Timing of Supplemental Nutrition Assistance Program Benefits and Families' Home Food Environments

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abstract

BACKGROUND AND OBJECTIVES: Supplemental Nutrition Assistance Program (SNAP) benefits are designed to buffer families from food insecurity, but studies suggest that most benefits are used by midmonth. In this study, we examined whether the home food environment varies across the SNAP benefits cycle among participating families .

METHODS: Participants in this mixed-methods study were 30 SNAP participants who were primary caregivers of a child ages 4–10 years. The home food environment was measured 1 week before SNAP benefit replenishment and again within 1 week after replenishment by using the Home Food Inventory. Household food insecurity was assessed by using the US Department of Agriculture Household Food Security Survey. Wilcoxon rank tests were used to evaluate changes in median Home Food Inventory subscales and food insecurity pre- to post-replenishment. Qualitative interviews with participating caregivers were conducted to explore contextual factors influencing the home food environment across the benefits cycle.

RESULTS: Participants had significantly fewer types of vegetables (median: 7.0 vs 8.5, median difference 1.73, 95% confidence interval: 0.5–2.5, $P = .03$) and higher food insecurity pre- versus post-replenishment (median: 4.0 vs 2.0, median difference 1, 95% confidence interval: 0.1–1.5, $P = .03$). Caregivers described employing a variety of intentional strategies to reduce cyclic variation in food availability.

CONCLUSIONS: Findings suggest that there is relatively limited cyclic variation in the home food environment among families participating in SNAP. This may be explained by a number of assistance programs and behavioral strategies caregivers used to make food last and buffer against scarcity. Future research should evaluate the relationship between the degree of home food environment changes and child health outcomes.

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Ms You and Ms Anash drafted the initial manuscript, reviewed and revised the manuscript, and worked alongside other team members to code transcripts according to a codebook the study team developed; Ms Flessa conducted interviews, worked alongside other team members to code transcripts according to a codebook the study team developed, and critically reviewed and revised the manuscript; Ms Mullins analyzed the coded qualitative data and drafted, reviewed, and revised the qualitative portion of the study; Drs Thornton and Johnson lead development of the initial research study questions and study design, supervised the study implementation, and critically reviewed and revised the manuscript; Dr Perin performed quantitative data analysis and critically reviewed and revised the manuscript; and all authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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WHAT'S KNOWN ON THIS SUBJECT: In most studies, authors describe the home food environment in low-income households participating in the Supplemental Nutrition Assistance Program (SNAP) on the basis of a single time point. Less is known about whether the home food environment varies with the timing of SNAP benefit disbursements.

WHAT THIS STUDY ADDS: In this study, we assess the home food environment at 2 time points during the SNAP benefit cycle. We explore whether there are patterns of abundance and scarcity coinciding with SNAP benefit disbursement that impact child nutrition.

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In 2018, 11% of US households were food insecure, unable to access and provide adequate food for all household members to maintain a healthy, active lifestyle.[1] Households with low socioeconomic status, racial or ethnic minority households, and households with children are at increased risk of food insecurity.[1] More than one-half (56%) of food-insecure households in 2018 relied on at least 1 of the 3 largest federal assistance programs: the Supplemental Nutrition Assistance Program (SNAP), the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), or the National School Lunch Program.[1] Research suggests that household food insecurity is associated with lower quality food in the home (eg, fewer fruits and proteins) as compared with food-secure households[2] and that SNAP participation may be associated with worse diet quality[3] for children as compared with children in higher income households . Approximately 44% of SNAP participants are aged <18 years.[4] Children living in food-insecure households are at risk for adverse health outcomes, including undernutrition and obesity.[5] Children participating in SNAP may have higher intake of unhealthy foods (eg, sugar-sweetened beverages, high-fat dairy, processed meats) and lower intake of healthy foods (eg, nuts, legumes).[6]

Most families exhaust SNAP benefits before the end of the month.[7] 62% of households use more than one-half of their benefits by the end of the first week, and 86% use more than one-half by the end of the second week of the benefits cycle.[7] These patterns suggest that families may experience significant variability in home food availability over the benefit cycle. Such variation may also influence children's eating habits.[8] Yet, most studies characterizing the food environment in low-income households rely on observations of a single time point without considering the timing of benefits.

