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Do food expenditure patterns of Supplemental Nutrition Assistance Program households meet Thrifty Food Plan recommendations?

Namrata Sanjeevi, PhD [Postdoctoral Fellow],

Social and Behavioral Sciences Branch, Eunice Kennedy Shriver National Institute of Child Health and Human Development, **Address:** 6710B Rockledge Drive Room 3165A, MSC 7004, Bethesda, MD 20817, USA, **Phone number:** 734-389-5552, namratas@utexas.edu

Jeanne-Freeland Graves, PhD, RD, FACN* [The Bess Heflin Centennial Professor],

Division of Nutritional Sciences, The University of Texas at Austin, **Address:** 1 University Station, A2700, The University of Texas at Austin, Austin, TX 78712, USA, **Phone number:** 512-619-3102, jfg@mail.utexas.edu

Prageet K. Sachdev, Masters in Public Health [PhD Candidate], and

Division of Nutritional Sciences, The University of Texas at Austin, **Address:** 1 University Station, A2700, The University of Texas at Austin, Austin, TX 78712, USA, **Phone number:** 979-229-0584, Prageet@utexas.edu

Jeanette Sands, BS Chemistry [Masters Candidate]

Division of Nutritional Sciences, The University of Texas at Austin, **Address:** 1 University Station, A2700, The University of Texas at Austin, Austin, TX 78712, USA, **Phone number:** 214-679-1528, jeanette.sands@gmail.com

Abstract

The Supplemental Nutrition Assistance Program (SNAP) increases the food purchasing power of its clients by distribution of monthly benefits. The goal of this study was to determine if food expenditure patterns of SNAP households meet the Thrifty Food Plan (TFP) recommendations. Results indicated that greater TFP-adjusted total grocery expenditure was significantly associated with greater spending on low fat dairy, vegetables, whole grains and fruits relative to the recommendations. Future research could focus on psychosocial factors associated with inadequate grocery spending among SNAP households.

Background

The Supplemental Nutrition Assistance Program (SNAP) (previously Food Stamps) is the largest nutrition assistance program in the United States. It aims to strengthen the food purchasing power of low-income Americans by distribution of monthly benefits¹. These benefits enable an individual to buy most foods and beverages, with the exception of alcohol, tobacco, dietary supplements, and hot or prepared foods². In 2017, nearly \$63.7

*Corresponding Author: Jeanne-Freeland Graves.

billion was distributed as SNAP benefits to 42.2 million individuals ³. The best possible and most effective use of these benefits is essential, so that SNAP participants can achieve low-cost, healthy diets.

Food purchasing behaviors are important determinants of dietary intake in low-income populations, as 72% of the energy intake is accounted for by foods consumed at-home ⁴. Food plans developed by the United States Department of Agriculture's (USDA) suggest recommended amounts to be spent on groceries in order to help families achieve a nutritious diet ⁵. These include the thrifty-, low-cost, moderate-cost and liberal-cost plans. Of these, the Thrifty Food Plan (TFP) serves as the basis for allotment of SNAP benefits ⁵. SNAP benefits are allotted so that when combined with household's resources, the amount provided will help households access a healthy and minimal cost diet ⁶. Moreover, the TFP provides guidance on food category spending for SNAP participating households. The objective of this study was to discern monthly food expenditure patterns of SNAP clients by analysis of grocery receipts, and to compare these to the TFP recommendations. Although the TFP offers low-cost food choices, it has been shown that SNAP households do not spend the recommended amount for total groceries ⁷. Consequently, this disparity may affect the purchasing patterns of certain food categories. A secondary goal of this study was to determine the association of TFP-adjusted total grocery expenditure with food category spending relative to TFP recommendations. Analysis of adequacy of food expenditures in SNAP households is important in view of the 2013 cuts in benefit allotment, where a household of four lost \$36 of benefits per month ⁸.

