A click too far from fresh foods: A mixed methods comparison of online and in-store grocery behaviors among low-income households

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ABSTRACT

A recent policy in the U.S. authorized monthly benefits from a nutrition assistance program - Supplemental Nutrition Assistance Program (SNAP) - to be used online to increase grocery access and promote healthy eating. This study examined online grocery attitudes and purchasing behaviors among low-income SNAP-eligible households with young children with and without online grocery experience. An explanatory sequential mixed methods design was used, including a survey informed by the theory of planned behavior (TPB) and focus groups conducted between November–March 2021. In the quantitative phase, 310 Maryland residents completed an online survey assessing TPB constructs (attitudes, social norms, perceived control), and food purchase frequency online and in-store. Subsequently, 42 participated in the qualitative phase. Differences in TPB constructs and food purchase selection and fees were a common obstacle to online grocery purchasing. Families who had purchased groceries online (57%) had more positive attitudes and perceived fewer barriers to online shopping than those who had not. Self-reported frequency of buying fresh produce (OR = 0.34, p < 0.001), meat and seafood (OR = 0.29, p < 0.001), and sweets (OR = 0.54, p = 0.005) were lower online than in-store. Families discussed mistrust of online hired shoppers and fewer impulse purchases online as reasons for less frequent purchases of produce and sweets, respectively. Successful scale-up of the U.S. policy must address barriers to healthier purchasing behaviors to effectively promote equitable food access, such as decreasing delivery fees and improving the online food selection.

1. Introduction

Many low-income families live in environments where small food retailers are ubiquitous and grocery stores and fresh produce are scarce (Rummo et al., 2017). These families may lack access to personal transportation, further reducing their access to healthy foods (Coveney & O’Dwyer, 2009). Online grocery shopping is a new and growing part of the food system that has seen a dramatic increase in usage in recent years. In 2018, 34% of U.S. households reported online grocery shopping at least sometimes (Food Market Institute, 2018). Of those households, approximately one-third were low-income (<$40,000 per year) and 64% included parents with children (Food Market Institute, 2018).

Online grocery services may be a promising strategy to increase access to grocery foods, reduce shopping trips, and minimize the effort required to purchase nutritious, safe, and affordable foods. It has the potential to increase healthy food purchasing by reducing unhealthy “impulse buys” (Huyge, Verstraeten, Geuens, & Van Rerkhhove, 2017).
and increasing access to whole grains, fresh produce, and healthier snacks compared to neighborhood stores (Coffino, Udo, & Hormes, 2020). This strategy could be especially beneficial for families who live in areas with few grocery stores or healthful food outlets and are at the highest risk for poor dietary habits. In the U.S., an online purchasing pilot (OPP) tested the use of monthly government benefits for food to be used across authorized online grocery retailers by eligible low-income households participating in the Supplemental Nutrition Assistance Program (SNAP) (U.S. Department of Agriculture, 2021).

Despite the potential to address inequities in healthy food access, possible unintended consequences of the SNAP OPP should be considered before the policy is scaled broadly. Some features specific to online grocery shopping may widen inequities in healthy food access, such as the need for internet access, targeted online marketing, and personalized purchase recommendations potentially including unhealthy foods based on shopping history. Although the few studies assessing online food purchasing among SNAP-recipients reported potential increases in healthier food choices, concomitant increases in discretionary foods such as high-sugar beverages have also been documented (Appelhans et al., 2013; Lagisetty et al., 2017).

Factors that are singular to the online grocery environment are likely to influence purchase behaviors differently than in-store purchasing, such as product presentation, selection, and payment (Benn, Webb, Chang, & Reidy, 2015; van Ittersum, Wansink, Pennings, & Sheehan, 2013). In addition to the food retail environment, intrapersonal factors such as knowledge, attitudes, and norms play important roles in shaping grocery shopping experiences and decisions. However, most studies comparing online versus in-store grocery shopping have focused primarily on differences in demographic variables (Whaley, Hur, & Kim, 2019; Zatz et al., 2021), and rarely consider intrapersonal factors (Hansen, 2008; Huyghe et al., 2017). The theory of planned behavior (TPB) has previously been used to understand individuals’ purchasing intentions, particularly in the food retail environment (Hansen, 2008). The theory posits that individuals’ attitudes, subjective norms, and perceived behavioral control are proximal determinants of their behavior (e.g., use of grocery services) (Ajzen, 1991; Hansen, 2008). Therefore, examining how attitudes and perceived barriers relate to online compared to in-store grocery shopping (Huyghe et al., 2017) advances our understanding of consumer food decisions.