The goals of this study were to do the following: (1) assess variation in the home food environment at the end and beginning of the SNAP benefit cycle and (2) explore contextual factors influencing the home food environment via in-depth interviews with caregivers of children ages 4–10 years receiving SNAP benefits. We hypothesized that there would be less food variety and more obesogenic foods in the home at the end versus the beginning of the benefit cycle.

METHODS

Study Design and Study Population

This observational, mixed-method study was conducted in Baltimore, Maryland, between August 2017 and January 2018. Participants were eligible if they met the following requirements: (1) lived in Baltimore City, (2) participated in SNAP, and (3) reported being the primary caregiver for a child aged 4–10 years who lived in the home. Participants were excluded if they did not speak English or had a significant impairment that precluded their participation. Thirty-two families were enrolled in the study. Twenty households were recruited from among participants ($n = 230$) in an observational, mixed-methods study of extremely low-income families in Baltimore who agreed to be recontacted for future research. These families were originally recruited on the basis of random sampling from State of Maryland SNAP program administrative records supplemented by venue-based sampling.[9] For the current study, 12 additional households were recruited via snowball sampling of persons referred by participating families. Two participants were unable to complete data collection. One participant reported living in Baltimore City, but their address was later found to be outside of the city limits; they are included in the study. This study was approved by the Johns Hopkins Medicine Institutional Review Board. Adult participants provided written consent.

Data Collection

Participating parents agreed to 2 home visits ~6 weeks apart. The first home visit occurred within one week before SNAP benefit issuance to reflect a hypothesized period of food scarcity. The second home visit occurred within one week after SNAP benefit issuance and ~5–6 weeks after first home visit, when relative food abundance was hypothesized. This timing allowed for a one-month washout period to minimize any impact of remuneration on the home food environment. Maryland SNAP benefits are issued from the fourth to the 23rd of each month on the basis of the participant's last name. Home visits were timed accordingly.[10]

At the first home visit, primary caregivers completed an in-depth interview. Int erview questions were developed by the research team and adapted from work by Edin et al[11] in keeping with best practices. Interviews explored the nature of food scarcity, perceived risk of cyclic changes in food availability, caregivers' strategies to mitigate scarcity, and approaches to supplementing SNAP (Table 1). Trained staff conducted all interviews, which lasted 40–90 minutes and were audio-recorded and transcribed verbatim.

Research staff, guided by the participant, administered the Home Food Inventory (HFI)[12] at each home visit, completing an

TABLE 1 Sample Questions From In-depth Interviews

Sample Questions
A lot of families run short on food when things get tight. Tell me about the last time you ran short of what you needed to pay for food. How did you cope? How about the time before that? What do you typically do when the food budget gets tight?
For you, what are the toughest times to get by foodwise? How do you cope then? Tell me all about the last time that happened

exhaustive list of food categories and making observations of countertops, cabinets and refrigerators in the home. Participants also completed the Household Food Security Survey (HFSS)[13] and a demographic questionnaire.

Measures

Home Food Environment

The home food environment was assessed by using the HFI, which is validated in low-income families.[12,14] The HFI groups foods into 13 major food categories, including fruits, vegetables, meats and other proteins, dairy, prepared desserts, microwavable foods, snacks, and other beverages.[12] The HFI also includes 2 measures of readily accessible foods: visible and within reach in the kitchen (ie, on countertops, tables, or the refrigerator top), and easily accessible and visible on opening the refrigerator.

A composite obesogenic food availability score was calculated by using a previously validated approach that combines scores from 10 major food categories (eg, vegetables, fruits, dairy, packaged foods, desserts) plus 22 individual HFI items encompassing fats, savory snacks, and beverages. The obesogenic score ranges from 0 to 71.[12]

Food Insecurity

The US Department of Agriculture 10-item HFSS, validated for use in households with and without children, was used to assess household food security in the last 12 months.[13] The survey is scored on a 10-point scale in which higher values indicate higher food insecurity. The HFSS does not measure child food insecurity specifically but was selected to reduce survey burden and because it improves comparability between households with children of different ages and between households with and without children.[13] Whereas the measure asks about food insecurity over the past 12 months, we administered the HFSS at both time points to assess whether perceptions of food insecurity in the past year vary across the SNAP benefits cycle.