Methods

This study utilized grocery receipts to record food expenditure patterns as they are considered to provide a detailed representation of household food purchases over a multi-week time period ⁹.

Design

A sample of 160 women successfully completed this study. On the first encounter, women were administered a demographics questionnaire and instructed to save household grocery receipts for one month. At the last visit, receipts for the month were collected.

Participants

Enrollment criteria were: participation in the SNAP program, ages 18-50 years old, and Hispanic, non-Hispanic White or African-American ethnicity. Since women identified themselves as the primary grocery shoppers in this population, male SNAP participants were not recruited. Pregnant or lactating women and women with chronic health conditions were excluded. A total of 217 women who met the criteria were recruited from low-income residential housing and neighborhood centers in Central Texas from January-December 2015. Of the 217 women recruited, 166 saved their grocery receipts. Six participants were excluded due to insufficient grocery receipt data; resulting in a final sample of 160. This study was granted an exempt status by the Institutional Review Board at The University of Texas at Austin, based on 45 46.101 (b)(2) Code of Federal Regulations. Participation in the

study was voluntary and informed consent was obtained from participants. The receipts and demographics questionnaire were numbered sequentially.

Demographic Questionnaire

A modified demographics questionnaire, developed by the author¹⁰, was used to record information regarding ethnicity, age, education, amount of monthly SNAP benefits, income, household size, and age and gender of each household member.

Thrifty Food Plan (TFP) 2015

The TFP is the basis of the amount of SNAP benefits that are needed to achieve a healthy diet at a minimal cost³². The cost of the TFP is based primarily on raw ingredients over convenience foods, and assumes that all meals are prepared at home. The 2015 plan provides the percentage of total expenditures that should be spent on 29 food categories for 15 age-gender groups. The TFP recommendation for each food category is determined from a weighted average of the amount to be spent on the food category for each of the age-gender classifications, in which average is weighted according to the number of household members in each age-gender cohort. The total monthly recommended cost for groceries also is calculated by summation of the indicated costs on 29 food categories (Personal Communication, Lino M).

Food Receipts

Participants were asked to collect all grocery receipts for one month, as SNAP clients receive their program benefits once a month. Moreover, distribution of benefits once every month has been associated with spending less on groceries towards the end of the month^{11,12}. Thus, a 1-month time period would be inclusive of these changes in expenditures. The total grocery expenditure for 1-month was calculated from the receipts. Further, expenditure related to SNAP benefits for one month were recorded from the receipts, and compared to the benefit amount specified in the demographic questionnaire. If the SNAP expenditure obtained from the receipts was less than 90% of the benefit amount denoted in the demographics questionnaire, the receipts of the respective participant were excluded from analysis. By this criterion six participants were excluded, decreasing the sample size to 160. A cut-off of 90% of the total amount of benefits received from SNAP, as indicated in the demographics survey, was utilized since program benefits are sometimes carried over to the next month. Consequently, some individuals may not spend their entire benefits within one month. By this method, the average SNAP-related expenditure for the sample of 160 women was 100.5% of the monthly benefit amount specified in the demographics.

Each food item in the receipts was classified into one of the 29 TFP food categories. The amount and percentage spent on each food category was determined. Food items with indistinct description on receipts were clarified by consulting with the listed retailer, and clarification was obtained for 71 receipts. Four TFP food categories were expanded for a more detailed analysis of expenditure patterns, including 1) refined grains; 2) whole milk, yogurt and cream; 3) potato and potato products; and 4) soft drinks, sodas, fruit drinks and ades. For example, refined grains was divided further into refined grains bread, rice and pasta; sweet snacks; salty snacks; and cereals.