In the context of the USDA SNAP OPP, using an approach informed by TPB, this study addresses these gaps by examining differences in attitudes, perceived barriers, and grocery purchasing behaviors among households with children (age ≤8) in Maryland, comparing families with and without experience ordering groceries online. The primary hypothesis is that previous experience ordering groceries online is positively associated with attitudes and negatively associated with perceived barriers to online grocery services. The secondary hypothesis is that online grocery shopping is associated with healthier purchases compared to in-store purchases.

2. Methods

2.1. Study design

Data for this mixed methods study were collected between November 2020 and March 2021 via online surveys and online interviews across the state of Maryland in the U.S. At the time of the study, ten grocery chains had online services (four were part of the SNAP OPP), and were located primarily in urban areas. This study was informed by constructs from the TPB (i.e., attitudes, perceived social norms, and perceived behavioral control) to explain individuals’ willingness to purchase groceries online (Hansen, 2008). Potential individual- and environmental-level barriers related to online grocery shopping that could preclude low-income families from using online food services (e.g., shipping cost, inconvenient delivery times, quality of products, payment security) were also assessed.

Fig. 1 illustrates the conceptual framework guiding the study design, survey, and interviews developed prior to data collection. The mixed-methods integration of the quantitative and qualitative components occurred across the recruitment, design, and analysis of the study using an explanatory sequential design (Edmonds & Kennedy, 2017). The following steps were included: 1) qualitative exploratory data to develop a psychometric quantitative survey (n = 8); 2) application of a quantitative survey (n = 310); 3) qualitative data collection through 11 focus groups of 3-5 participants each and 5 in-depth interviews with survey participants (n = 42) conducted concomitantly with the quantitative phase, informed by preliminary survey findings.

2.2. Study population and recruitment

Participants were recruited primarily from targeted Facebook advertisements (targeted at zip codes in Maryland) between November 2020 and March 2021. Facebook posts and paid advertisements have been shown to be a recruitment method that mirrors those of research, rapidly collects diverse and valid data, particularly during the COVID-19 pandemic when other means of data collection were challenging (Ali et al., 2020; Whitaker, Stevelink, & Fear, 2017). A Facebook project account was created to assure credibility of the research study. Research assistants managed the page, posted a recruitment flyer weekly and used paid ($25/week) targeted ads to increase reach and engagement with the post (Wozney, Turner, Rose-Davis, & McGrath, 2019). Interested participants directly messaged the Facebook page with their email address and received a unique link to a QualtricsXM (Qualtrics, Provo, UT) survey eligibility screener that included: current state of residence, household composition, food assistance participation, and grocery shopping frequency. Eligible participants were Maryland adults who were either low-income (<130% federal poverty level identified by the U.S. federal government) or enrolled in SNAP and were the primary grocery shopper for a household with at least one child aged <8. Online grocery shopping experience was not a criterion for participation. Fig. 2 illustrates participant flow.

Using a stratified purposeful sampling strategy (Palinkas et al., 2015), a subsample of survey participants (n = 178) was stratified based on SNAP status and previous online grocery shopping experience. An additional Qualtrics link with a pre-focus group recruitment survey was emailed to the subsample to assist in scheduling. Participants who completed the pre-focus group survey (n = 95) were contacted up to three times to confirm participation in the qualitative phase. All interviews took place via Zoom from January 2021 to March 2021.

2.3. Measures

2.3.1. Online grocery survey development and validation

An online survey was developed and tested to assess TPB domains to

### Abbreviations

- CFI: Comparative Fit Index
- EBT: Electronic Benefit Transfer
- OPP: Online Purchasing Pilot
- RMSEA: Root-Mean-Square Error of Approximation
- SNAP: Supplemental Nutrition Assistance Program
- SRMR: Standardized Root Mean Square Residual
- SSB: Sugar-sweetened beverages
- TLI: Tucker-Lewis index
- TPB: Theory of Planned Behavior
- USDA: United States Department of Agriculture
- WIC: Special Supplemental Nutrition Program for Women, Infants, and Children

