

Dietary Quality among SNAP Recipients in the Southern United States: Associations with Food Insecurity, Nutrition Insecurity, and Sociodemographic Factors

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Abstract

Background

Poor dietary quality among Supplemental Nutrition Assistance Program (SNAP) recipients remains a significant public health concern, especially in the Southern United States, where food insecurity and diet-related chronic disease burdens are disproportionately high. This study aimed to characterize dietary quality among adults participating in SNAP in the Southern United States and to explore associated sociodemographic, food security, and nutrition security factors.

Methods

A cross-sectional, web-based survey was administered to adults residing across 16 Southern states and the District of Columbia who had received SNAP benefits at any point during the preceding 12 months. Dietary quality was evaluated using the validated Mini Eating Assessment Tool (Mini-EAT). Food and nutrition security were measured using the U.S. Household Food Security Survey Module and a validated 4-item nutrition security scale developed by the Center for Nutrition and Health Impact, respectively. Descriptive statistics, analysis of variance, and multinomial logistic regression analyses were performed to identify predictors of dietary quality.

Results

A total of 1,019 participants completed the study. The sample was predominantly female (54.6%), and the largest age group was early middle-aged adults aged 30–44 years (47.2%). Overall, 62.9% of participants were classified as having unhealthy dietary quality, and only 8.1% achieved a healthy dietary quality. Lower household income, lower educational attainment, and food insecurity each independently predicted worse dietary quality.

Conclusion

Poor dietary quality is highly prevalent among SNAP recipients in the Southern United States and is strongly associated with socioeconomic disadvantage and food insecurity. These findings highlight the need for policies that improve food affordability, strengthen SNAP benefit adequacy, and expand access to nutritionally adequate foods in high-burden Southern communities.

Background

Food insecurity, as defined by the United States Department of Agriculture (USDA), refers to limited or uncertain access to adequate food due to insufficient financial or other resources and

remains a persistent and growing public health problem in the United States (U.S.)[1], with approximately 13.7% of American households being food insecure in 2024, representing roughly 18.3 million households, and the rate has been gradually rising over the years.[2] In 2024, food insecurity rates ranged from approximately 17.6% in Louisiana and Texas to 19.4% in Arkansas, and the Southern region reported a food insecurity prevalence of 15.0%, exceeding that of other U.S. regions.[2, 3] Food insecurity prevalence has disproportionately affected low-income households, racial and ethnic minority groups, and residents of the Southern U.S.[2, 3]

The health consequences of food insecurity are well established and have been explored rigorously, including elevated risks of type 2 diabetes, obesity, hypertension, and cardiovascular disease.[4, 5, 6] As many food security measures and tools currently do not assess or explore nutritional adequacy directly, examining dietary quality may provide additional insight, leading to further exploration of nutrition security among SNAP recipients.[7] In parallel with food insecurity, nutrition security has received increasing attention in recent years, while food security focuses on whether households have sufficient access to food, nutrition security focuses on whether households have consistent access to foods that are nutritionally adequate and promote health and overall well-being.[8] Nutrition security is here defined as the “consistent access, availability, and affordability of foods and beverages that promote well-being and prevent disease.”[8] A household may be classified as food secure while simultaneously consuming a nutritionally inadequate diet, as food security measures do not assess the nutritional quality of the food.[9] Grounded in the Thorndike et al. policy statement, food insecurity operates as a distal antecedent that restricts household food resources, creating conditions that undermine nutrition security.[7] Nutrition security, in turn, serves as a proximal determinant of dietary quality, defined as the overall healthfulness of an individual’s dietary pattern often in terms of adequacy and moderation relative to evidence- or government-based dietary guidelines or recommendations. Households experiencing food insecurity consistently report lower intake of fruits, vegetables, and whole grains, and poor dietary quality, which, in turn, is a well-established risk factor for cardiometabolic disease and mortality.[10, 11] Studies have found that lower intake of fruits and vegetables and high sodium and processed meat intake accounted for a substantial proportion of preventable cardiovascular, diabetes, and stroke-related deaths in the U.S.[11] Chapman and colleagues reported that food insecurity and low nutrition security were associated with poor adult dietary quality, higher prevalence of adult overweight and obesity, and greater reliance on food assistance programs, demonstrating that nutrition security carries independent implications for dietary health outcomes beyond food security status.[12]

The Supplemental Nutrition Assistance Program (SNAP) is one of the largest federal nutrition assistance programs in the U.S., with 41.7 million participants per month in fiscal year 2024.[13] While the program is intended to promote food accessibility and nutritional adequacy among low-income households, the extent to which receiving SNAP benefits improves dietary quality remains limited in the Southern U.S., where poverty rates, food insecurity, and diet-related chronic disease burdens are highest. Research conducted in the Southern U. S. further highlights the substantial dietary quality challenges faced by low-income populations and SNAP participants. In a study of low-income adults residing in the Lower Mississippi Delta Region, approximately 13%–22% of participants failed to meet any recommended food

