

The Supplemental Nutritional Assistance Program Benefit Cycle and Mental Health

by

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Abstract

An average of about 22.2 million households in the United States receive monthly food benefits through the Supplemental Nutrition Assistance Program (SNAP). Benefits are distributed once per month, with distribution dates varying across households within the month. Some households exhaust their benefits before the end of the benefit cycle, which can lead to food insecurity and poorer mental health later in the month. This study investigates the relationship between the SNAP benefit cycle and SNAP recipients' mental health. We leverage an online survey of SNAP participants in Alabama that captures both the number of days since a participant's household received SNAP benefits and their self-reported mental stress over the past week. Mental stress is measured using the 10-item Depression Anxiety Stress Scale (DASS-10). Regression analyses are performed to examine the pattern of distress across the benefit cycle. The results show that overall distress increases significantly after day 21 of the benefit cycle. Additionally, anxiety-stress and depression scores increase significantly in the later part of the cycle, paralleling the overall distress result. These findings highlight the psychological strain associated with benefit depletion and underscore the need for policy interventions to mitigate the end-of-cycle hardship.

Artificial Intelligence (AI) Use Disclosure Statement

In the preparation of this thesis, the following Artificial Intelligence (AI) tools were used: ChatGPT and Microsoft Copilot. These tools were used primarily for language editing and grammar checking. The author acknowledges full responsibility for the intellectual content of this work and has ensured that all AI-assisted sections have been reviewed and revised for accuracy and appropriate academic style. All AI-generated content was reviewed and validated for relevance, appropriateness, and accuracy before incorporation into the final document to maintain scholarly integrity of this research.

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List of Abbreviations

ATUS	American Time Use Survey
SNAP	Supplemental Nutrition Assistance Program
USDA	U.S. Department of Agriculture
GusNIP	Gus Schumacher Nutrition Incentive Program
PHQ-9	Patient Health Questionnaire-9
DASS-10	Depression Anxiety Stress Scale 10
DUFB	Double Up Food Bucks

Chapter 1

Introduction

The Supplemental Nutrition Assistance Program (SNAP) is the largest federal food assistance program in the United States and serves as a crucial safety net for low-income households (Schanzenbach, 2023). SNAP benefits are distributed once per month, with issuance dates varying by state and recipient. A large body of research documents a distinct “SNAP benefit cycle,” in which households rapidly spend a substantial portion of their benefits within the first one to two weeks of the month, leaving limited resources toward the end of the cycle (Wilde & Ranney, 2000; Shapiro, 2005; Hamrick & Andrews, 2016; Castellari et al., 2017; Lee et al., 2022). As benefits become depleted, households reduce healthy food expenditures and caloric intake (Wilde & Ranney, 2000; Shapiro, 2005; Todd, 2015), and food insecurity becomes more pronounced toward the end of the month (Weinstein et al., 2009; Gregory & Todd, 2021). To cope with these shortfalls, SNAP participants often adopt a range of hunger-coping strategies, including eating less, skipping meals, postponing other expenses, or relying on emergency food sources such as food pantries and soup kitchens (Thompson et al., 1988; Kempson et al., 2003; Hoisington et al., 2002; Calloway et al., 2015). Research from the food insecurity literature suggests that these coping strategies are linked to elevated psychological stress, anxiety, and depressive symptoms (Leung et al., 2015; Compton, 2023). Thus, the existing literature points to a clear pathway through which benefit depletion can contribute to worsening mental health later in the benefit cycle.

Further support for this mechanism comes from studies using clinically validated measures. For example, PHQ-9 based studies show that the prevalence of clinically significant depression ranges from about 5% among food-secure individuals to over 25% among those experiencing severe food insecurity and is substantially higher among low-income populations (Wei et al., 2024; Reeder et al., 2022). Similarly, the DASS-10 captures broader psychological distress by distinguishing between anxiety-stress and depressive symptoms and has been validated as a reliable two-dimensional measure of mental health (Goodwin & Knox, 2024).

Building on this evidence, the main objective of this study is to assess the effect of the SNAP benefit cycle on mental health. While previous studies have documented changes in food consumption and expenditure across the SNAP cycle, much less is known about how mental health fluctuates over the course of the benefit cycle among SNAP participants. This study examines how mental health changes across the SNAP cycle using two validated instruments: the Depression Anxiety Stress Scale (DASS-10) to measure depression, anxiety and stress, and the Patient Health Questionnaire-9 (PHQ-9) to measure depression. In this study, we refer to these outcomes collectively as “mental health,” encompassing stress, anxiety, and depressive symptoms as measured by the PHQ-9 and DASS-10. Throughout the paper, the terms “mental health” and “mental well-being” are used interchangeably to refer to these clinically validated measures. In addition to SNAP benefits, SNAP households are also offered nutrition incentive programs designed to encourage healthy diets by incentivizing the purchase of fruits and vegetables, including the Gus Schumacher Nutrition Incentive Program (GusNIP) (Krueger et al., 2022). Evidence suggests that these incentives help maintain access to healthy foods when SNAP benefits run low toward the end of the month (Cuffey et al., 2024). Because access to fruits and vegetables may reduce end-of-cycle food insecurity and associated psychological

strain, we also examine whether the effect of the SNAP benefit cycle on mental health is moderated by participation in a program that incentivizes fruit and vegetable consumption.

Prior research has examined the relationship between SNAP participation and mental health. Although SNAP supports millions of low-income individuals by reducing food insecurity and improving diet quality (Ratcliffe et al., 2011; Mabli et al., 2013; Gregory & Smith, 2019), its impact on psychological well-being remains unclear. Heflin and Ziliak (2008) find that food stamp recipients report higher emotional stress, reflecting the severe economic hardship often experienced by participating households. Similarly, Wei et al. (2024) show that current or recent SNAP users have higher depressive symptoms than income-eligible nonparticipants. Other studies report comparable patterns: Adynski et al. (2023) find no mental health advantage of SNAP participation, and Leung et al. (2015) observe that SNAP users face higher risk of depression when food insecurity persisted. Munger et al. (2016) likewise showed that SNAP does not buffer the strong link between food insecurity and maternal depression. This evidence suggests that although SNAP reduces hunger, many recipients continue to experience substantial psychological distress driven by persistent food insecurity and financial strain.

