EAR)	12	--	--	--	--	--	--

¹age ≥60 years. ²Statistical significance was determined as p<0.00625 to adjust for multiple comparisons using Bonferroni method. Estimates were adjusted for day of the week of recalled day, recall sequence, and supplement use. ³EAR of calcium are 800mg for men 60-70 years of age and 1,000mg for adults over 70 years of age.

Table 3-5. Usual intake from food among U.S. older adults over 60 years **by age group** participating in the Supplemental Nutrition Assistance Program (SNAP) and those participating in other programs (but not SNAP) as drawn from the NHANES 2007-2016¹

		Usual Intake from food					
Nutrient	Daily Recommended Intake	Mean (SE)			% not meeting EAR (SE)		
		SNAP	Other non-SNAP programs	p-value ²	SNAP	Other non-SNAP program	p-value ²
60-70							
Calcium, mg (EAR) ³	800-1,000	814.2 (37.4)	816.9 (39.9)	0.96	67.0 (4.0)	67.0 (4.1)	1.0
Magnesium, mg (EAR) ⁴	265-350	251.9 (8.7)	279.1 (15.1)	0.12	71.2 (3.1)	62.1 (4.5)	0.10
Zinc, mg (EAR) ⁵	6.8-9.4	9.4 (0.3)	10.4 (0.6)	0.14	34.9 (3.4)	37.0 (5.2)	0.74
Vitamin A, mcg (EAR) ⁶	500-625	567.2 (31.2)	588.7 (40.9)	0.68	56.0 (4.2)	58.0 (4.0)	0.73
Folate, mcg (EAR)	320	452.0 (19.1)	492.6 (41.6)	0.38	22.9 (3.9)	14.0 (14.5)	0.55

Vitamin B6, mg (EAR) ⁷	1.3-1.4	1.6 (0.06)	1.9 (0.1)	0.011	32.3 (4.5)	29.4 (4.8)	0.66
Vitamin B12, mcg (EAR)	2	4.2 (0.3)	4.3 (0.2)	0.78	7.7 (2.7)	11.6 (3.9)	0.41
Vitamin C, mg (EAR) ⁸	60-75	70.0 (6.0)	64.6 (6.9)	0.56	56.8 (4.9)	64.3 (5.4)	0.30
Vitamin D, mcg (EAR)	10	4.2 (0.3)	4.9 (0.3)	0.10	95.5 (1.7)	93.9 (2.9)	0.63
Vitamin E, mg (EAR)	12	6.1 (0.4)	7.2 (0.6)	0.13	99.0 (0.7)	88.5 (2.9)	0.0005
70+							
Calcium, mg (EAR)	1,000	748.5 (29.2)	740.8 (27.8)	0.85	82.0 (4.7)	85.0 (3.4)	0.61
Magnesium, mg (EAR) ⁴	265-350	228.7 (6.9)	226.8 (6.2)	0.84	79.8 (2.9)	80.0 (2.6)	0.96
Zinc, mg (EAR) ⁵	6.8-9.4	9.3 (0.5)	8.9 (0.4)	0.53	34.0 (4.7)	39.2 (5.9)	0.49
Vitamin A, mcg (EAR) ⁶	500-625	531.3 (36.7)	579.4 (27.3)	0.29	55.0 (8.2)	47.0 (5.8)	0.43
Folate, mcg (EAR)	320	432.1 (25.3)	418.3 (20.6)	0.67	19.9 (7.9)	20.7 (10.0)	0.95
Vitamin B6, mg (EAR) ⁷	1.3-1.4	1.5 (0.07)	1.6 (0.07)	0.31	34.0 (5.7)	29.4 (13.0)	0.75
Vitamin B12, mcg (EAR)	2	4.5 (0.2)	3.9 (0.2)	0.034	3.5 (2.8)	5.4 (3.8)	0.69
Vitamin C, mg (EAR) ⁸	60-75	74.0 (5.9)	71.5 (5.6)	0.76	50.1 (5.3)	53.1 (4.8)	0.68
Vitamin D, mcg (EAR)	10	4.6 (0.3)	4.4 (0.3)	0.64	96.9 (2.1)	97.2 (1.2)	0.90
Vitamin E, mg (EAR)	12	5.9 (0.3)	6.6 (0.4)	0.16	98.5 (1.5)	95.9 (1.8)	0.270

¹age ≥60 years. ²Statistical significance was determined as p<0.005 to adjust for multiple comparisons using Bonferroni method. Estimates were adjusted for day of the week of recalled day, recall sequence, and supplement use. ³EAR of calcium are 800mg for men 60-70 years of age and 1,000mg for women years of age and adults over 70 years of age. ⁴EAR of magnesium are 350mg for men over 60 years and 265mg for women over 60 years. ⁵EAR of zinc are 9.4mg for men over 60 years and 6.8mg for women over 60 years. ⁶EAR of vitamin A are 625mcg for men over 60 years and 500mcg for women over 60 years. ⁷EAR of vitamin B6 are 1.4mg for men over 60 years and 1.3mg for women over 60 years. ⁸EAR of vitamin C are 75mg for men over 60 years and 60mg for women over 60 years.