or nutrient guidelines, while virtually no adults met all dietary recommendations.[14] Compared with income-eligible nonparticipants, SNAP participants consumed 39% fewer whole grains and significantly greater amounts of fruit juice, potatoes, and red meat, suggesting persistent nutritional inadequacies despite participation in food assistance programs. Similarly, Nguyen et al. found that food secure individuals had significantly better dietary quality, as measured by the Healthy Eating Index (HEI), and that the associations between SNAP participation and improved diet quality were stronger among White/Caucasian participants than among Black and Hispanic participants, highlighting important racial and ethnic disparities in nutrition-related outcomes.[15] Additional evidence from disadvantaged neighborhoods in the Southeastern U.S. demonstrated that dietary quality was significantly lower among individuals with lower educational attainment and among those living in food insecure households, indicating that socioeconomic disadvantage and food insecurity remain important determinants of dietary behaviors in the region.[16] Collectively, these studies suggest that poor dietary quality is prevalent among Southern populations with low income and is influenced by a combination of socioeconomic, demographic, and food access factors. Southern states, particularly Texas, Oklahoma, and Louisiana, consistently report among the highest food insecurity rates and diet-related chronic disease prevalence in the country and could be a priority when exploring these interconnected factors related to dietary quality.[2, 3] Addressing this gap is essential to inform targeted nutrition interventions and policies that improve dietary outcomes among populations at elevated risk of diet-related chronic disease. Therefore, this study examined dietary quality and its associations with food security, nutrition security, and sociodemographic factors among SNAP recipients residing in the Southern U.S.

Study Aims

This study examined dietary quality among adults with current or recent SNAP participation residing in the Southern U.S. The objectives were to: (1) characterize dietary quality; (2) examine differences in dietary quality by food security and nutrition security status; (3) assess geographic variation in dietary quality across Southern Census divisions; and (4) identify sociodemographic, food security, and nutrition security factors associated with dietary quality.

Methods

Study Design and Participant Recruitment

A cross-sectional survey consisting of 36 items, including two screening questions and 11 demographic questions, was administered through Qualtrics to reach a demographically diverse sample of respondents. Eligible individuals received an email invitation containing a secure hyperlink, and all participants completed an electronic informed consent process before beginning the survey.

Eligibility criteria required participants to be at least 18 years of age, have received SNAP benefits at any point during the preceding 12 months, and reside within the Southern U.S., including Florida, Georgia,

Maryland, North Carolina, South Carolina, Virginia, West Virginia, Delaware, Alabama, Kentucky, Mississippi, Tennessee, Arkansas, Louisiana, Oklahoma, Texas, and the District of Columbia. The survey was administered from November to December 2025, yielding 1,189 responses. After removal of 132 duplicate submissions and 49 incomplete responses, the final analytic sample comprised 1,019 participants. Ethical approval was obtained from the Oklahoma State University Institutional Review Board (Protocol: IRB-25-532).

Measures

Sociodemographic and household characteristics

Participants' self-reported sociodemographic characteristics, including age, gender, race and ethnicity, highest level of educational attainment, current employment status, and annual household income. Other household-level information was also collected, including total household size, number of children, and geographic identifiers such as state of residence, county, and zip code.

Food Insecurity: Household food insecurity over the prior 12 months was collected and measured using the 10-item U.S. Household Food Security Survey Module, a validated and widely used tool.[17] Each item covered the food access condition over the last 12 months. Responses were "often true," "sometimes," "never true," "yes," or "no." This provided a raw score ranging from 0–10, to map four standard categories: high food security (score = 0), marginal food security (score = 1–2), low food security (score = 3–5), and very low food security (score = 6–10). The categories were dichotomized into broader categories, food secure and food insecure, such that high and marginal categories constituted food security and low and very low categories constituted food insecurity.[17]

Nutrition Security

Household-level nutrition security was assessed using a 4-item Nutrition Security tool validated by the Center for Nutrition and Health Impact.[9] The survey questions explored whether participants could get healthful food, had to eat the same food for several days in a row, or had to eat food that was not good for their health and well-being. The tool generated a total score for each respondent and categorized scores ≤ 2 as nutrition insecurity and > 2 as nutrition security.[9]

Dietary Quality

The primary study outcome, dietary quality, was measured using the Mini-Eating Assessment Tool (Mini-EAT).[18] Mini-EAT is a validated 9-item, brief dietary screener that quantifies overall diet quality through self-reported frequency of consumption across food groups central to nutritional adequacy, including fruits, vegetables, whole grains, fish or seafood, as well as items associated with poor dietary quality such as high-fat dairy and saturated fats, refined grains, and sweets and sweet foods. Scoring and result analyses were conducted using the Mini-EAT scoring tool that was developed and used by permission of Mayo Foundation for Medical Education and Research. By permission of Mayo Foundation for Medical

Education and Research. All rights reserved. Higher scores were set to reflect closer adherence to evidence-based dietary recommendations, while lower scores indicate dietary patterns characterized by greater consumption of unhealthy food and reduced intake of health-promoting food groups.[18]