To our knowledge, only one prior study examines how well-being changes across the SNAP benefit month. Engel (2025) shows that happiness declines and stress increases as more days pass after households receive their monthly SNAP benefits, using the ATUS Well-Being Module (2012-2013) to capture people's feelings during daily activities. Her study focuses on everyday emotional states and subjective well-being rather than clinically validated mental health measures. Our study uses validated mental health instruments (PHQ-9 and DASS-10) to assess depression and anxiety-stress and evaluates how these outcomes vary across the SNAP benefit cycle. We also extend prior research on SNAP participation and food insecurity by

examining mental health at different points within the SNAP benefit month. Leveraging survey data with exact SNAP payment dates, this study strengthens the identification of short-term timing effects on mental health. By integrating precise benefit timing, validated mental health instruments, and information on nutrition incentive participation, this study provides new evidence on how the structure of SNAP benefit cycle shapes psychological well-being throughout the month.

This paper is organized as follows. The next section describes data collection and methods, including the study sample, measures, and statistical analysis, followed by the presentation of the main results. Finally, the paper concludes with a summary of the key findings and their implications.

Chapter 2

Data

Study Sample

This study used cross-sectional online survey data from annual marketing campaigns conducted in 2023 and 2024 that were designed to inform SNAP participants about the state's GusNIP initiative, implemented under the name Double Up Food Bucks (DUFEB). This statewide program offered a dollar-for-dollar match for spending on eligible fresh produce. These incentives were provided in the form of redeemable coupons at participating grocery stores or tokens that were used at participating farmers' markets.

In 2023 and 2024, approximately 108,254 and 104,893 marketing flyers, respectively, were mailed to SNAP households in the counties with retailers participating in the state's incentive program. The flyers contained information about how to use the GusNIP initiative and which retailers in the respective areas offered incentives. At the bottom of the marketing flyer, a QR code was provided for SNAP households to scan and participate in an online survey.

Survey responses were collected via the Qualtrics platform (Qualtrics, 2024). Across the two-year period, 1,587 responses were collected in 2023 and 1,552 in 2024, corresponding to an overall response rate of approximately 1.4%. The data collection was determined to be exempt from review by the Institutional Review Board (IRB).

Measures

In both years, respondents were asked a series of questions related to their mental health. In 2023, individual mental health was assessed using the Patient Health Questionnaire-9 (PHQ-9), a widely used questionnaire that focuses on assessing depressive symptoms over the previous

two weeks (Kroenke et al., 2001). The PHQ-9 consists of nine items assessing symptoms of depression, ranging from “little interest or pleasure in doing things” to “thoughts that you would be better off dead or of hurting yourself in some way” (see Appendix Table A1). Each item was scored from 0 (not at all) to 3 (nearly every day), yielding a total possible score between 0 and 27 (Kroenke et al., 2001, Meshkat et al., 2024).

In 2024, psychological distress was assessed using DASS-10. The original Depression Anxiety Stress Scales (DASS) were developed by Lovibond and Lovibond (1995) as a 42-item self-report instrument that measures the negative emotional states of depression, anxiety, and stress over the past week, with 14 items for each domain (Brown et al., 1997). The 2024 survey employed the DASS-10 scale, which included six items related to anxiety and stress (e.g., “I felt I was close to panic”) and four items related to depression (e.g., “I felt downhearted and blue,” see in Appendix Table A2) derived from the original DASS-42 (Halford & Frost, 2021). Each DASS-10 item was scored from 0 (not at all) to 3 (very much), yielding a total score ranging from 0 to 30 (Goodwin & Knox, 2024). In this study, we use the total distress score as well as the two DASS-10 subscales: the anxiety-stress subscale (0-18) and the depression subscale (0-12) (Halford & Frost, 2021). Histograms of these mental health indicators are presented in Figure A1 in the Appendix, illustrating the distribution of PHQ-9 and DASS-10 scores across respondents.

The DASS-10 is more sensitive to recent events than the PHQ-9 because it captures psychological conditions over the past week rather than over the past two weeks. Turkoz et al. (2021) show that the PHQ-9’s two-week recall period was less responsive to short-term symptom changes compared with other one-week measures. Therefore, the shorter recall period may better capture cyclical fluctuations in mental health within a benefit month.

Mental health outcome measures in this study are constructed using responses from the DASS-10 and PHQ-9 scales. From the DASS-10 scale, we construct three continuous outcomes: total distress (the sum of all DASS-10 items), total anxiety-stress (the sum of six anxiety-stress related items), and total depression (the sum of four depression-related items) (Halford & Frost, 2021). For each DASS-10 outcome, we additionally create two separate binary indicators equal to one if the respective score is at or above the 50th percentile or the 75th percentile of the sample distribution. From the PHQ-9 scale, we similarly create outcome variables including the continuous total PHQ-9 score and binary indicators equal to one if an individual's total PHQ-9 score is at or above the 50th percentile or above the 75th percentile, capturing moderate to severe depressive symptoms.

To measure the SNAP cycle, we calculate the number of days since the respondent's household received SNAP benefits. Respondents were asked on which day of the month their household usually receives benefits. Using these self-reported issuance dates, we calculate the number of days from the previous benefit issuance. We assume that all participating households are enrolled in the SNAP during the previous month. Therefore, the current month's issuance date is calculated based on the previous month's payment date. By comparing the date on which the respondent completes the survey with the household's most recent issuance date, we measure the number of days since benefits were received, with possible values ranging from 0 to 30 days.

We measure food insecurity using the U.S. Household Food Security Survey Module: Six-Item Short Form developed by the U.S. Department of Agriculture (USDA-ERS, 2012). Using normal scoring for the six-item food security instrument, households with a raw score of 0-1 are classified as food secure, while those with a score of 2 or higher are classified as food

insecure, combining the low and very low food security categories. Furthermore, we include a variable capturing participation in the GusNIP program implemented through DUFEB. The survey includes questions on respondents' awareness of, access to, and use of the program. GusNIP use is measured as a binary indicator equal to one if the respondent reports using DUFEB coupons or tokens to purchase fruits or vegetables, and zero otherwise.

We focus on mental health toward the end of the SNAP benefit cycle. Evidence consistently shows that food insecurity and financial stress increase toward the end of SNAP month. For example, many households report that SNAP benefits last only two to three weeks, leaving families more vulnerable to food insecurity later in the month (Calloway et al., 2015). Research using administrative and scanner data similarly documents decline in food expenditures and food availability toward the end of the cycle (Todd, 2015). Building on this evidence, this study focuses on the later part of the SNAP cycle as the period when resource scarcity is most acute and the psychological distress is expected to be highest. Our variable of interest is therefore an indicator for whether more than 21 days have passed since SNAP benefits were received.

This chapter provides detailed information on the SNAP benefit issuance timing, participation in nutrition incentives, and validated measures of psychological distress. Our key explanatory variable captures whether respondents are in the later phase of the SNAP cycle (more than 21 days since benefit issuance), allowing us to assess whether psychological distress changes toward the end of the month. The next chapter outlines the empirical strategy.