Statistical Analysis

Descriptive statistics were used for all demographic characteristics. A sign test with a Bonferroni-Holm correction was conducted to determine differences between actual household food expenditures and recommendations for the 29 TFP food categories. This method was chosen over the traditional Bonferroni correction, in order to retain greater statistical power¹³. A simple linear regression was used to determine the association between demographic variables, such as household size, number of children and socio-economic status indicator, and TFP-adjusted total grocery expenditure. A multivariate regression analysis was conducted using the ratio of the total grocery expenditure to TFP recommended cost as the independent variable. The ratios of amount spent on 29 food categories to its respective TFP recommendation were used as the dependent variables. Food expenditure analyses are expressed relative to the TFP cost in order to adjust for compositional differences across households^{7,14}. However, since TFP amounts of some food categories were 0 for certain age-gender groups, additional analyses using absolute differences between food expenditures and TFP costs were performed. The regression analyses accounted for variation across respondents in demographic characteristics. Standardized β coefficients (obtained by standardizing the variables) and standard errors are reported, with two-tailed $p < 0.05$ used for significance. All the analyses were performed using the Statistical Package for the Social Sciences (SPSS 22, Armonk, NY, 2013)¹⁵.

Results

Demographics

Table 1 indicates the demographic characteristics of the study sample. The age of participants ranged from 19-50 years, and the median household size was three. The household income was adjusted for family size by dividing it by the Census Bureau-based poverty threshold, as described by Daly et al., in order to obtain an optimal socioeconomic status indicator¹⁶. The mean value of this indicator was 0.68. The overwhelming majority of the total sample was Hispanic (72%). About 38% of the participants had a partial college degree, and 62% had an educational level less than partial college.

Monthly grocery expenditure

Table 2 indicates the average monthly grocery expenditure, the monthly TFP recommended total cost, and the amount of spending using SNAP benefits. The monthly grocery expenditure and SNAP benefits utilized were lower than the mean TFP recommended total cost calculated for the participating households (\$476) ($p < 0.001$).

Household size ($\beta = -0.789$, $p < 0.001$) and number of children ($\beta = -0.635$, $p < 0.001$) were negatively associated with TFP-adjusted monthly grocery expenditures; no significant relationship was observed for household size-adjusted family income (data not presented).

Food purchasing patterns and TFP recommendations

Figure 1 shows a comparison of recommendations of the TFP for 29 food categories with monthly percentage food expenditures of SNAP households. Significant differences between actual expenditure and TFP recommendation were found for numerous food categories, with

the exception of other vegetables, gravies and condiments, fats, and coffee and tea. Refined grains, red meat, whole fruits and other vegetables represented the highest proportions of expenditure; whereas, food categories with the lowest percentage expenditures were soups (ready-to-serve and condensed), soups (dry), orange vegetables, and whole grain breads, rice and pasta. Some of the food categories for which actual expenditures exceeded recommendations include: refined grains (15.3% vs 7.9%); red meat (11.1% vs 5.9%); frozen entrees (5.9% vs 0.07%); soft drinks, fruits drinks and ades (5.6% vs 0.06%); bacon, sausage and lunch meats (5.2% vs 0.3%); and sugar, sweets and candies (4.9% vs 0.1%). Some categories in which the expenditures were significantly lower than recommendations include whole grain breads, rice and pasta (0.5% vs 7.2%); dark green vegetables (0.7% vs 5.8%); orange vegetables (0.5% vs 2.7%); legumes (0.8% vs 5.6%); whole fruits (8.1% vs 12.6%); low fat dairy (3.6% vs 13.4%); and nuts and nut butters (1.4% vs 4.0%). The monthly amount of purchase was highest for refined grains (\$45.53), followed by red meat (\$32.35) (data not presented).

Figure 2 illustrates that bread, rice, and pasta and sweet snacks collectively were 75% of the total expenditure within refined grains. A breakdown of potato and potato products showed that expenditure on potato chips and products (\$3.81) was more than three times that of potatoes (\$1.58). Whole milk (\$3.31) and cream (\$2.91), such as sour cream, cream substitutes and dips accounted for a greater share than full fat yogurt (\$0.68). Finally, the purchase amount of soft drinks (\$8.14) was the highest within the soft drinks, fruit drinks, and ades category.