Statistical Analysis

Analyses were performed with SPSS version 30.0 (IBM Corporation, Armonk, NY, USA). Given the sociodemographic characteristics, household-level variables, and the prevalence and distribution of food and nutrition insecurity across sociodemographic subgroups are the focus of a separate manuscript currently under development, those findings are not reported here. The present analysis focused exclusively on dietary quality as measured by the Mini-EAT and its association with sociodemographic, food, and nutrition security status. Descriptive statistics were computed to characterize dietary quality scores across the full analytic sample. Bivariate analyses examined mean differences in dietary quality across sociodemographic subgroups, including age, gender, race/ethnicity, educational attainment, household income, and household composition, as well as food and nutrition security status, using t test and one-way ANOVA. Post hoc comparisons using Tukey's Honestly Significant Difference (HSD) test were conducted to identify which specific group differences contributed to the overall significant findings. Dietary quality was additionally studied across the three U.S. Census Bureau Southern divisions: the South Atlantic division, which includes Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, West Virginia, Delaware, and the District of Columbia; the East South Central, which includes Alabama, Kentucky, Mississippi, and Tennessee; and the West South-Central division, which includes Arkansas, Louisiana, Oklahoma, and Texas.[19] A logistic regression model was estimated for dietary quality and sociodemographic characteristics, with dietary quality serving as the dependent variable, and all covariates entered simultaneously. Results are reported as odds ratios (OR) with 95% confidence intervals (CI).

Results

In the study sample, sociodemographic and household-level characteristics, including age, gender, race/ethnicity, educational attainment, household income, and household composition, as well as food and nutrition security status, were examined in relation to dietary quality.

Dietary Quality Distribution across Sociodemographic Characteristics

The overall mean dietary quality score for the entire sample of 1019 participants was 59.48 (6.27). Dietary quality was classified into three categories, Unhealthy, Intermediate, and Healthy, based on the Mini-EAT categories across all sociodemographic and household characteristics for the full analytic sample.[18] The distribution was notably skewed toward poor dietary quality: 62.9% of respondents (n = 641) were classified as having unhealthy dietary quality, 28.9% intermediate (n = 295), and only 8.1% (n = 83) healthy.

Notable variation in dietary quality was observed across multiple sociodemographic and household characteristics. Female respondents were more likely than male respondents to be classified as having unhealthy dietary quality (68.0% vs 56.8%), while males had a higher proportion classified as having healthy dietary quality (9.7% vs 6.8%). The prevalence of unhealthy dietary quality declined from 73.2% among respondents with a high school education or less to 43.1% among those with a graduate or professional degree, while the proportion classified as healthy increased from 3.5% to 14.6% across these educational categories. A similar pattern emerged across household income levels, with unhealthy dietary quality most prevalent among low-income respondents (78.8%) and least prevalent among high-income respondents (47.0%), who also had the highest percentage of healthy dietary quality (13.2%).

Food insecurity was consistently associated with poorer dietary quality outcomes. Among food insecure respondents, 66.6% were classified as having unhealthy dietary quality compared with 51.9% of food-secure respondents, while the proportion classified as healthy was lower among food- insecure respondents (7.1% vs 11.2%). Dietary quality also worsened progressively with increasing severity of food insecurity. Respondents experiencing very low food security had the highest prevalence of unhealthy dietary quality (68.0%), compared with 44.4% among those with high food security. By geographic division, the East South-Central Division had the highest proportion of respondents classified as unhealthy dietary quality (69.9%), followed by the West South-Central Division (65.9%) and the South Atlantic Division (59.5%). In contrast, the South Atlantic Division has the highest proportion classified as having a healthy dietary quality (8.9%). More information can be accessed from Table 1.

State-level Variation in Dietary Quality

Figure 1 presents the distribution of dietary quality across all 16 states, and the District of Columbia included in the study. States are ordered by the proportion classified as having unhealthy dietary quality, from highest to lowest. West Virginia had the highest proportion of participants with unhealthy dietary quality (87.5%), followed by Arkansas (84.6%) and Kentucky (81.6%). In contrast, the District of Columbia had the lowest proportion of unhealthy dietary quality (29.4%). Florida (53.1%) and Delaware (46.2%) also had lower proportions of participants with unhealthy dietary quality. The proportion classified as having a healthy dietary quality was uniformly low across all states, ranging from 0% in Kentucky and Mississippi to 14.6% in South Carolina. This wide state-level variation should be interpreted with caution, as sample sizes within several states were small and may not be representative of the broader state population; these figures are presented for descriptive purposes only and are not intended to support state-level comparisons or generalizations.

Mean Dietary Quality Scores by Sociodemographic Characteristics

Significant differences were observed in dietary quality scores across gender, age, education, employment status, household income, household size, food security, nutrition security, and Census

divisions. Gender differences were significant, with male respondents reporting higher mean dietary quality scores than female respondents (60.61 vs. 58.54, $p < .001$). Dietary quality also varied by age group, with early middle-aged adults (30–44 years) reporting the highest mean score (60.35) and older adults (65+ years) reporting the lowest (57.49). Post hoc comparisons confirmed that early middle-aged adults had significantly higher mean scores than both late middle-aged adults ($p=.003$) and older adults ($p<.001$). Mean dietary scores increased progressively with educational attainment, ranging from 57.75 among respondents with a high school diploma or less to 62.60 among those with a graduate or professional degree.

Similarly, dietary quality scores increased across household income categories, with low-income respondents reporting the lowest mean scores (57.08) and high-income respondents the highest (62.11, $p < .001$). Full-time employed respondents had the highest mean dietary quality score (60.94), whereas unemployed or retired respondents and those with disabilities had the lowest (57.16, $p<.001$).