Use of Food and Nutrition Programs and Resources

Families' reports of access to other economic and food resources, including WIC, food pantries, and school meals programs, were extracted from in-depth interviews to better understand families' strategies across the benefit cycle.

Data Analysis

We assessed whether the variety of foods available in the home that fell within the HFI-designated major food categories (eg, fruits, vegetables, dairy) differed at the end versus the beginning of the benefit cycle. Paired Wilcoxon rank tests were used to compare the median number of foods in major categories and the median obesogenic score across the benefits cycle (assuming a type 1 error of 0.05). Confidence intervals (CIs) for the median change across benefits cycles were constructed on the basis of rank statistics.[15] Cronbach's α was used to describe the internal reliability for the major food categories and other HFI measures (eg, o besogenic food availability score) that were recorded at the 2 time points. Cohen's κ statistic measured the reliability of the Food Security Survey at the 2 time points. One participant had missing HFSS data from the second home visit and was excluded from the food insecurity analysis.

Transcribed interviews were coded by 2 independent coders through an iterative process using MAXQDA Standard (a qualitative data analysis software) to identify a priori themes derived from the interview guide and to identify emergent themes.[16] Intercoder agreement >80% was reached. To better understand contextual factors related to managing the home food environment across the benefits cycle, codes related to food planning, scarcity, and purchasing strategies were extracted from coded transcripts for further thematic analysis (see Table 2 for codes and descriptions). Data from these codes were grouped into key themes that contextualize variation in the home food environment and food insecurity scores that were observed across the benefit cycle.

RESULTS

Among the 30 participating households, 70% of the caregivers were African American and 97% were women, with a mean age of 42.6 years (SD = 9.27). The mean age of children in participating households was 7.2 years (SD = 2.17), and 40% were women. Table 3 summarizes food availability at the beginning and end of the benefits cycle for each HFI major food category. There were significantly fewer types of vegetables in the home pre- versus

TABLE 2 Codes and Associated Descriptions From the Codebook to Identify Content for Thematic Analysis to Address the Study's Research Question

Code	Description
Food scarcity	Applied when participants describe running short or low on food and frequency of occurrence
Food scarcity coping mechanisms	Applied when participants describe how they coped (both emotionally and practically) with food-related scarcity
Food payment strategy	Applied when participants describe how they cover their food expenses in the month
Attitudes about government or federal benefit	Applied when participants describe their philosophy of stewardship of government or federal benefits received
Emergency food plan	Applied when participants describe any existing plan or lack of plan they have in place to cover for food in emergency situations or a future occasion or event
Opinions on WIC	Applied when participants describe their understanding of WIC, adequacy of benefit, factors that affect the amount of their WIC benefit, and opinions about the timing of renewal and how this influences meal planning
Opinions of SNAP	Applied when participants describe their understanding of SNAP, adequacy of benefit, factors that affect the amount of their SNAP benefit, and opinions about the timing of renewal and how this influences meal planning

post-replenishment, both including (7.0 to 8.5, $P = .03$) and excluding potatoes (7.0 to 7.5, $P = .02$). There were no statistically significant differences in the variety of types of fruit (3.5 vs 4.5, $P = .09$) and regular fat cheese (1.0 vs 2.0, $P = .07$) observed in participants' homes pre- versus post-replenishment. There were no significant changes in the types of processed meats or other proteins available in participants' homes pre- versus post-replenishment, nor was there any significant change in the obesogenic food environment score (Fig 1).