Association between TFP-adjusted monthly grocery expenditure and recommended food category spending

Table 3 and Supplementary table 1 show the relationship between TFP-adjusted monthly grocery expenditure and recommended food category spending among SNAP participants using relative and absolute differences, respectively. As indicated in Table 3, a greater TFP-adjusted expenditure share was significantly associated with increased spending on majority (16 of the 29) of the food categories, relative to recommendations. Notably, a significant standardized β coefficient was observed for fruits, legumes, low fat dairy, orange vegetables, other vegetables, whole grain breads, rice and pasta, and dark green vegetables. The amount spent on monthly groceries did not significantly influence spending on the following food categories relative to TFP recommendations: milk drinks and milk desserts, whole grain cereal, fats, gravies and condiments, nuts and nut butters, frozen entrees, whole milk, yogurt and cream, fruit juice, soups (dry), soft drinks, sodas, fruit drinks and ades, whole grain snacks, coffee and tea, soups (ready to serve and condensed).

Discussion

The mean SNAP benefits (\$243) in our study represented 79% of total household grocery expenditure, indicating these benefits are a critical resource for food supply in this low-income population. However, the total monthly grocery expenditure (including SNAP and non-SNAP related expenditure) was lower than the TFP recommended total cost by approximately 35%. Moreover, total grocery expenditures lower than the TFP recommended

total cost were reported for 84% of the households. However, the TFP assumes that SNAP clients prepare all their meals from scratch using raw ingredients. In contrast, the average meal preparation time in the US has been shown to be less than that indicated by the TFP model ¹⁷. Thus, families with lower grocery expenditures could be relying on food away from home due to lack of time or other resources. The share of groceries accounted for by frozen entrees (5.9%) in the present study suggests a limited use of convenience foods in this population. This study also found that household size and number of children negatively affected the TFP-adjusted total grocery expenditure. The presence of more household members could influence eating patterns of the household, such as greater consumption of food away from home, thereby explaining the observed lower grocery expenditure. The socio-economic status indicator did not significantly influence monthly grocery spending, relative to the TFP cost. This finding suggests that factors other than household income may be involved in budget allocation for groceries in this population.

Results obtained from this study also indicate that food spending patterns of SNAP participants did not meet the majority of the recommendations of the TFP. Of particular concern is that soft drinks, sodas, fruit drinks and ades represented 5.7% of the total market basket expenditure. The amount spent on this category is similar to that obtained by Andreyeva et al. who utilized grocery scanner data from a supermarket chain to assess beverage purchases of households ¹⁸. Expenditures comparable to ours were observed for soft drinks (2.6% vs 2.7%), fruit drinks (1.4% vs 1.5%) and energy drinks (0.3% vs 0.2%) ¹⁸, respectively. However, their reported spending was slightly lower for 100% fruit juices (1.2% vs 2.2%) and diet beverages (0.07% vs 0.9%), but higher for sports drinks (0.9% vs 0.4%), respectively. Moreover, spending on soft drinks, sodas, fruit drinks and ades was comparable to that reported by Garasky et al. using point-of-sale transaction data from 2011 ¹⁹.

The total of refined grains and red meat combined represented one-quarter of the monthly household expenditure share on grocery purchases. The percentage expenditure on these two food categories were double the TFP recommendations. Notably, the percentage spent on the food category, other vegetables, was similar to the TFP recommendation. This congruence might be attributed to the high percentage of a Hispanic population in our sample, as the amount spent on vegetables is greater among Hispanics compared to Non-Hispanic Whites and African Americans ²⁰.