Food security status was also significantly associated with dietary quality. Further, across food security categories, dietary quality declined progressively from high food security (62.20) to very low food security (58.77). Nutrition-secure respondents similarly reported higher dietary quality scores than nutrition insecure respondents (60.17 vs 58.95, $p=.002$). Across Census divisions, the South Atlantic Division reported a slightly higher mean dietary quality score than the West South-Central Division (59.96 vs 58.92, $p=.046$). More information can be accessed from Table 2 as below.

Predictors of Dietary Quality: Multinomial Logistic Regression

Multinomial logistic regression was used to identify independent predictors of the dietary quality category, using healthy dietary quality as the reference category. Education was a significant overall predictor of dietary quality. Compared with respondents with a graduate or professional degree, those with a high school diploma or less had 3.08 times the odds of unhealthy rather than healthy dietary quality ($p=.025$). The odds ratios for some college/associate degree and bachelor's degree did not reach statistical significance for the unhealthy vs healthy comparison.

Household income was one of the predictors, with middle-income respondents (OR = 3.43, 95% CI: 1.33–8.84, $p = .011$) having significantly higher odds of unhealthy relative to healthy dietary quality compared with high-income respondents. Similarly, for the intermediate vs healthy comparison, only middle-income respondents reached marginal significance (OR = 2.64, 95% CI: 1.00–7.00, $p = .05$).

Food insecurity status was an independent predictor of dietary quality. Food secure respondents had significantly lower odds of being classified as having unhealthy dietary quality than healthy compared to food insecure respondents (OR = .49, 95% CI: .26–.92, $p = .026$). Gender, race and ethnicity, age, employment status, children in the household, and nutrition security status were not statistically significant predictors in the adjusted model. More information can be accessed from Table 3 located below.

Table 3
Multinomial Logistic Regression Predicting Dietary Quality

Predictor	Unhealthy vs Healthy			Intermediate vs Healthy		
	OR	95% CI	p- value	OR	95% CI	p-value
Gender (ref: Male)						
Female	0.83	.46–1.45	.508	.90	.50–1.60	.711
Race/Ethnicity (ref: Non-Hispanic White)						
Asian	1.90	.23–15.45	.550	1.38	.15–12.40	.771
Hispanic or Latino	1.14	.47–2.74	.771	1.09	.43–2.73	.857
Native American/Alaska Native	.58	.06–5.19	.622	1.21	.14–10.73	.867
Non-Hispanic Black	.81	.41–1.58	.532	1.19	.59–2.39	.636
Prefer not to answer	.91	.09–9.32	.940	.87	.08–8.98	.904
Employment Status (ref: Unemployed/Retired/Disabled)						
Student	.60	0.12–3.07	.533	1.15	.20–6.62	.875
Full time	.99	0.39–2.57	.997	1.17	.43–3.22	.759
Part time	.79	0.28–2.24	.661	1.01	.33–3.09	.983
Age (ref: Older adults 65+)						
Young adults (18–29)	.35	.08–1.61	.178	0.52	.10–2.64	.432
Early middle-aged (30–44)	.43	.11–1.72	.235	0.51	.12–2.22	.370
Late middle-aged (45–64)	.44	.11–1.72	.240	0.46	.11–1.96	.295
Education (ref: Graduate/Professional degree)						
High school or less	3.08	1.15–8.23	.025*	2.04	.73–5.69	.171
Some college/Associate degree	1.67	.72–3.89	.232	0.72	.29–1.76	.466
Bachelor's degree	1.63	.79–3.37	.191	1.29	.61–2.70	.508
Household Income (ref: High (≥\$75,000))						
Low (<\$35,000)	2.51	1.00–6.34	.051	0.80	.30–2.14	.649
Middle (\$35,000–\$74,999)	3.43	1.33–8.84	.011*	2.64	1.00–7.00	.050*
Household Size (ref: 4 or more persons)						
<i>Note. OR = Odds Ratio; CI = 95% Confidence Interval; Reference outcome category: Healthy Dietary Quality.</i>						

Predictor	Unhealthy vs Healthy			Intermediate vs Healthy		
	OR	95% CI	p- value	OR	95% CI	p-value
1 person	.43	.16–1.21	.109	.61	.21–1.83	.378
2–3 persons	1.65	.83–3.27	.155	1.36	.66–2.78	.402
Children in Household (ref: 3 or more children)						
No children	1.17	.36–3.84	.798	1.27	.36–4.43	.708
1–2 children	.70	.32–1.55	.382	.88	.39–1.99	.756
Nutrition Security (ref: Nutrition insecure)						
Nutrition Secure	1.01	.56–1.82	.977	.90	.48–1.67	.731
Food Insecurity (ref: Food insecure)						
Food Secure	.49	.26–.92	.026*	.97	.50–1.87	.923
<i>Note. OR = Odds Ratio; CI = 95% Confidence Interval; Reference outcome category: Healthy Dietary Quality.</i>						