Chapter 3

Method

This paper has two research objectives: to examine the effect of SNAP benefit cycle on mental health and to assess whether a nutrition incentive program (GusNIP) moderates the SNAP cycle effects on mental health. For the first objective, we use ordinary least squares (OLS) to estimate the effect of SNAP benefit timing on mental health by regressing mental health outcomes on an indicator for more than 21 days since SNAP benefits were received, conditional on observed covariates:

$$y_i = \beta_0 + \beta_1 I(\text{Days} > 21)_i + \gamma X_i + \varepsilon_i \quad (1)$$

In equation (1), the dependent variable y_i represents the mental health outcome. As mentioned above, we use three forms of dependent variables. First, y_i is measured as a continuous composite mental health score. Second, this continuous score is transformed into a binary indicator equal to one if the score is at or above the 50th percentile of the sample distribution, and zero otherwise. Third, the score is similarly transformed into a binary indicator equal to one if it is at or above the 75th percentile of the sample distribution, and zero otherwise. OLS is used for all specifications, with binary outcomes interpreted as linear probability models. The regressions are estimated separately for each survey year.

In 2023, mental health was measured using the PHQ-9 score, which has a 14-day recall window, and in 2024, it was measured using the DASS-10 score, which has a 7-day recall window. In some cases, the recall window for the current SNAP cycle may capture psychological distress experienced during the final days of the previous SNAP cycle when the recall period exceeds the number of days since the benefit was received. To ensure that each

respondent's mental health score reflects conditions solely within the current SNAP benefit cycle, we restrict the sample to respondents interviewed 8-30 days after receiving SNAP benefits in 2024 and respondents interviewed 15-30 days after receiving SNAP benefits in 2023. These restrictions account for differences in recall lengths across the two survey instruments. After excluding respondents whose recall periods extend beyond the current SNAP cycle, and omitting observations with missing values, the final sample sizes are 653 (2023) and 907 (2024), respectively.

The key explanatory variable is an indicator $I(Days > 21)_i$, which equals 1 if more than 21 days have passed since the household received SNAP benefits. For the 2024 sample, days 8-21 serve as the mid-month comparison group, while days 22-30 represent the late-month period. For the 2023 sample, the mid-month comparison group includes days 15-21, with days 22-30 again defining the late-month period. Control variables (X_i) include respondents' gender, race, household size, education level, number of children, and whether the household has two or more adult members, and food insecurity status. We also control for shopping-related behaviors that capture household food-access constraints, transportation costs, and price sensitivity. These include indicators for whether the respondent is the primary household shopper, whether shopping trips involve ride sharing or public transportation, travel time to the primary food store, price-driven shopping decisions, shopping close to home, and access to food retailers offering incentive programs. In addition, for the second objective, we estimate the same model by interacting with the GusNIP use variable with the indicator variable $I(Days > 21)$ to evaluate the moderating effect of GusNIP participation on mental health outcomes.

Respondents are not randomly assigned to complete the survey at different points in their SNAP benefit cycle. SNAP issuance dates vary across households, and survey participation is

voluntary. As a result, respondents from some ZIP codes, survey months, and racial groups appear more often on certain days of the cycle than others. These differences could bias the relationship between cycle timing and mental health. To address this, we include fixed effects for the interaction of ZIP code, Black race, and survey month. These fixed effects control for differences in location, survey timing, and respondent composition, ensuring that the estimated effects reflect variation in SNAP benefit timing rather than systematic differences across groups.

Chapter 4

Results

Table 1 reports descriptive statistics for the mental health outcome variables by benefit cycle timing. For the 2023 sample, outcomes are measured using the PHQ-9 scale, with mean total scores of 7.57 in the mid-month period and 6.63 in the late-month period. The table also reports the proportions of respondents with PHQ-9 scores at or above the 50th and 75th percentiles for each period. These mean values are somewhat higher than those reported in nationally representative samples; for example, Wei et al. (2024) report mean PHQ-9 scores ranging from 3.49 to 5.38 among low-income U.S. adults, suggesting elevated levels of depressive symptoms in our sample of SNAP participants. For the 2024 sample, mental health outcomes are measured using the DASS-10 scale, with mean total distress scores of 6.66 in the mid-month period and 7.42 in the late-month period. Prior research using the DASS-10 reports mean distress scores of approximately 12.9 in clinical samples and 3.0 in community samples (Halford & Frost, 2021), suggesting a moderate level of psychological distress in our sample. Mean subscale scores for anxiety-stress and depression are also reported for each period, along with indicators for scores at or above the 50th and 75th percentiles. Other PHQ-9 and DASS-10 studies show lower averages in community samples, consistent with the higher distress levels faced by SNAP participants in our study.

Table 1: Description of the outcome variables

Outcome Variables	Mid-month (mean)	Late month (mean)
PHQ-9 total score	7.57 (6.69)	6.63 (6.38)
PHQ-9 Total depression score (\geq P50)	0.55 (0.50)	0.49 (0.50)
PHQ-9 Total depression score (\geq P75)	0.32 (0.47)	0.26 (0.44)
Number of observations for PHQ	342	293
DASS-10 total score	6.66 (5.78)	7.42 (6.74)
DASS-10 anxiety-stress score	3.95 (3.58)	4.42 (4.08)
DASS-10 depression score	2.71 (2.45)	2.99 (2.94)
DASS-10 Total distress score (\geq P50)	0.53 (0.50)	0.52 (0.50)
DASS-10 Anxiety-stress score (\geq P50)	0.57 (0.49)	0.61 (0.49)
DASS-10 Depression score (\geq P50)	0.63 (0.48)	0.62 (0.49)
DASS-10 Total distress score (\geq P75)	0.30 (0.46)	0.32 (0.47)
DASS-10 Anxiety-stress score (\geq P75)	0.32 (0.47)	0.35 (0.48)
DASS-10 Depression score (\geq P75)	0.37 (0.48)	0.38 (0.49)
Number of observations for DASS-10	421	486

Notes: Table 1 shows the means and standard deviations (in parentheses) of outcome variables.

Table 2 presents summary statistics for the explanatory variables in the 2023 and 2024 samples. Approximately 14 percent of respondents in 2023 and 11 percent in 2024 are male. The largest share of respondents (42-51 percent) identify as Black. White respondents constitute a significant share (27-33 percent), with smaller proportions identifying as Hispanic or other races. Most households consist of two to four members, and more than one-third report having no

children. Regarding education, about one-third of respondents have completed high school, more than one-fourth have attended some college, and a small share holds a college or higher degree.