HFSS ratings revealed high test-retest reliability over time ($\kappa =$ 0.83, 95% CI: 0.64–1.00). Yet, participants also reported significantly more food insecurity at the end of the benefits cycle (pre-replenishment) compared with the beginning of the benefits cycle (median HFSS 4.0 vs 2.0, respectively, $P = .03$). Three key themes emerged from the qualitative analysis that help

TABLE 3 Median Household HFI Major Food Categories and Food Security Before and After SNAP Benefit Replenishment

Food Category	No. Items	Median Pre-Replenishment	Median Post-Replenishment	*P*	α (t1)[a]	α (t2)[a]
Cheese (regular fat)	5	1	2	.07	0.460	0.502
Cheese (reduced fat)	6	0	0	.17	0.475	0.170
Milk (regular fat)	1	1	0.5	.79	—	—
Milk (reduced fat)	4	2	2	.64	0.179	−0.035
Yogurt (regular fat)	1	2	2	.18	—	—
Yogurt (reduced fat)	1	0	0	.78	—	—
Other dairy (regular fat)	2	0	0	1.00	0.564	0.085
Other dairy (reduced fat)	1	0	0	1.00	—	—
Vegetables	20	7	8.5	.03*	0.748	0.707
Vegetables without potatoes	19	7	7.5	.02*	0.750	0.663
Fruit	26	3.5	4.5	.09	0.733	0.812
Processed meats	4	2	2	.11	0.160	0.385
Other protein	12	6	6	.75	0.660	0.677
Kitchen accessibility (healthy)[b]	6	2.5	2.5	.94	0.403	0.305
Kitchen accessibility (unhealthy)	6	2	2.5	.60	0.386	0.539
Fridge accessibility (healthy)	9	2	2	.97	0.352	0.590
Fridge accessibility (unhealthy)	5	2	2	.99	0.463	0.614
Obesogenic total score	71	20	23	.47	0.832	0.838
Food security						
HFSS[c]	—	4	2	.03*	0.879	0.891

—, not applicable.

[a] Cronbach's α, measure of internal reliability, not defined for scales with only one item. Range from −1 to 1, in which a value >0.6 is considered desirable, ideally >0.7.

[b] Kitchen accessibility and fridge accessibility refer to whether food is in plain view in the kitchen or the fridge. Unhealthy versus healthy foods were categorized by assessing foods' fat and sugar content.

[c] Range from 0 to 10 (a sum of 10 items), in which higher value indicates less food security and more food insecurity.

* $P < .05$, determined by a paired Student's *t* test.

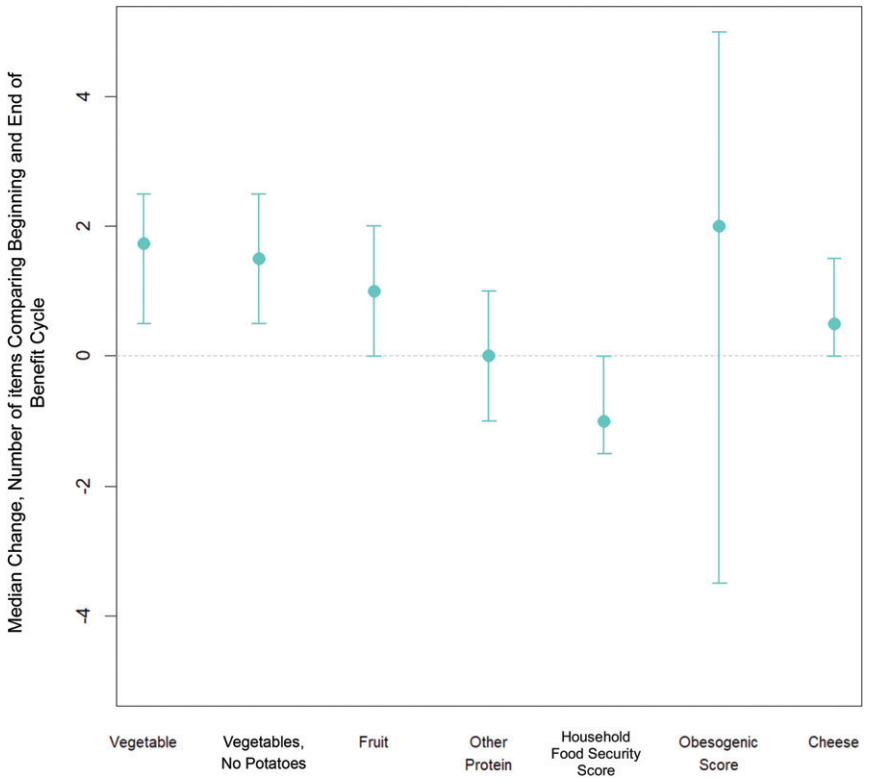

FIGURE 1
Median change and approximate 95% CI in change for HFI major food categories, household food security scores, and obesogenic scores and subscales comparing the beginning and end of the SNAP benefits cycle.