Abbreviations: CFI, Comparative Fit Index; EBT, Electronic Benefit Transfer; OPP, Online Purchasing Pilot; RMSEA, Root-Mean-Square Error of Approximation; SNAP, Supplemental Nutrition Assistance Program; SRMR, Standardized Root Mean Square Residual; SSB, Sugar-sweetened beverages; TLI, Tucker-Lewis index; TPB, Theory of Planned Behavior; USDA, United States Department of Agriculture; WIC, Special Supplemental Nutrition Program for Women, Infants, and Children.
understand utilization of both online grocery shopping and in-store grocery shopping among low-income families (Supplemental Material). A systematic review of the literature (Trude, Lowery, Ali, & Vedovato, 2022) was conducted to identify relevant questions followed by a Delphi method (Okoli & Pawlowski, 2004) to gather experts’ feedback on the developed survey. Then, cognitive interviews were conducted over the phone with eight caregivers who were SNAP-eligible (current participants and non-participants) with and without previous experience purchasing groceries online to further refine the questions and ensure that the survey was relevant to the target audience. The survey was pilot tested with 30 individuals and answers were assessed for reliability estimated with Cronbach’s alpha. The online survey was composed of 60 multiple-choice items, most using a 4-point Likert scale ranging from 1 for “strongly disagree” to 4 for “strongly agree” to avoid central tendency bias. The online survey contained skip sequencing based on an initial question related to experience using online grocery shopping, and used validation by requesting responses to unanswered questions before study participants proceeded to the next page. The screener questions assessing study eligibility and the online grocery experience question were the only items that forced participants to choose an answer. A captcha verification was used to prevent non-human answers and cookie technology to ensure a single submission from each respondent. Researchers assessed all survey responses for variability/patterns in answers and checked geolocation to ensure that I. P. addresses were in Maryland prior to compensating participants. On average, respondents took between 15 and 20 min to answer all the questions and received a $25 electronic gift card.

2.3.2. Qualitative interviews and focus groups

The development of the focus group guide was informed by constructs of TPB related to attitudes, perceptions, and barriers to online grocery shopping and aligned with the quantitative survey to explore the background, reasons, and socioeconomic context behind the quantitative findings. Due to the stratified sampling strategy, the interview guide was modified for different groups of participants (e.g., online grocery shoppers participating vs. not participating in SNAP). Minor iterative modifications to the interview guide were made to incorporate insights learned from previous interviews.

Due to the pandemic, online virtual video-conferencing software was used to conduct the focus groups. Prior to the sessions, participants consented to audio-record the session and a set of guidelines (e.g., consistent use of video to enhance engagement and reviewed privacy procedures). Two research assistants, trained in qualitative assessment at the graduate level, facilitated the sessions. If fewer than three participants joined the call, the research assistants conducted in-depth interviews, rather than the focus group. A total of 5 in-depth interviews and 11 focus group discussions (n = 37; mean group size: 3–4 participants) were conducted until adequate information power was achieved for the analysis. Participant responses were deidentified, and interviews were transcribed verbatim.

2.4. Data analysis

2.4.1. Quantitative statistical analysis

Factor analysis extracted standardized factor scores for each individual based on their response to the 34 Likert scale questions on attitudes, social norms, perceived behavioral control, and perceived barriers to online grocery shopping using Mplus 8 (Muthén & Muthén, 2010). First, principal component analysis, followed by parallel analysis, were used to select the number of factors to be retained (Dunteman, 1989). Then, scree plots were used to retain factors with eigenvalues of >1 (Dunteman, 1989). Oblique rotation (geomin) was performed for each factor before loading scores were analyzed. Items had to load significantly on one factor exclusively, meaning that the loading score for an item was ≥0.50 for a factor, and <0.50 for all other factors. Confirmatory factor analysis extracted standardized factor scores for each participant. Goodness of fit statistics such as Chi-square, Tucker-Lewis index (TLI), Comparative Fit Index (CFI), Root-Mean-Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR) were used to determine model fit (Hu & Bentler, 1999). Cronbach’s alpha coefficients were calculated for reliability.