About 90% of respondents are primary household shoppers. About two-thirds of shoppers use their own vehicles for shopping. Approximately one quarter of them rely on ride sharing, whereas only about 5% use public transportation. More than 50% of them shop at the stores located less than 10 minutes away. More than one-third of the shoppers choose stores offering the incentive (SNAP/EBT/WIC) program. In 2023, almost 7% use GusNIP benefits, while 6% do so in 2024. Almost three-fourths of respondents identify as food insecure.

Table 2: Description of the explanatory variables

Variables	Mean (2023)	Mean (2024)
Male	0.14 (0.35)	0.11 (0.31)
Black	0.51 (0.50)	0.42 (0.49)
White	0.27 (0.45)	0.33 (0.47)
Hispanic	0.13 (0.33)	0.17 (0.37)
Other race	0.09 (0.28)	0.09 (0.28)
Single-member household	0.23 (0.42)	0.20 (0.40)
Two-member household	0.24 (0.43)	0.24 (0.43)
Three-member household	0.20 (0.40)	0.20 (0.40)
Four or more members in household	0.33 (0.47)	0.36 (0.48)
Household with no children	0.41 (0.49)	0.37 (0.48)
Household with 1 child	0.22 (0.41)	0.22 (0.42)

Household with 2 children	0.16 (0.37)	0.18 (0.38)
Household with 3 or more children	0.21 (0.41)	0.23 (0.42)
Household with 2 or more adults	0.42 (0.49)	0.42 (0.49)
Educational status (some high school)	0.22 (0.42)	0.25 (0.44)
Educational status (graduated high school)	0.33 (0.47)	0.32 (0.47)
Educational status (some college)	0.29 (0.45)	0.27 (0.44)
Educational status (graduated college)	0.13 (0.33)	0.13 (0.34)
Educational status (MS degree)	0.03 (0.17)	0.02 (0.15)
Educational status (Terminal degree)	0.01 (0.09)	0.00 (0.06)
Primary shopper	0.91 (0.28)	0.90 (0.30)
Driving own car during shopping	0.63 (0.48)	0.67 (0.47)
Ride sharing during shopping trip	0.30 (0.46)	0.25 (0.43)
Using public transportation	0.04 (0.19)	0.05 (0.21)
Shops within less than 10 minutes away	0.51 (0.50)	0.52 (0.50)
Shops within 10-20 minute away	0.32 (0.47)	0.35 (0.48)
Shops more than 20 minute away	0.15 (0.36)	0.12 (0.33)
Chooses nearby store	0.67 (0.47)	0.49 (0.50)
Chooses store due to low prices	0.52 (0.50)	0.45 (0.50)
Chooses store offering the incentive program (SNAP/EBT/WIC)	0.34 (0.47)	0.34 (0.47)
GusNIP use	0.07 (0.25)	0.06 (0.24)
Food-insecure households	0.77 (0.42)	0.74 (0.44)
Number of observations (N)	635	907

Notes: Table 1 shows the means and standard deviations (in parentheses) of control variables. “GusNIP use” is an indicator for whether the respondent has used GusNIP coupons or tokens.

Table 3 presents the relationship between the timing of SNAP benefits and mental health outcomes measured by the DASS-10 scale. Total distress score in the later part of the benefit cycle (after 21 days) is 1.30 points higher than the mid-cycle average score (days = 8-21; mean=6.66), amounting to a 19.51 percent rise. This difference is statistically significant at the 5 percent level. Similarly, anxiety-stress scores rise by 0.83 points from an average of 3.95, reflecting a 21.01 percent increase, also significant at the 5 percent level. Depression scores increase by 0.47 points relative to an average of 2.71, representing a 17.34 percent rise, significant at the 10 percent level. Overall, these results indicate that mental well-being declines as SNAP households move toward the end of the benefit cycle.

Using the PHQ-9 scale, we find that total depression scores increase during the later part of the benefit cycle; however, these differences are not statistically significant. Overall, the PHQ-9 results suggest no statistically relevant variation in depressive symptoms over the benefit cycle.

Table 3: SNAP Benefit Cycle and Mental Health

Indicators	DASS-10 Total distress score	DASS-10 Anxiety-stress score	DASS-10 Depression score	PHQ-9 Total depression score
Later in the benefit cycle (<i>Days</i> > 21)	1.296** (0.570)	0.826** (0.360)	0.470* (0.239)	0.037 (1.211)
Number of observations (N)	907	907	907	635

Note: Robust standard error in parentheses ($p < 0.1$, ** $p < 0.05$, *** $p < 0.01$). *Days* denotes the number of days since benefits were received. The covariates controlled for include gender, race, household size, education level, and number of children as well as shopping behaviors, such as whether the respondent is primary shopper of the households, whether the household has two or more adults members, ride sharing during shopping trips, use of public transportation, travel time to the primary food store, shopping at nearby stores, shopping based on low price and households food insecurity. Standard errors are clustered at the level of the fixed effects: ZIP code, black race, and survey month.

Table 4 shows results when mental health outcomes are defined as binary indicators equal to one if the respondent’s score is at or above the sample median (50th percentile). Across all DASS-10 domains and the PHQ-9 measure, the estimated coefficients for being later in the SNAP benefit cycle ($Days > 21$) are small in magnitude and statistically insignificant. These results indicate that while mental health outcomes worsen on average toward the end of the benefit cycle as shown in the continuous specifications, being late in benefit cycle does not significantly increase the likelihood that individuals cross the median threshold of psychological distress or depressive symptoms. Overall, the findings suggest that the effect of benefit timing is reflected in changes in symptom intensity rather than in broad shifts across the middle of the mental-health distribution.

Table 4: SNAP Benefit Cycle and Mental Health ($\geq 50^{\text{th}}$ Percentile)

Indicators	DASS-10 Total distress score ($\geq P50$)	DASS-10 Anxiety-stress score ($\geq P50$)	DASS-10 Depression score ($\geq P50$)	PHQ-9 Total depression score ($\geq P50$)
Later in the benefit cycle ($Days > 21$)	0.007 (0.046)	0.054 (0.046)	0.002 (0.045)	0.021 (0.091)
Number of observations (N)	907	907	907	635

Note: Robust standard error in parentheses ($p < 0.1$, ** $p < 0.05$, *** $p < 0.01$). *Days* denotes the number of days since benefits were received. The covariates controlled for include gender, race, household size, education level, and number of children as well as shopping behaviors, such as whether the respondent is primary shopper of the households, whether the household has two or more adults members, ride sharing during shopping trips, use of public transportation, travel time to the primary food store, shopping at nearby stores, shopping based on low price and households food insecurity. Standard errors are clustered at the level of the fixed effects: ZIP code, black race, and survey month.