contextualize our findings: (1) caregivers' awareness that SNAP benefits are insufficient on their own, (2) caregivers' plans to stretch benefits, and (3) explicit effort by caregivers to leverage resources other than SNAP to feed their families throughout the benefits cycle.

Theme 1: SNAP Benefits Alone Are Insufficient

Many participants expressed that SNAP benefits were insufficient to ensure food security and were expended before the end of the benefit cycle. Caregivers described SNAP benefits as only sufficient to cover a fraction of their families' food needs, with many caregivers estimating that SNAP benefits cover approximately one-half of their monthly food expenses. As one mother put it, "I am grateful of what I do get from SNAP program, but it's definitely not enough, […] if I put nothing toward [purchasing food], I wouldn't be able to eat for the whole month."

Theme 2: Caregivers Plan to Stretch SNAP Benefits

Knowing that SNAP resources are scarce at the end of the benefit cycle, caregivers described various methods to stretch SNAP resources. Some decreased meal portions when resources became scarcer. As one mother stated, "Sometimes […] they got to eat lesser because they just got to work with what we got." Others prioritized advanced meal preparation, cooking large meals that generated leftovers that they then used to provide preportioned meals over multiple days.

Another common strategy was planning grocery trips. For some, this meant one large trip immediately after SNAP distribution to purchase pricier items like meats and freeze them for later in the month. For others it meant frequent grocery shopping to purchase only enough food to last a week, so children were limited to eating and snacking on a finite quantity at a given time:

> *I go [to the store] and then I go back because I refuse to spend it all in one time because then, I probably wouldn't have no food. […] Because it's like when you buy food in a house, the more food a person see, the more they want to eat. […] So if I buy little at a time, then they won't eat it all up. So I have to do it that way, even so, to make it last.*

Theme 3: Leveraging Resources Beyond SNAP to Feed Their Families

Despite various methods to stretch SNAP benefits, many participants reported a persistent gap in food availability at the end of the month. To bridge this gap, many participants reported accessing additional food assistance programs to supplement what they received from SNAP, including community or church food pantries (66%), WIC, participants' own cash (66%), and the National School Lunch Program (100%). This is exemplified by a mother describing how she leverages additional resources:

> *See what happens is when I get low, […] if I say, "Okay I got enough to make 5 complete meals. It's the end of the month. We know 5 complete meals ain't gonna last." That's when I'm going to the food pantry. That's when I'm going to the churches. […] You gotta plan for those—hungry is one thing I ain't gonna be. And neither is [my child] right there, sorry. Ain't gonna happen.*

Data extracted from interviews suggest that participants were participating in other benefit

programs, including Temporary Cash Assistance for Needy Families (50%), which some participants reported using for food purchases. When resources were depleted, some participants sought support from family members, friends, and neighbors. As one mother stated, "I'll even ask my family for assistance, you know, […] they don't mind helping."

Caregivers commonly described securing emergency food. As one mother put it:

> *I stock up on can goods, anything nonperishable. That's one thing. Every month I make a certain, I'll set aside at least 50 bucks to buy nonperishable items, items that will last many months in the future. I'll buy those in bulk too so I know if anything happens, if my benefits are cut off, we'll still have at least a little bit to bridge the gap.*

Almost all caregivers described emergency food planning that focused on stocking shelf-stable foods with prioritization of canned goods that could be used when all else failed.