Discussion

This study found that poor dietary quality is widespread, structurally patterned, and concentrated among the most economically vulnerable SNAP participating adults across the Southern United States. To our knowledge, this is among the first studies to examine dietary quality in relation to both food security and nutrition security among SNAP recipients across multiple Southern states. Nearly two-thirds of the sample (62.9%) scored below the unhealthy threshold, and fewer than one in ten participants achieved a healthy dietary quality classification. These findings parallel those from other dietary quality studies. Andreyeva and colleagues, in their review of studies between 2003–2014, found that adult SNAP participants consistently scored lower on the HEI than both income-eligible and higher-income nonparticipants.[20] Similarly, Wang and colleagues documented that overall dietary quality in the U.S. remains substantially below federal recommendations across all income and education groups, with socioeconomic disparities in dietary quality persisting and in some cases widening over time.[21] On the contrary, a more recent paper provided empirical support for the retail access dimension, showing that SNAP recipients living closer to authorized superstores and grocery stores had higher diet quality scores.[22]

The income gradient in dietary quality was one of the strongest and most consistent associations observed. Respondents with household incomes below \$35,000 had lower mean dietary quality scores than those earning \$75,000. Similarly, as shown in the regression model, middle-income respondents had 3.43 times the odds of unhealthy versus healthy dietary quality compared to high-income respondents. A study utilizing 1999–2008 National Health and Nutrition Examination Survey data among

lower-income adults found that food insecurity was inversely associated with dietary quality [10] in part because food-insecure adults may consume less expensive, energy-dense foods as a coping mechanism under conditions of chronic resource stress.[20] Similarly, Morales and Berkowitz documented that food insecurity was associated with dietary patterns toward cheaper and less healthy foods.[5] Income retained independent predictive significance in the adjusted model, after accounting for food security status, confirming that food purchasing power constraints operate through pathways that extend beyond food access, which can include time available for food preparation, with lower-income adults disproportionately working multiple jobs, and managing irregular schedules.[23] Income also determines geographic proximity to full-service grocery retail, with lower-income neighborhoods more likely to exhibit food swamp conditions, where the density of fast food and convenience outlets substantially exceeds that of supermarkets, making healthier purchasing decisions structurally difficult. [21, 24]

Food insecurity status was a significant independent predictor of dietary quality after adjustment. Food-secure respondents had roughly half the odds of being classified as having unhealthy dietary quality compared to food-insecure respondents. Consistent with prior evidence linking food insecurity to lower consumption of nutrient-dense foods and poorer overall dietary quality, food-secure participants in the present study had substantially lower odds of unhealthy dietary quality than food-insecure participants. [25, 26] The present findings extend this pattern to a large, geographically diverse community-based sample, demonstrating that variation in food access continues to matter for dietary outcomes, even among adults already enrolled in federal food assistance programs. These findings are consistent with the literature, which suggests that food insecurity does not merely reduce the quantity of food available; it fundamentally restructures the decision-making environment in which households make food choices. Under conditions of food insecurity, households adopt a range of compensatory behavioral strategies, including purchasing cheaper processed foods with longer shelf lives, reducing meal frequency, and prioritizing caloric sufficiency, all of which erode dietary quality.[27]

Nutrition security status showed a statistically significant bivariate association with dietary quality. This pattern was similar to that of Chapman et al. who found that low household nutrition security was associated with significantly lower dietary quality scores among food-insecure households with children. [12] A more recent study of SNAP participants in Rhode Island and Connecticut noted that nutrition insecurity was not associated with HEI scores.[28] Statistical suppression does not imply that nutrition security is conceptually redundant. Rather, these findings suggest that the attenuation of the association after adjustment suggests that nutrition security may overlap substantially with food insecurity and socioeconomic disadvantage. Notably, the odds ratios for nutrition security in the adjusted model were not significantly different, suggesting that after accounting for income, education, and food insecurity, nutrition security status conferred virtually no independent influence on the odds of dietary quality classification. One possible explanation is that, in this population, the structural conditions captured by income and food security status thoroughly constrain dietary nutrition security as measured here offer little additional explanatory power. Future studies using longitudinal or mediation analyses are needed to clarify the pathways linked to nutrition security and dietary quality.

The geographic findings add a dimension that most prior work on dietary quality had not addressed systematically. The East South-Central Division had the highest proportion of participants classified as having unhealthy dietary quality and the lowest share in the healthy category. Mean dietary quality scores followed the same pattern, with the South Atlantic Division reporting a significantly higher mean score than the West South-Central Division ($p = .046$). These divisional differences are noteworthy given that all three divisions fall within the same federal region and share broadly similar food assistance policy contexts, yet dietary quality outcomes diverge meaningfully across them. Geographic differences may reflect variation in socioeconomic conditions, food environments, and access to healthy foods across Southern states, although these factors were not directly assessed in the present study. National dietary surveillance data consistently show lower dietary quality scores in the South than in other U.S. regions.[29]

The gender finding that men reported significantly higher mean dietary quality score than women run counter to most diet quality literature, which typically finds that women report better dietary outcomes. [26] Contrary to prior literature, men reported higher dietary quality than women. The reasons for this finding remain unclear and warrant further investigation. Potential explanations may include differences in caregiving responsibilities, household food allocation, or reporting behaviors.

The educational gradient in dietary quality was pronounced and persisted in the adjusted model. Mean scores were higher among participants with a graduate or professional degree than among those with a high school diploma or less, and they also had over 3 times the odds of unhealthy dietary quality compared to respondents with higher educational attainment. Education likely operates through several reinforcing channels. Higher educational attainment is associated with greater food literacy, encompassing not only knowledge of nutritional content but also the skills to plan, prepare, and evaluate food choices amid competing household demands. This suggests that education shaped dietary quality through channels including food literacy, nutrition knowledge, and the capacity to navigate food labeling and preparation contexts.[30, 31] In a population of SNAP recipients with relatively low educational attainment, these findings reinforce the importance of programs that help build practical food preparation skills, budget-conscious meal-planning capacities, and critical competencies in navigating the food environment.