Table 5 extends the analysis by redefining mental-health outcomes as binary indicators equal to one if the respondent’s score is at or above the 75th percentile, capturing individuals in the upper tail of the distress distribution. In contrast to the median-based results in Table 4, late

SNAP benefit cycle exposure (*Days* > 21) is associated with a statistically significant increase in the probability of experiencing elevated psychological distress. Specifically, the likelihood of being in the top quartile of total DASS-10 distress increases by 7.6 percentage points, and anxiety-stress increases by 8.7 percentage points, both statistically significant. The estimated effects for the depression score and the PHQ-9 measure remain statistically insignificant.

Table 5: SNAP Benefit Cycle and Mental Health ($\geq 75^{\text{th}}$ Percentile)

Indicators	DASS-10 Total distress score ($\geq P75$)	DASS-10 Anxiety-stress score ($\geq P75$)	DASS-10 Depression score ($\geq P75$)	PHQ-9 Total depression score ($\geq P75$)
Later in the benefit cycle (<i>Days</i> > 21)	0.076* (0.043)	0.087** (0.043)	0.046 (0.047)	0.019 (0.082)
Number of observations (N)	907	907	907	635

Note: Robust standard error in parentheses ($p < 0.1$, ** $p < 0.05$, *** $p < 0.01$). *Days* denotes the number of days since benefits were received. The covariates controlled for include gender, race, household size, education level, and number of children as well as shopping behaviors, such as whether the respondent is primary shopper of the households, whether the household has two or more adults members, ride sharing during shopping trips, use of public transportation, travel time to the primary food store, shopping at nearby stores, shopping based on low price and households food insecurity. Standard errors are clustered at the level of the fixed effects: ZIP code, black race, and survey month.

Tables 6-8 examine whether participation in the GusNIP program moderates the association between the late SNAP benefit cycle and mental health outcomes. Table 6 indicates that GusNIP participation does not moderate the association between the late SNAP benefit cycle (*Days* > 21) and mental health outcomes, as the interaction coefficients are small in magnitude and statistically not significant across all DASS-10 domains and the PHQ-9 measure. Tables 7 and 8 extend this analysis by examining moderation effects at the median and the 75th percentile of mental health scores. Consistent with Table 6, the interaction terms remain statistically insignificant across all outcomes. Overall, these results indicate that, within the current sample,

GusNIP participation does not significantly moderate the relationship between late-cycle SNAP benefit exhaustion and mental health outcomes. Consistent with earlier findings in Tables 3 through 5, mental distress increases toward the end of the benefit cycle, particularly among individuals with higher baseline distress. However, there is no statistically robust evidence that GusNIP participation meaningfully alters this relationship.

Table 6: Moderating Effects of GusNIP use on the relationship Between the SNAP Benefit Cycle and Mental Health

Indicators	DASS-10 Total distress score	DASS-10 Anxiety-stress score	DASS-10 Depression score	PHQ-9 Total depression score
Later in the benefit cycle (<i>Days</i> > 21)	1.245** (0.582)	0.819** (0.369)	0.426* (0.244)	0.443 (1.136)
GusNIP use	-1.166 (1.557)	-0.428 (0.962)	-0.738 (0.636)	2.921 (3.121)
Later in the benefit cycle (<i>Days</i> > 21) × GusNIP use	-0.090 (2.088)	-0.332 (1.264)	0.242 (0.975)	-4.558 (4.758)
Number of observations (N)	907	907	907	635

Note: Robust standard error in parentheses ($p < 0.1$, ** $p < 0.05$, *** $p < 0.01$). *Days* denotes the number of days since benefits were received. The covariates controlled for include gender, race, household size, education level, and number of children as well as shopping behaviors, such as whether the respondent is primary shopper of the households, whether the household has two or more adults members, ride sharing during shopping trips, use of public transportation, travel time to the primary food store, shopping at nearby stores, shopping based on low price and households food insecurity. Standard errors are clustered at the level of the fixed effects: ZIP code, black race, and survey month.

Table 7: Moderating Effects of GusNIP use on the relationship Between the SNAP Benefit Cycle and Mental Health ($\geq 50^{\text{th}}$ Percentile)

Indicators	DASS-10 Total distress score ($\geq P50$)	DASS-10 Anxiety-stress score ($\geq P50$)	DASS-10 Depression score ($\geq P50$)	PHQ-9 Total depression score ($\geq P50$)
Later in the benefit cycle (<i>Days</i> > 21)	0.01 (0.05)	0.05 (0.05)	-0.01 (0.05)	0.05 (0.09)
GusNIP use	-0.05 (0.16)	-0.10 (0.13)	-0.15 (0.15)	0.19 (0.21)
Later in the benefit cycle (<i>Days</i> > 21) \times GusNIP use	-0.01 (0.17)	-0.01 (0.18)	0.11 (0.19)	-0.32 (0.30)
Number of observations (N)	907	907	907	635

Note: Robust standard error in parentheses ($p < 0.1$, ** $p < 0.05$, *** $p < 0.01$). *Days* denotes the number of days since benefits were received. The covariates controlled for include gender, race, household size, education level, and number of children as well as shopping behaviors, such as whether the respondent is primary shopper of the households, whether the household has two or more adults members, ride sharing during shopping trips, use of public transportation, travel time to the primary food store, shopping at nearby stores, shopping based on low price and households food insecurity. Standard errors are clustered at the level of the fixed effects: ZIP code, black race, and survey month.

Table 8: Moderating Effects of GusNIP use on the relationship Between the SNAP Benefit Cycle and Mental Health ($\geq 75^{\text{th}}$ Percentile)

Indicators	DASS-10 Total distress score ($\geq P75$)	DASS-10 Anxiety-stress score ($\geq P75$)	DASS-10 Depression score ($\geq P75$)	PHQ-9 Total depression score ($\geq P75$)
Later in the benefit cycle (<i>Days</i> > 21)	0.07 (0.05)	0.08* (0.05)	0.05 (0.05)	0.04 (0.08)
GusNIP use	-0.06 (0.09)	-0.08 (0.09)	-0.04 (0.13)	0.14 (0.18)
Later in the benefit cycle (<i>Days</i> > 21) \times GusNIP use	0.02 (0.15)	0.08 (0.17)	-0.06 (0.20)	-0.32 (0.28)
Number of observations (N)	907	907	907	635

Note: Robust standard error in parentheses ($p < 0.1$, ** $p < 0.05$, *** $p < 0.01$). *Days* denotes the number of days since benefits were received. The covariates controlled for include gender, race, household size, education level, and number of children as well as shopping behaviors, such as whether the respondent is primary shopper of the households, whether the household has two or more adults members, ride sharing during shopping trips, use of

public transportation, travel time to the primary food store, shopping at nearby stores, shopping based on low price and households food insecurity. Standard errors are clustered at the level of the fixed effects: ZIP code, black race, and survey month.