DISCUSSION

In this study, we explored whether there are changes in the home food environment across the benefits cycle among low-income families participating in SNAP. We found fewer vegetable types and higher reports of food insecurity at the end of the benefit cycle than at the beginning (Fig 1). Our findings are consistent with the study hypothesis that there would be less food variety at the end versus beginning of the benefit cycle, but the differences were modest. There were no differences in the HFI obesogenic score. Qualitative findings suggest that caregivers are aware that SNAP alone cannot meet their families' nutritional needs. Thus, they engage in multiple strategies to ensure adequate food in the home, including advanced meal preparation, planning grocery trips, supplementing SNAP with other resources, and prioritizing emergency food options.

Study limitations include the homogeneity of study participants and small sample size, which may limit the generalizability of these findings. Participants used a variety of external resources, including other benefit programs. We were unable to control for these factors in the analysis. Instead, we describe food availability holistically among study participants, recognizing that families may seek and receive support in a number of settings, as borne out by our qualitative results. The HFI does not account for the quantity or quality of food available in the home, which limited our ability to account for these aspects of the home food environment. The HFI captures whether foods are canned, fresh, frozen, or dried but does not distinguish these in scoring. In using the 10-item HFSS, we may have lost some nuance regarding the specific experiences of children that are captured in the 18-item child food security survey. Lastly, there is a possibility that study remuneration could have influenced the home food environment by supplementing the funds families would otherwise have available to buy food. To minimize this, the bulk of remuneration ($80) was given after the post-replenishment visit, which was the second home visit to occur. The pre-replenishment visit also occurred before any remuneration, although families did receive $20 for completing the pre-replenishment visit ($20).

CONCLUSIONS

In this study, we found only modest differences in food availability before and after SNAP benefit replenishment among families participating in SNAP. The relative lack of variability in the home food environment may be explained, in part, by SNAP participants' efforts to intentionally and strategically buffer against scarcity using a variety of strategies. In this way, this study illustrates the attention caregivers pay to maintaining adequate food in their households and the competencies they employ to supplement and stretch SNAP benefits. Study participants sought to mitigate scarcity in their home food environment and demonstrated a high level of awareness of the risk of scarcity over the SNAP benefit cycle.

Although families in this study described a variety of strategies to buffer against food scarcity, the results of this study also suggest that future interventions could more systematically address the cyclical risk of food scarcity that low-income families face when benefits run out. Research on SNAP suggests that participation in the program reduces the likelihood of food insecurity by 31.2%. Thus, increasing SNAP enrollment, via expanded outreach and more flexible rules, are possible solutions to food insecurity.[17]

Increasing SNAP may be one effective strategy to decrease food insecurity .[18] As noted by SNAP policy experts, advocates, and program participants; SNAP benefits are modest and insufficient to cover monthly food costs without supplementation, and increasing benefits may improve health and well-being.[18–20] Experiments conducted from 2011 to 2014 revealed that increasing SNAP benefits in the US Department of Agriculture's Summer Electronic Benefit Transfer for Children demonstration may improve food security. In comparison with no change in benefits, receiving an additional $60 per month per child through the Summer Electronic

Benefit Transfer for Children during the summer decreased prevalence of the most severe food insecurity among children by 33%, decreased the prevalence of overall food insecurity by 20%, and increased children's daily fruit and vegetable consumption by one-third cup.[19,21]

Increasing SNAP benefits might address shortfalls that are commonly experienced at the end of the benefit cycle, decrease food insecurity, and increase healthy food access.[22] Beyond the effectiveness of SNAP in reducing food insecurity,[17,23] our study participants stressed difficulties maintaining a consistent supply of preferred healthy foods in the home throughout the entire benefit cycle. In this way, our findings may have transferability beyond the study population. Optimizing policies and practices to ensure consistent access to high quality nutritious foods for children and families receiving SNAP is critical. Additional research is needed to understand how families' changing food environments impact dietary intake, food choices, health, and well-being. Optimizing SNAP disbursements to minimize cyclicality could have both nutritional and psychosocial benefits that merit further investigation.

ABBREVIATIONS

Abbreviations

CI: confidence interval
HFI: Home Food Inventory
HFSS: Household Food Security Survey
SNAP: Supplemental Nutrition Assistance Program
WIC: Special Supplemental Nutrition Program for Women, Infants, and Children

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