Descriptive analyses were conducted including frequencies, means and standard deviations using Stata 16.1 software (TX, USA). Standardized factor scores were examined and determined that all assumptions of regression-based models were met. Based on theoretical relevance and statistical significance, the following covariates were considered in hypothesis testing: household size, primary shopper’s age, sex, race/ethnicity, and grocery shopping frequency.
Linear regression models with robust standard errors were employed to assess the association between online grocery experience (independent variable) and standardized TPB factor scores (outcome). To test the hypothesis that online grocery shopping is associated with healthier purchases compared to in-store purchases, ordered logit models examined whether the self-reported frequency of purchasing a grocery item (outcome) differed by store type (online versus in-store), after controlling for age, sex, race, household size, and frequency of grocery shopping for the household.

A sensitivity analysis was performed to compare sociodemographic differences between the quantitative analytic sample and participants in the qualitative phase using Chi-square tests for binary and categorical variables and t-tests for continuous variables.

2.4.2. Qualitative data analyses

Textual data from focus group discussions were coded by trained research assistants using a codebook focused on TPB constructs (Hansen, 2008), barriers, purchasing habits, and unintended consequences of online grocery shopping. Informed by principles of grounded theory (Charmaz, 2000), qualitative analysis was centered on providing contextually rich descriptions for key sources of variation in habits and experience (i.e., context, policy, environment, race, gender, income, and previous experience with online grocery shopping). Transcripts were independently coded by two researchers after an inter-rater reliability of 80.2% was obtained (O'Connor & Joffe, 2020). Analysis of the qualitative data was conducted using MAXQDA software.

Fig. 2. Flow diagram of participants in this explanatory sequential mixed methods study on online grocery shopping attitudes and behaviors among SNAP-eligible families with children living in Maryland.
2.5. Ethics

The study’s protocol was submitted to the University of Maryland, Baltimore (UMB) Institutional Review Board (IRB) and it was deemed exempt for review because the identity of the Human Subjects could not readily be ascertained, directly or indirectly through identifiers linked to the subjects (HM-HP-00090624-2). Participants in the qualitative phase electronically signed a written consent prior to answering the online survey. Participants in the qualitative phase also electronically signed a written consent when completing the pre-interview survey in addition to providing verbal consent immediately before the interview took place and was audio recorded.

3. Results

3.1. Demographic characteristics and online grocery shopping experience

The majority of participants were female (92%) and between 30 and 39 years old (50%) (Table 1). Approximately one-third identified as Non-Hispanic Black, 86% lived in urban areas, and 81% reported answering the online survey. Over half of participants reported having ever shopped online (n = 177, 57%). Those who never shopped for groceries online were younger (aged 18–39), whereas most of online grocery shoppers were 30–49 years old (H (3) = 13.4, p = 0.004). Participants in the qualitative phase were similar to the quantitative-only sample (Supplemental Table 1 and Supplemental Table 2).

Availability of online grocery ordering was high among the sample, with self-reporting having the option to have groceries delivered and 85% able to pick up groceries in-store (Table 2). Most participants (54%) started shopping for groceries online after the OPP was implemented (<6 months prior to the survey). Among participants who had ever shopped for groceries online, most perceived spending the same amount (33%) or less (44%) online than in-store.

The perception of spending the same or less money online than in-store was partially supported in the qualitative data, with cost savings related to transportation, and the absence of in-store marketing and nudging that contribute to ‘impulse buying’ cited as reasons behind perceived lower spending online compared to in-store.

“Online, I feel I save a bit more because if it’s not there, okay, I can’t be mad. If I’m in the store, it’s always that one or two rare things that you see, ‘Oh, I like that, and I’ll grab it.’” (Shopped online)

However, some focus group participants noted spending more online due to the inability to redeem coupons, delivery fees, and tipping.