To assess the robustness of the results for the first objective, additional models examine whether the effects of late SNAP benefit timing (Days > 21) on mental health outcomes vary across shopping behaviors and household characteristics. The interaction estimates reported in Appendix Tables A3 and A4 generally indicate that the positive association between late-cycle exposure and mental distress remains stable across subgroups. Most interaction terms are small in magnitude and statistically insignificant, suggesting that the observed increase in distress toward the end of the benefit cycle is not driven by specific shopping behaviors or household demographic characteristics. Although a few subgroup effects appear in isolated specifications, there is no consistent pattern indicating that these factors meaningfully alter the late-cycle distress effect. Overall, the robustness checks reinforce the main finding that mental distress increases after day 21 of the SNAP benefit cycle across a broad range of household and behavioral contexts.

In short, the results indicate that mental distress increases toward the end of the SNAP benefit cycle, particularly when measured using continuous DASS-10 scores and among individuals in the upper tail of the distribution. Using the PHQ-9 scale, no statistically significant variation is observed across the cycle. Additionally, there is no evidence that GusNIP participation moderates the association between benefit timing and mental health outcomes.

Chapter 5

Discussion

This study documents how mental health outcomes vary systematically across the SNAP benefit cycle. Respondents who are more than 21 days since receiving their SNAP benefits report higher levels of distress, anxiety, and depression than those in the middle of the cycle (days 8-21). Using the DASS-10 scale, our results indicate that total distress and anxiety-stress scores increase by approximately 19 percent and 21 percent, respectively, in the later part of the month. Depression scores also rise by about 17 percent, although the effect is smaller. These findings are consistent with previous studies showing that welfare and well-being decline as SNAP benefits are exhausted (Shapiro, 2005; Engel, 2025). They also align evidence indicating that SNAP related policy and economic conditions contribute to elevated anxiety and psychological distress (Allen et al., 2023). However, our results extend the boundary of existing literature by documenting within-month fluctuations in mental health outcomes, demonstrating that anxiety-stress, and depressive symptoms rise when benefits diminish and access to food becomes more constrained.

The rise in distress, anxiety-stress, and depressive symptoms toward the end of the SNAP cycle may have several important consequences for SNAP households. Elevated psychological distress can impair cognitive functioning and reduce individuals' ability to make forward-looking decisions, including budgeting and meal planning (Brasington et al., 2025). Under heightened stress and emotional strain, households may rely more heavily on short-term coping strategies such as skipping meals, reducing portion sizes, or purchasing lower-cost, less nutritious foods, which can further exacerbate food insecurity (Heflin & Ziliak, 2008). Anxiety

may play a distinct role in this process, as heightened anxiety is associated with increased uncertainty, worry, and difficulty in planning, which can further weaken households' ability to manage limited resources effectively (Hazzard et al., 2022). In addition, reduced access to nutritious food may further worsen mental health, increasing the risk of serious conditions such as major depression, bipolar disorder, and schizophrenia. Over time, chronic mental health problems can contribute to broader health complications, including heart disease and stroke (Mueller-Stierlin et al., 2022; Wei et al., 2024).

Distributional analyses reveal that the adverse mental-health effects of late-cycle benefit exhaustion are not uniform across households. While average symptom severity increases toward the end of the benefit cycle, it does not significantly increase the likelihood of crossing the median threshold of psychological distress or depressive symptoms. By contrast, when SNAP benefits run low near the end of the month, individuals are more likely to experience severe psychological distress and anxiety-stress, as reflected in effects concentrated in the upper tail of the outcome distribution. Together, these findings indicate that SNAP benefit timing has heterogeneous effects, with adverse impacts concentrated at higher levels of symptom severity rather than across the entire recipient population.

This study investigates whether GusNIP participation moderates the relationship between late-cycle SNAP receipt and mental health outcomes. The interaction estimates between late-cycle exposure and GusNIP use are small and statistically insignificant across all outcomes, suggesting no moderation effect of GusNIP on mental health within the benefit cycle. While GusNIP may provide important nutritional or purchasing benefits, these results indicate that its role in mitigating short-term mental-health fluctuations associated with benefit timing is not evident in the current data.

The results highlight important implications of SNAP program redesign. In particular, expanding access to mental health resources could enhance both participants' stability and overall well-being. Evidence from Barker et al. (2022) shows that community-based Cognitive Behavioral Therapy (CBT) for low-income households reduces psychological distress, improves self-efficacy, and increases optimism about financial conditions. Incorporating similar mental health services into SNAP could help educate participants on stress-management, positive reframing, and problem-solving skills. Research on spending behavior further supports potential policy adjustments. Cotti et al. (2021) find that households receiving SNAP benefits later in the month exhibit smoother spending pattern than those receiving benefits earlier, suggesting that modifying disbursement timing could help households manage resources more evenly. Similarly, Carr and Packham (2019) show that staggered SNAP disbursement schedules reduce grocery-related crime and theft, likely by mitigating early-month spending spikes and alleviating end-of-cycle resource depletion. However, such policies may involve trade-offs. More frequent or staggered disbursement schedules can increase administrative complexity and may reduce households' flexibility to make bulk purchases or take advantage of price discounts. In addition, expanding nutrition incentive programs such as GusNIP, which provide extra funds for purchasing fresh fruits and vegetables, may help ease financial pressure on households that exhaust their benefits early (Krueger et al., 2022; Parks et al., 2020), even if short-run mental health effects are not directly observed. Taken together, these insights suggest that combination of policy approaches, including increasing benefit adequacy and adopting more frequent disbursement schedules may improve consumption smoothing and reduce the end-of-cycle psychological stress among SNAP participants.

This study has several limitations. First, it relies on cross-sectional data, which precludes the establishment of causal relationships. Second, the survey is conducted in a single state, which may differ from others in demographics, benefit issuance schedules, food prices, and local safety-net programs; therefore, the sample may not be representative of the US SNAP population. Third, although hunger-coping behaviors are known to intensify later in the benefit cycle, this study does not measure these behaviors, suggesting an important area for future research. Fourth, physical health and other stressors, such as chronic illness, sleep patterns, and financial strain, are not accounted for, leaving room for further investigation into their potential influence on mental health outcomes.

Chapter 6

Conclusion

This study provides empirical evidence that the timing of SNAP benefits is associated with variation in mental health outcomes across the benefit cycle. Total distress, anxiety-stress, and depressive symptoms increase on average as benefits are depleted toward the end of the SNAP cycle, with the most pronounced effects concentrated among SNAP recipients experiencing higher levels of psychological distress. These findings highlight the importance of incorporating mental health considerations into food assistance programs. Future work should consider how SNAP allotments can be better aligned with households' demographic characteristics and expenditure needs to ensure benefits more accurately meet household needs. Policy approaches such as increasing benefit amounts, adopting more frequent disbursements (e.g., weekly or bi-weekly), expanding nutrition incentives, and integrating community-based mental health interventions may help reduce food insecurity and alleviate end-of-cycle psychological distress among SNAP recipients.