Household composition findings were somewhat unexpected. Larger households and the presence of 1–2 children were each associated with higher dietary quality scores in bivariate analyses, with households of 4 or more members and those with 1–2 children scoring significantly higher than smaller or childless households. These patterns suggest that household food purchasing in the presence of children may involve greater coverage of food groups, potentially driven by heightened parental concern for child nutrition or exposure to child nutrition through WIC and school meals.[5, 25] Hammad et al., similarly found higher dietary quality among graduate students with children than among those without, suggesting that the association between having a child and dietary behavior may be driven by caregiving-related factors.[26] Taken together, these findings have implications for nutrition policy that

extend beyond food assistance alone. The geographic variations in dietary quality across divisions warrant targeted investments in food retail infrastructure, nutrition education, and food assistance.

Strengths and Limitations

This study possesses several methodological strengths. First, it includes a sample of 1,021 participants from 16 states and the District of Columbia, providing broader geographic coverage than most prior studies. Second, the focus on SNAP recipients enables precise characterization of dietary quality within a policy-defined population directly relevant to federal nutrition assistance programming. Third, using regression with a three-category dietary quality outcome preserves meaningful variation in the dietary quality distribution and allows distinct comparisons among unhealthy, intermediate, and healthy categories, yielding more nuanced findings than a binary approach.

Several limitations should be considered when interpreting these findings. The cross-sectional design precludes causal inference, and the direction and mechanisms of associations between study variables cannot be established without longitudinal data. The SNAP-participation status and dietary quality variables were derived from a self-reported instrument, which is subject to bias and variation in participants' interpretations. The online recruitment method may have underrepresented individuals with limited digital access, low literacy, or those residing in rural areas without reliable internet access. The nutrition security measure is an emerging construct, and although validated, its application remains less established than that of traditional food security measures. Additionally, the study did not collect data on food environment characteristics, such as food swamp exposure, which could mediate the relationship between socioeconomic position and dietary quality. Finally, several states had small sample sizes, limiting the statistical reliability of state-level dietary quality estimates, particularly for Delaware, West Virginia, and the District of Columbia.

Conclusion

Poor dietary quality was widespread and strongly associated with indicators of socioeconomic disadvantage among SNAP recipients in the Southern U. S. Nearly two-thirds of participants were classified as having unhealthy dietary quality, and fewer than one in ten achieved a healthy classification. The scale of dietary quality deficits in this population is substantial and consistent across nearly all sociodemographic subgroups examined. Food insecurity was an independent predictor of dietary quality after adjustment for income and other covariates. The findings suggest that dietary quality disparities reflect the cumulative effects of socioeconomic disadvantage operating through multiple pathways. The geographic variation across the Census Bureau's Southern divisions, with the East South-Central states showing the highest dietary quality burden, may help identify geographic areas where additional investigation and targeted nutrition interventions may be warranted. Although the cross-sectional design precludes causal inference, the findings highlight the importance of addressing both economic and food access barriers to support healthier dietary patterns among SNAP participants. Future research should examine how food environment characteristics and nutrition security interact with food insecurity to

influence dietary quality and should employ longitudinal designs to better understand the pathways through which changes in food access and economic resources affect dietary outcomes over time.

Declarations

Author contributions

Conceptualization of the study was carried out by NP. The methodology was developed by NP. The software was developed by KN. Formal analysis was conducted by NP and KN. The investigation was carried out by NP. Resources were provided by NP. The original draft of the manuscript was prepared by NP, KN, SS, RL, JJ, JP, and DH. The manuscript was reviewed and edited by NP, KN, SS, RL, JJ, JP, and DH. The study was supervised by NP.

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The Mini-EAT used in this study to assess dietary quality. By permission of Mayo Foundation for Medical Education and Research. All rights reserved.

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IRB Statement

The study was approved by the Oklahoma State University Institutional Review Board (Protocol: IRB-25-532).

Informed consent statement

Informed consent was obtained from all subjects involved in the study.

Consent for Publication

Not applicable

Competing interests

The authors declare that they have no competing interests.

Availability of data and materials

The datasets generated and/or analyzed during the current study are not publicly available due but are available from the corresponding author on reasonable request.