Table 3-6. Total usual intake from food among U.S. older adults over 60 years **by age group** participating in the Supplemental Nutrition Assistance Program (SNAP) and those participating in other programs (but not SNAP) as drawn from the NHANES 2007-2016¹

		Total usual nutrient intake	
Nutrient	Daily Recommended Intake	Mean (SE)	% not meeting EAR (SE)

		SNAP	Other non-SNAP programs	p-value ²	SNAP	Other non-SNAP program	p-value ²
60-70							
Calcium, mg (EAR) ³	800-1,000	960.0 (42.4)	952.6 (58.7)	0.92	54.0 (3.8)	56.0 (4.2)	0.72
Magnesium, mg (EAR) ⁴	265-350	275.5 (11.7)	307.4 (14.9)	0.093	65.3 (3.0)	55.7 (3.9)	0.052
Zinc, mg (EAR) ⁵	6.8-9.4	12.4 (0.6)	15.2 (1.3)	0.051	30.0 (3.3)	28.6 (3.8)	0.78
Vitamin A, mcg (EAR) ⁶	500-625	--	--	--	--	--	--
Folate, mcg (EAR)	320	648.0 (32.5)	707.3 (38.5)	0.24	19.0 (3.8)	11.0 (11.2)	0.50
Vitamin B6, mg (EAR) ⁷	1.3-1.4	4.0 (0.6)	5.7 (1.4)	0.27	27.3 (4.2)	21.9 (3.4)	0.32
Vitamin B12, mcg (EAR)	2	57.2 (14.0)	65.7 (22.4)	0.75	7.0 (2.2)	9.0 (3.1)	0.60
Vitamin C, mg (EAR) ⁸	60-75	120.7 (11.3)	129.8 (27.3)	0.76	44.0 (4.4)	48.0 (7.6)	0.65
Vitamin D, mcg (EAR)	10	12.4 (1.6)	18.0 (4.3)	0.22	66.7 (3.0)	61.3 (7.2)	0.49
Vitamin E, mg (EAR)	12	--	--	--	--	--	--
70+							
Calcium, mg (EAR)	1,000	909.9 (38.8)	956.6 (43.2)	0.37	66.0 (4.3)	64.0 (3.7)	0.72
Magnesium, mg (EAR) ⁴	265-350	242.8 (7.5)	259.6 (14.9)	0.31	73.2 (2.8)	71.0 (3.6)	0.63
Zinc, mg (EAR) ⁵	6.8-9.4	12.8 (1.0)	14.8 (1.1)	0.18	28.2 (3.9)	31.8 (4.7)	0.56
Vitamin A, mcg (EAR) ⁶	500-625	--	--	--	--	--	--
Folate, mcg (EAR)	320	601.2 (30.0)	611.3 (39.2)	0.84	14.0 (5.9)	16.0 (7.5)	0.83
Vitamin B6, mg (EAR) ⁷	1.3-1.4	4.4 (1.2)	5.1 (1.2)	0.68	28.0 (4.3)	25.0 (10.3)	0.79
Vitamin B12, mcg (EAR)	2	71.9 (32.8)	117.8 (35.6)	0.34	3.0 (2.0)	4.0 (2.6)	0.76
Vitamin C, mg (EAR) ⁸	60-75	160.5 (36.3)	148.2 (20.2)	0.77	40.0 (4.0)	40.0 (4.0)	1.0
Vitamin D, mcg (EAR)	10	10.2 (0.7)	17.9 (3.2)	0.019	66.2 (3.5)	61.2 (4.2)	0.36
Vitamin E, mg (EAR)	12	--	--	--	--	--	--

¹age ≥60 years. ²Statistical significance was determined as p<0.00625 to adjust for multiple comparisons using Bonferroni method. ³EAR of calcium are 800mg for men 60-70 years of age and 1,000mg for women years of age and adults over 70 years of age. ⁴EAR of magnesium are 350mg for men over 60

years and 265mg for women over 60 years. ⁵EAR of zinc are 9.4mg for men over 60 years and 6.8mg for women over 60 years. ⁶EAR of vitamin A are 625mcg for men over 60 years and 500mcg for women over 60 years. ⁷EAR of vitamin B6 are 1.4mg for men over 60 years and 1.3mg for women over 60 years. ⁸EAR of vitamin C are 75mg for men over 60 years and 60mg for women over 60 years.

Table 3-7. Mean Healthy Eating Index-2015 (HEI-2015) total and component scores among U.S. older adults over 60 years participating in the Supplemental Nutrition Assistance Program (SNAP) and those participating in other programs (but not SNAP) as drawn from the NHANES 2007–2016¹

HEI-2015 component (maximum score)	SNAP participants (n=713)		Other non-SNAP participants (n=493)		<i>P</i> – Value ²
	Mean	SE	Mean	SE	
Total Score (100)	59.4	0.9	59.1	1.2	0.84
Total Fruits (5)	3.2	0.2	3.2	0.2	1.0
Whole Fruits (5)	3.7	0.1	3.6	0.3	0.75
Total Vegetables (5)	3.8	0.1	3.7	0.2	0.65
Greens and Beans (5)	3.3	0.6	2.6	0.4	0.33
Whole Grains (10)	3.2	0.04	3.8	0.3	0.048
Dairy (10)	5.7	0.3	5.7	0.4	1.0
Total Protein Foods (5)	4.8	0.06	5.0	0.02	0.0016
Seafood and Plant Proteins (5)	4.3	0.2	4.2	0.2	0.72
Fatty Acids (10)	4.8	0.3	5.1	0.3	0.48
Refined Grains (10)	5.8	0.3	6.0	0.4	0.69
Sodium (10)	3.5	0.2	2.8	0.4	0.12
Added Sugars (10)	7.2	0.3	6.8	0.3	0.35
Saturated Fats (10)	6.2	0.3	6.7	0.4	0.32

¹Age ≥ 60 years. ²Statistical significance for total score was set as $P < 0.05$. Statistical significance for component scores was determined as $P < 0.00385$ to adjust for multiple comparisons using Bonferroni method. Estimates were adjusted for day of the week of recalled day, recall sequence, race/ethnicity and supplement use.