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Appendix

Table A1: The Patient Health Questionnaire (PHQ-9)

Over the past two weeks, how often have you been bothered by any of the following problems?	Not at all=0	Several Days=1	More than half the days=2	Nerely everyday=3
1. Little interest or pleasure in doing things				
2. Feeling down, depressed or hopeless				
3. Trouble falling asleep, staying asleep, or sleeping too much				
4. Feeling tired or having little energy				
5. Poor appetite or overeating				
6. Feeling bad about yourself- or that you are a failure or have let yourself or your family down				
7. Trouble concentrating on things, such as reading newspapers or watching television				
8. Moving or speaking so slowly that other people's souls noticed. Or the opposite being so fidgety or restless that you have been moving around a lot more than usual				
9. Thoughts that you would be better off dead or of hurting yourself in some way				

Table A2: DASS-10 Questionnaire

Please tell us how often you experienced these feelings in the past week	Not at all=0	Some of the time=1	Often =2	Very much=3
1. I felt I was close to panic				
2. I found it difficult to work up the initiative to do things				
3. I felt down hearted and blue				
4. I found myself getting impatient when I was delayed in any way (e.g., elevators, traffic lights, being kept waiting)				
5. I felt that I had nothing to look forward to				
6. I felt scared without any good reason				
7. I tended to over-react to situations				
8. I was worried about situations in which I might panic and make a fool of myself				
9. I found it difficult to relax				
10. I couldn't seem to experience any positive feelings at all				

Table A3: Interaction Effects of SNAP Benefit Timing and Shopping Behaviors on Mental Health Outcomes

Indicators	DASS-10 Total distress score	DASS-10 Anxiety- stress score	DASS-10 Depression score	PHQ-9 Total depression score
Panel A: Primary Shoppers of the HHs				
Later in the benefit cycle (<i>Days > 21</i>)	-1.611 (2.666)	-1.055 (1.615)	-0.556 (1.147)	-1.620 (5.421)
Primary Shoppers of the HHs	-0.464 (2.144)	-0.353 (1.287)	-0.111 (0.928)	0.236 (4.516)
Later in the benefit cycle (<i>Days > 21</i>) # Primary Shoppers of the HHs	2.892 (2.688)	1.880 (1.651)	1.011 (1.138)	1.250 (5.281)
Household with 2 or more adults	0.603 (2.659)	0.282 (1.682)	0.320 (1.124)	2.313 (5.365)
Later in the benefit cycle (<i>Days > 21</i>) # Household with 2 or more adults	2.764 (3.574)	1.891 (2.211)	0.873 (1.515)	0.876 (6.816)
Primary Shoppers of the HHs # Household with 2 or more adults	-1.233 (2.620)	-0.751 (1.656)	-0.482 (1.099)	-0.318 (5.324)
Later in the benefit cycle (<i>Days > 21</i>) # Primary Shoppers of the HHs # Household with 2 or more adults	-2.437 (3.728)	-1.722 (2.305)	-0.716 (1.567)	0.408 (6.829)
Panel B: Ride sharing during shopping trip				
Later in the benefit cycle (<i>Days > 21</i>)	1.365** (0.594)	0.903** (0.373)	0.462* (0.262)	0.102 (1.203)
Ride sharing during shopping trip	0.643 (0.894)	0.492 (0.553)	0.151 (0.380)	1.341 (1.159)
Later in the benefit cycle (<i>Days > 21</i>) # Ride sharing during shopping trip	-0.296 (1.506)	-0.331 (0.905)	0.035 (0.654)	-0.265 (1.762)
Panel C: Using public transportation				
Later in the benefit cycle (<i>Days > 21</i>)	1.374** (0.587)	0.867** (0.374)	0.507** (0.243)	-0.166 (1.137)
Using public transportation	-0.266 (1.882)	0.019 (1.201)	-0.286 (0.765)	-4.801* (2.828)
Later in the benefit cycle (<i>Days > 21</i>) # Using public transportation	-1.901 (2.701)	-0.988 (1.638)	-0.913 (1.194)	5.873 (4.173)
Panel D: Shops within 10-20 minute away				
Later in the benefit cycle (<i>Days > 21</i>)	1.474** (0.654)	0.939** (0.409)	0.535* (0.274)	-0.396 (1.274)
Shops within 10-20 minute away	-0.105 (0.740)	-0.102 (0.470)	-0.003 (0.323)	-0.669 (1.449)

Later in the benefit cycle (<i>Days</i> > 21) # Shops within 10-20 minute away	-0.523 (1.175)	-0.331 (0.705)	-0.192 (0.534)	1.300 (1.887)
Indicators	DASS-10 Total distress score	DASS-10 Anxiety- stress score	DASS-10 Depression score	PHQ-9 Total depression score
Panel E: Shops more than 20 minute away				
Later in the benefit cycle (<i>Days</i> > 21)	1.255** (0.605)	0.811** (0.379)	0.444* (0.256)	-0.098 (1.225)
Shops more than 20 minute away	-0.219 (1.298)	-0.334 (0.768)	0.116 (0.593)	-0.429 (2.176)
Later in the benefit cycle (<i>Days</i> > 21) # Shops more than 20 minute away	0.361 (1.912)	0.135 (1.104)	0.226 (0.871)	1.257 (2.732)
Panel F: Chooses store due to low prices				
Later in the benefit cycle (<i>Days</i> > 21)	0.500 (0.728)	0.369 (0.458)	0.131 (0.302)	-0.416 (1.374)
Chooses store due to low prices	-0.396 (0.765)	-0.232 (0.503)	-0.164 (0.305)	0.127 (1.013)
Later in the benefit cycle (<i>Days</i> > 21) # Chooses store due to low prices	1.795 (1.181)	1.030 (0.723)	0.765 (0.508)	0.931 (1.543)
Panel G: Chooses nearby store				
Later in the benefit cycle (<i>Days</i> > 21)	1.466* (0.847)	0.880* (0.521)	0.586 (0.364)	1.882 (1.782)
Chooses nearby store	0.239 (0.762)	0.154 (0.497)	0.085 (0.298)	0.956 (1.335)
Later in the benefit cycle (<i>Days</i> > 21) # Chooses nearby store	-0.344 (1.097)	-0.109 (0.688)	-0.235 (0.455)	-2.497 (1.843)
Panel H: Chooses store offering the incentive program (SNAP/EBT/WIC)				
Later in the benefit cycle (<i>Days</i> > 21)	1.491** (0.703)	0.858* (0.441)	0.633** (0.300)	0.407 (1.326)
Shore offering incentive facility (SNAP/EBT/WIC)	0.419 (0.900)	0.052 (0.581)	0.367 (0.356)	1.851* (1.072)
Later in the benefit cycle (<i>Days</i> > 21) # Shore offering incentive facility (SNAP/EBT/WIC)	-0.554 (1.228)	-0.091 (0.762)	-0.463 (0.528)	-1.157 (1.519)
Number of observations (N)	907	907	907	635