References

1. US Department of Agriculture, Economic Research Service. Food Security in the US. USDA. 2026. Accessed March 26, 2026. <https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/definitions-of-food-security>
2. Rabbitt MP, Reed-Jones M, Hales LJ, Suttles S, Burke MP. Household Food Security in the United States in 2024. US Department of Agriculture, Economic Research Service; 2025. Report No. ERR-358. <https://doi.org/10.32747/2025.9458834.ers>.
3. Food Research & Action Center. USDA food security report highlights startling hunger crisis in America. FRAC. 2024. Accessed April 1, 2026. <https://frac.org/news/usdafoodsecurityreportsept2024>
4. Casagrande SS, Bullard KM, Siegel KR, Lawrence JM. Food insecurity, diet quality, and suboptimal diabetes management among US adults with diabetes. *BMJ Open Diabetes Res Care*. 2022;10:e003033. <https://doi.org/10.1136/bmjdr-2022-003033>.
5. Morales ME, Berkowitz SA. The relationship between food insecurity, dietary patterns, and obesity. *Curr Nutr Rep*. 2016;5(1):54–60. <https://doi.org/10.1007/s13668-016-0153-y>.
6. Royer MF, Rosas LG, King AC. Food insecurity and cardiovascular disease risk factors among US adults. *BMC Public Health*. 2025;25:817. <https://doi.org/10.1186/s12889-025-22031-9>.
7. Thorndike AN, Gardner CD, Kendrick KB, et al. Strengthening US food policies and programs to promote equity in nutrition security: a policy statement from the American Heart Association. *Circulation*. 2022;145(24). <https://doi.org/10.1161/CIR.0000000000001072>.
8. Mozaffarian D, Fleischhacker S, Andrés JR. Prioritizing nutrition security in the US. *JAMA*. 2021;325(16):1605–6. <https://doi.org/10.1001/jama.2021.1915>.
9. Calloway EE, Carpenter LR, Gargano T, Sharp JL, Yaroch AL. Development of new measures to assess household nutrition security, and choice in dietary characteristics. *Appetite*. 2022;179:106288. <https://doi.org/10.1016/j.appet.2022.106288>.
10. Leung CW, Epel ES, Ritchie LD, Crawford PB, Laraia BA. Food insecurity is inversely associated with diet quality of lower-income adults. *J Acad Nutr Diet*. 2014;114(12):1943–53. <https://doi.org/10.1016/j.jand.2014.06.353>.
11. Micha R, Peñalvo JL, Cudhea F, Imamura F, Rehm CD, Mozaffarian D. Association between dietary factors and mortality from heart disease, stroke, and type 2 diabetes in the United States. *JAMA*. 2017;317(9):912–24. <https://doi.org/10.1001/jama.2017.0947>.
12. Chapman KL, Haushalter K, Wu AJ et al. Nutrition security, diet quality, and food assistance program use among food insecure households with children: a cross-sectional analysis. *Nutr Health* Published online 2026:1–8. <https://doi.org/10.1177/02601060261445338>
13. US Department of Agriculture, Economic Research Service. Supplemental Nutrition Assistance Program (SNAP). USDA. 2025. Accessed April 15, 2026. <https://www.ers.usda.gov/topics/food-nutrition-assistance/supplemental-nutrition-assistance-program-snap>

14. Champagne CM, Casey PH, Connell CL, Lower Mississippi Delta Nutrition Intervention Research Initiative, et al. Poverty and food intake in rural America: diet quality is lower in food insecure adults in the Mississippi Delta. *J Am Diet Assoc.* 2007;107(11):1886–94. <https://doi.org/10.1016/j.jada.2007.08.003>.
15. Nguyen BT, Shuval K, Bertmann F, Yaroch AL. The Supplemental Nutrition Assistance Program, food insecurity, dietary quality, and obesity among US adults. *Am J Public Health.* 2015;105(7):1453–9. <https://doi.org/10.2105/AJPH.2015.302580>.
16. Wilcox S, Sharpe PA, Liese AD, Dunn CG, Hutto B. Socioeconomic factors associated with diet quality and meeting dietary guidelines in disadvantaged neighborhoods in the Southeast United States. *Ethn Health.* 2020;25(8):1115–31. <https://doi.org/10.1080/13557858.2018.1493434>.
17. US Department of Agriculture, Economic Research Service. US Adult Food Security Survey Module. USDA. 2012. Accessed April 16, 2026. <https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-u-s/survey-tools/>
18. Lara-Breitinger KM, Medina Inojosa JR, Li Z, et al. Validation of a brief dietary questionnaire for use in clinical practice: Mini-EAT (Eating Assessment Tool). *J Am Heart Assoc.* 2023;12(1):e025064. <https://doi.org/10.1161/JAHA.121.025064>.
19. Rector. Southern United States, Published EBSCO. 2022. Accessed March 27, 2026. <https://www.ebsco.com/research-starters/social-sciences-and-humanities/southern-united-states>
20. Andreyeva T, Tripp AS, Schwartz MB. Dietary quality of Americans by Supplemental Nutrition Assistance Program participation status: a systematic review. *Am J Prev Med.* 2015;49(4):594–604. <https://doi.org/10.1016/j.amepre.2015.04.035>.
21. Wang DD, Leung CW, Li Y, et al. Trends in dietary quality among adults in the United States, 1999 through 2010. *JAMA Intern Med.* 2014;174(10):1587–95. <https://doi.org/10.1001/jamainternmed.2014.3422>.
22. Li Q, Zhao S. Access to SNAP-authorized retailers and diet quality among SNAP recipients. *JAMA Health Forum.* 2025;6(4):e250677. <https://doi.org/10.1001/jamahealthforum.2025.0677>.
23. Rahkovsky I, Young J, Carlson A. Consumers Balance Time and Money in Purchasing Convenience Foods. US Department of Agriculture; 2018. Report No. ERR-251. <https://ageconsearch.umn.edu/record/276227?v=pdf>. Economic Research Service.
24. Abdul Razak S, Atoloye AT, Antrum CJ, et al. Food swamps and transportation access: intersecting structural determinants of food shopping and access in marginalized urban communities. *Int J Environ Res Public Health.* 2025;22(10):1481. <https://doi.org/10.3390/ijerph22101481>.
25. Hanson KL, Connor LM. Food insecurity and dietary quality in US adults and children: a systematic review. *Am J Clin Nutr.* 2014;100(2):684–92. <https://doi.org/10.3945/ajcn.114.084525>.
26. Hammad NM, Zimmer M, Chen JT, Tobias DK, Willett WC, Leung CW. Associations between food insecurity and diet quality among graduate students and postdoctoral trainees in the health sciences at a private university in Boston: a cross-sectional study. *Curr Dev Nutr.* 2024;8(6):102157. <https://doi.org/10.1016/j.cdnut.2024.102157>.