A higher expenditure for total monthly groceries relative to TFP recommendation was associated with greater spending on several nutrient-dense food groups, including low fat dairy, vegetables, whole grain breads and fruits. But, the average amounts spent on these food groups did not meet the TFP recommendations. The limited purchasing of these nutrient-dense food categories in SNAP households should be addressed in nutrition education efforts, especially in families that spend substantially lower than recommended amounts for total monthly groceries.

Snacks that are high in sugar and fat accounted for about 52% of the refined grain-based purchases. Thus, it would be helpful for the TFP to define sub-groups within the refined grains category, and provide recommended expenditures for these groups. Finally, a greater

expenditure share relative to TFP recommended total cost did not change the amount spent on some food groups that exceeded recommendations, including milk drinks and desserts, frozen entrees, soups (dry), and soft drinks, fruit drinks, sodas and ades.

The findings of this study are subject to certain limitations. This research utilized a relatively small sample size when compared to participation in SNAP at a national level. In contrast to national level SNAP participation where Whites form the major racial/ethnic group (40.2%) ²¹, the recruited sample from Central Texas was predominantly Hispanic and the proportion of Whites in the sample was 10%. Further, percentage of participants with an income-to-poverty ratio of less than 0.5 (26.1%) was lower than the national distribution (42.7%) ²², thus limiting the generalizability of results. Although the use of grocery receipts excludes errors that may occur with self-report, the type of foods purchased may vary widely from one shopping trip to another. Thus, receipt data from a single shopping occasion may not represent consistent food purchasing behaviors of an individual. Collection of grocery receipts for one month in this study could have reduced bias that arises from a one-time assessment of food purchasing patterns. However, exclusion of receipt data where monthly SNAP expenditure was less than 90% of that denoted in the demographics was arbitrary.

In the present study, interpretation of grocery receipts in this study was based solely on expenditure data. Spending patterns at the household level may not necessarily reflect an individual's total dietary intake. Sekula et al. reported good agreement between data obtained from budget survey and consumption of potatoes, vegetables, meat, poultry, and animal fats; whereas, comparisons with other food groups were less ²². Moreover, some food items represented in the receipts may not be consumed by the participant or other household members. Another limitation is that the cost of individual diets was not assessed which would be useful to determine diet expenditure and disease associations ²³. Finally, ambiguity may arise due to classification of different foods into specific food categories. For example, foods such as frozen pizza, frozen lasagna and frozen pot pie were classified jointly under one food category, frozen entrees. But the utilization of food categories helped define expenditure patterns due to the large number of foods present in grocery receipts.

This study focused on foods that are consumed primarily at home, and does not consider foods purchased from restaurants and fast food establishments. Also foods might be obtained from sources that do not provide receipts, such as friends and family. Any changes in habitual shopping behaviors during the data collection period are also potential for bias.

Conclusions

These results emphasize that the SNAP plays a predominant role in food acquisition of participating families, and indicate the need to enhance food purchasing behaviors of at-risk SNAP families. Expenditure shares for refined grains and red meat accounted about one-fourth of the TFP market basket. This study also implies that SNAP households may spend more on low fat dairy, vegetables, whole grains and fruits with increases in food purchasing power. Future research could focus on psychosocial factors associated with inadequate grocery spending. An understanding of factors involved in food selection decisions may help

health professionals better target nutrition education materials to specific types of participants.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1.

Comparison of mean TFP^a expenditure share with average actual expenditure share of SNAP^b households for 29 food categories

Significant differences were observed between actual expenditure share and TFP recommendation for all food categories, except for other vegetables, gravies and condiments, fats, and coffee and tea. p-value <0.05/ n_i was used for significance, where n_i is the number of food categories based on Bonferroni-Holm method. Amount spent on water was not included in this analysis.

* Vegetables other than potato, legumes, dark green and orange vegetables

^aTFP = Thrifty Food Plan

^bSNAP = Supplemental Nutrition Assistance Program

Figure 2.