Note: Robust standard error in parentheses ($p < 0.1$, ** $p < 0.05$, *** $p < 0.01$). *Days* denotes the number of days since benefits were received. The covariates controlled for include gender, race, household size, education level, and number of children as well as shopping behaviors, such as whether the respondent is primary shopper of the households, whether the household has two or more adults members, ride sharing during shopping trips, use of public transportation, travel time to the primary food store, shopping at nearby stores, shopping based on low price and households food insecurity. Standard errors are clustered at the level of the fixed effects: ZIP code, black race, and survey month.

Table A4: Interaction Effects of SNAP Benefit Timing and Households Characteristics on Mental Health Outcomes

Indicators	DASS-10 Total distress score	DASS-10 Anxiety- stress score	DASS-10 Depression score	PHQ-9 Total depression score
Panel A: Gender (Female)				
Later in the benefit cycle (<i>Days > 21</i>)	2.101 (1.672)	1.321 (1.057)	0.780 (0.672)	1.138 (1.524)
Female	-0.001 (1.253)	0.151 (0.794)	-0.152 (0.527)	1.271 (0.851)
Later in the benefit cycle (<i>Days > 21</i>) #Female	-0.905 (1.745)	-0.554 (1.086)	-0.351 (0.723)	-0.979 (1.509)
Panel B: Number of children in HH				
Later in the benefit cycle (<i>Days > 21</i>)	2.326*** (0.874)	1.305** (0.556)	1.021*** (0.376)	1.863 (1.183)
Household with 1 child	0.697 (1.264)	0.583 (0.789)	0.114 (0.540)	0.863 (1.076)
Later in the benefit cycle (<i>Days > 21</i>) # Household with 1 child	-1.559 (1.466)	-0.937 (0.957)	-0.622 (0.612)	-3.305** (1.537)
Household with 2 children	1.104 (1.551)	0.679 (0.967)	0.425 (0.665)	1.781 (1.485)
Later in the benefit cycle (<i>Days > 21</i>) # Household with 2 children	-2.585 (1.659)	-1.333 (1.053)	-1.253* (0.681)	-2.917** (1.478)
Household with 3 or more children	-0.613 (2.113)	-0.435 (1.273)	-0.178 (0.906)	1.191 (1.954)
Later in the benefit cycle (<i>Days > 21</i>) # Household with 3 or more children	-0.816 (1.616)	-0.057 (1.010)	-0.759 (0.658)	-1.843 (1.611)
Panel C: Number of members in HH				
Later in the benefit cycle (<i>Days > 21</i>)	1.569 (1.058)	1.150* (0.662)	0.419 (0.430)	0.835 (0.957)
Single-member household	-0.669 (2.602)	-0.467 (1.554)	-0.203 (1.139)	2.591 (2.231)
Later in the benefit cycle (<i>Days > 21</i>)# Single-member household	0.684 (1.813)	0.090 (1.120)	0.594 (0.748)	0.350 (1.552)
Two-member household	-1.366 (1.732)	-0.810 (1.059)	-0.556 (0.736)	1.908 (1.427)
Later in the benefit cycle (<i>Days > 21</i>)# Two-member household	0.085 (1.471)	-0.203 (0.902)	0.288 (0.633)	-0.382 (1.425)
Three-member household	0.897 (1.401)	0.608 (0.897)	0.289 (0.579)	2.106* (1.190)
Later in the benefit cycle (<i>Days > 21</i>)# Three-member household	-1.908	-1.289	-0.619	-2.440*

Indicators	(1.579) DASS-10 Total distress score	(1.049) DASS-10 Anxiety- stress score	(0.610) DASS-10 Depression score	(1.468) PHQ-9 Total depression score
Panel E: Education level of the respondent				
Later in the benefit cycle (<i>Days</i> > 21)	1.025	0.693	0.332	2.613*
	(1.151)	(0.689)	(0.493)	(1.345)
Graduated college	-0.741	-0.366	-0.375	1.284
	(1.384)	(0.905)	(0.556)	(0.993)
Later in the benefit cycle (<i>Days</i> > 21) # Graduated college	1.486	0.733	0.752	-1.052
	(2.115)	(1.352)	(0.850)	(2.038)
Graduated high school	-0.049	0.179	-0.228	1.098
	(0.987)	(0.607)	(0.435)	(0.837)
Later in the benefit cycle (<i>Days</i> > 21) # Graduated high school	0.264	0.113	0.151	-2.862*
	(1.428)	(0.879)	(0.604)	(1.646)
MS degree	8.443**	4.907**	3.536**	0.286
	(3.663)	(2.075)	(1.781)	(1.715)
Later in the benefit cycle (<i>Days</i> > 21) # MS degree	-11.590***	-6.679***	-4.911**	-2.736
	(4.324)	(2.410)	(2.141)	(3.977)
Some college	-0.687	-0.334	-0.353	1.433
	(1.047)	(0.638)	(0.442)	(0.904)
Later in the benefit cycle (<i>Days</i> > 21) # Some college	0.991	0.616	0.374	-3.732***
	(1.637)	(0.994)	(0.685)	(1.433)
Terminal degree	6.684***	5.801***	0.883	2.106
	(1.545)	(0.949)	(0.672)	(6.750)
Later in the benefit cycle (<i>Days</i> > 21) # Terminal degree	0.995	-0.393	1.388	-1.435
	(7.936)	(5.163)	(2.804)	(8.339)
Number of observations (N)	907	907	907	635

Note: Robust standard error in parentheses ($p < 0.1$, ** $p < 0.05$, *** $p < 0.01$). *Days* denotes the number of days since benefits were received. The covariates controlled for include gender, race, household size, education level, and number of children as well as shopping behaviors, such as whether the respondent is primary shopper of the households, whether the household has two or more adults members, ride sharing during shopping trips, use of public transportation, travel time to the primary food store, shopping at nearby stores, shopping based on low price and households food insecurity. Standard errors are clustered at the level of the fixed effects: ZIP code, black race, and survey month.

Figure A1: Histogram of DASS-10 and PHQ-9 Mental Health Scores