27. Niroula K, Abdul Razak S, Kalinowski J, Blackman Carr LT, Gorin A, Cooksey Stowers K. Understanding food and nutrition insecurity among college students: evidence from a cross-campus study. *Nutrients*. 2026;18(6):951. <https://doi.org/10.3390/nu18060951>.

28. Oddo VM, Leider J, Tovar A, Powell LM, Elenio E, Vadiveloo MK. Food insecurity and risk of nutrition insecurity among Supplemental Nutrition Assistance Program participants in Rhode Island and Connecticut, USA. *Prev Med Rep*. 2025;51:103002. <https://doi.org/10.1016/j.pmedr.2025.103002>.

29. Vadiveloo M, Perraud E, Parker HW, Juul F, Parekh N. Geographic differences in the dietary quality of food purchases among participants in the Nationally Representative Food Acquisition and Purchase Survey (FoodAPS). *Nutrients*. 2019;11(6):1233. <https://doi.org/10.3390/nu11061233>.

30. Mancone S, Corrado S, Tosti B, et al. Enhancing nutritional knowledge and self-regulation among adolescents: efficacy of a multifaceted food literacy intervention. *Front Psychol*. 2024;15:1405414. <https://doi.org/10.3389/fpsyg.2024.1405414>.

31. Olstad DL, McIntyre L. Educational attainment as a super determinant of diet quality and dietary inequities. *Adv Nutr*. 2025;16(9):100482. <https://doi.org/10.1016/j.advnut.2025.100482>.

Table 1 and 2

Table 1 and 2 are available in the Supplementary Files section.

Figures

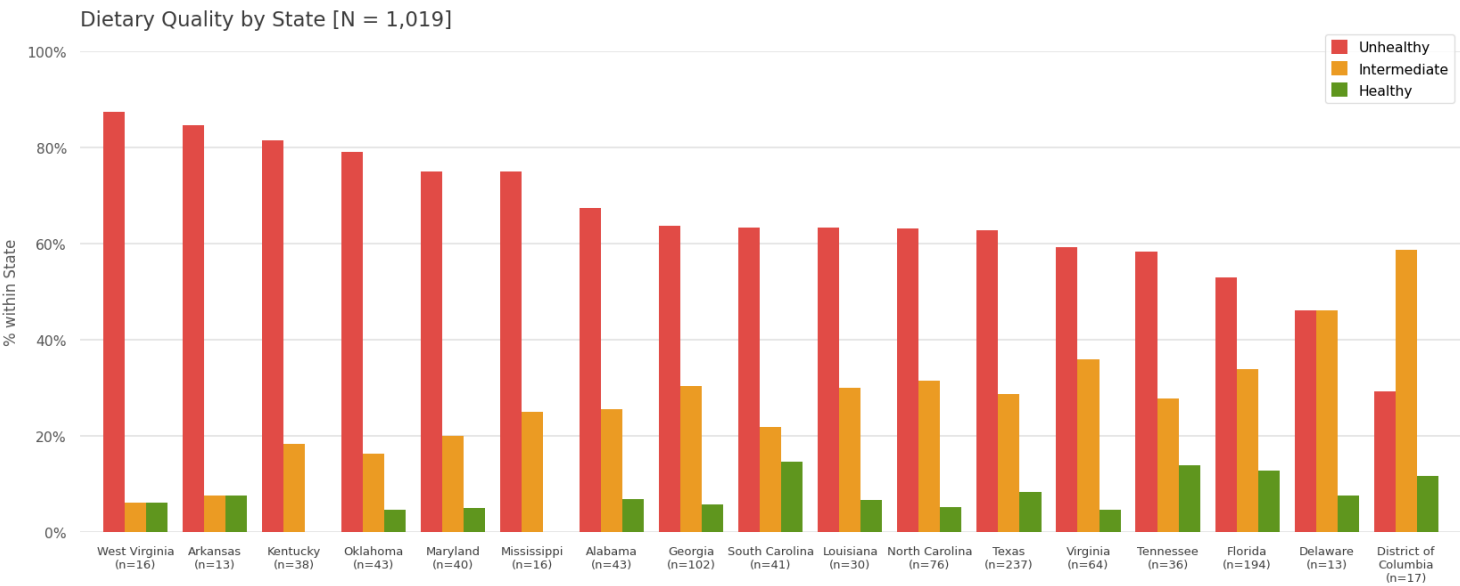


Figure 1

Dietary Quality across Different States

Supplementary Files

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- [Table12.docx](#)