Percentage of food category expenditure spent on sub groups within each category
 Refined grains was divided into refined grains bread, rice and pasta; sweet snacks; salty snacks; and cereals
 Potato and potato products was divided into potato chips, other potato products, and potato
 Whole milk, yogurt and cream was divided into whole milk, yogurt, and fluid creams, cream substitutes and dips
 Soft drinks, sodas, fruit drinks and ades was divided into soft drinks, fruit drinks, energy drinks, diet soda, and sports drinks

Table 1Demographic profile of a sample of women participating in SNAP^a (n=160)

Demographics	%
Age, yrs	
19-30	26.1
30-40	55.4
40-50	18.5
Household size	
1	10.0
2-4	67.5
> 4	22.5
Number of children	
0 or 1	39.4
2-4	60.0
> 4	0.6
Socio-economic status indicator^b	
< 0.60	33.1
0.60-1.00	47.8
>1.00	19.1
Race/ ethnicity	
Non-Hispanic White	10.0
Non-Hispanic Black	18.8
Hispanic	71.3
Education	
Less than high school diploma	29.6
High school	32.7
Partial college/ graduate	37.7

^aSNAP = Supplemental Nutrition Assistance Program^bhousehold income relative to family size-adjusted Census Bureau poverty threshold

Table 2

Average recommended and actual grocery expenditure for a sample of households participating in SNAP^a
(n=160)

Grocery Expenditure Per Month	Dollars
Thrifty Food Plan recommendation	476.42±15.06 ^b
Total grocery expenditure	308.97±8.53
Difference between Thrifty Food Plan recommendation and total grocery expenditure	167.45±12.73 *
SNAP benefits utilized	244.74±8.75
Difference between Thrifty Food Plan recommended expenditures and SNAP benefits utilized	231.68±13.11 *

^a Mean±Standard Error of Mean

^b SNAP = Supplemental Nutrition Assistance Program

* p<0.001

Table 3Relationship between total grocery spending and food category expenditure, relative to TFP recommendations^a

Food category (dependent variable)	Standardized β coefficient ^b	Standard error of β	p-value of β
Fruits	0.881	0.152	<0.001
Poultry	0.817	0.175	<0.001
Cheese	0.789	0.136	<0.001
Sugar, sweets and candies	0.787	0.116	<0.001
Bacon, sausage and lunchmeat	0.725	0.14	<0.001
Legumes	0.719	0.191	<0.001
Eggs and egg mixtures	0.676	0.122	<0.001
Low fat dairy	0.642	0.194	0.002
Orange vegetables	0.492	0.196	0.014
Other vegetables ^c	0.470	0.104	<0.001
Refined grains	0.469	0.111	<0.001
Potato and potato products	0.458	0.185	0.016
Milk drinks and milk desserts	0.403	0.211	0.061
Whole grain cereal	0.398	0.243	0.106
Whole grain breads, rice and pasta	0.372	0.151	0.016
Seafood	0.324	0.141	0.025
Red meat	0.293	0.088	0.001
Fats	0.256	0.146	0.083
Dark green vegetables	0.224	0.093	0.019
Gravies and condiments	0.192	0.105	0.073
Nuts and nut butters	0.185	0.209	0.379
Frozen entrees	0.169	0.159	0.293
Whole milk, yogurt and cream	0.117	0.130	0.372
Fruit juice	0.065	0.060	0.282
Soups (dry)	0.046	0.171	0.790
Soft drinks, sodas, fruit drinks and ades	0.038	0.021	0.073
Whole grain snacks	0.024	0.053	0.650
Coffee and tea	-0.160	0.240	0.508
Soups (ready to serve and condensed)	-0.270	0.186	0.152

TFP = Thrifty Food Plan

^a For this multivariate regression model, the independent variable was the ratio of total grocery expenditure to TFP recommended total cost, and the dependent variables were ratios of amount spent on each food category to its respective TFP recommendation

^b Adjusted for demographic characteristics

^c Vegetables other than potato, legumes, dark green and orange vegetables