Table 1

| Demographics | Analytical Sample (n = 310) | Previous Online Grocery Experience (n = 177) | Never Purchased Groceries Online (n = 133) | P value |
|--------------|-----------------------------|---------------------------------------------|-------------------------------------------|---------|
| Age          |                             |                                             |                                           |         |
| 18-29        | 66                          | 25                                          | 41                                        | 0.004⁰  |
| 30-39        | 157                         | 97                                          | 60                                        | 0.45    |
| 40-49        | 67                          | 44                                          | 23                                        | 0.17    |
| 50 or older  | 20                          | 11                                          | 9                                         | 0.7     |
| Sex (Female) | 287                         | 162                                         | 125                                       | 0.51²   |
| Race         |                             |                                             |                                           | 0.12⁵   |
| African American or Black | 94                          | 47                                          | 47                                        | 0.35    |
| White or Caucasian | 183                         | 113                                         | 70                                        | 0.52    |
| Other        | 21                          | 9                                           | 12                                        | 0.9     |
| Multiracial  | 12                          | 8                                           | 4                                         | 0.3     |
| <130% of Federal Poverty Line | 285                         | 161                                         | 124                                       | 0.56⁸   |
| Locale       |                             |                                             |                                           | 0.9⁰    |
| Urban        | 268                         | 153                                         | 115                                       | 0.85    |
| Suburban     | 18                          | 11                                          | 7                                         | 0.5     |
| Rural        | 24                          | 13                                          | 11                                        | 0.8     |
| Shopping Frequency |                 |                                             |                                           | 0.00¹   |
| ≥ Once a month | 51                          | 21                                          | 30                                        | 0.22    |
| Every two weeks | 65                          | 30                                          | 35                                        | 0.26    |
| Once a week  | 194                         | 126                                         | 68                                        | 0.51    |
| Mean SD      | Mean SD                     | Mean SD                                     | Mean SD                                   |         |
| Household Size | 4.34                        | 4.28                                        | 4.41                                      | 0.47¹   |

Supplemental Assistance Program Participation

| SNAP past 12 months | 251                          | 81                                          | 107                                       | 0.84¹   |
| SNAP Pre-COVID-19  | 207                          | 82                                          | 89                                        | 0.23⁵   |
| SNAP in the previous month | 225                         | 74                                          | 92                                        | 0.79⁹   |
| Other program, any |                             |                                             |                                           |         |
| P-EBT             | 102                          | 33                                          | 49                                        | 0.2⁰    |
| WIC               | 48                           | 15                                          | 26                                        | 0.08⁶   |
| FRPSM             | 65                           | 21                                          | 30                                        | 0.55¹   |

Abbreviations: SNAP = Supplemental Nutrition Assistance Program, P-EBT = Pandemic Electronic Benefit Transfer, WIC = Special Supplemental Nutrition Program for Women, Infants, and Children, EBT = Electronic Benefit Transfer, FRPSM = free and reduced-price school meal.

P value reported from ⁰ Kruskal-Wallis test by ranks when comparing two or more categories, ¹Chi-squared test for independence comparing two variables, or two-tailed t-test statistics for difference in two means.

One participant preferred not to say (n = 309).

Other race includes: Native American (n = 0), Asian or Asian American (n = 7), Hispanic or Latino (n = 9), Middle Eastern (n = 1), Native Hawaiian (n = 0), other (n = 3).

Multiracial are those who selected more than one race/ethnicity.

Percentage of families living below 130% of the federal poverty level. One participant left this question blank (n = 309).

Locale defined according to the 2010 Rural-Urban Commuting Area (RUMA) Codes: Urban (metropolitan area core or high commuting), suburban (metropolitan area low commuting), rural (micropolitan, small town, or rural area).

Among those who reported receiving SNAP in the past 12 months (n = 251); Pre-COVID-19 = Jan–March 2020.
Table 2
Description of online grocery shopping behavior among SNAP-eligible families with young children in Maryland (U.S.).

| Online Grocery Shopping Behavior | SNAP-Eligible Families (n=310) |
|----------------------------------|--------------------------------|
| **Availability of online grocery delivery** | n | % |
| Not available | 29 | 10 |
| Unsure if available | 69 | 23 |
| Available | 203 | 67 |
| **Availability of click and collect service** | n | % |
| Not available | 14 | 5 |
| Unsure if available | 31 | 10 |
| Available | 257 | 85 |
| **Ever purchased online** | n | % |
| Never | 133 | 43 |
| Yes, but more than 6 months ago | 24 | 7 |
| Yes, >1 time in the past 6 months | 153 | 49 |
| **Started shopping online** | n | % |
| Less than one month | 22 | 12 |
| One to six months | 75 | 42 |
| > 6 months | 80 | 45 |
| **Modality** | n | % |
| Website | 81 | 46 |
| Phone app | 96 | 54 |
| **Shop online using SNAP** | n | % |
| No, EBT card not accepted | 10 | 7 |
| No, never tried EBT online | 45 | 31 |
| Yes | 91 | 62 |
| **Amount purchased online compared to in-store** | n | % |
| All groceries in-store | 148 | 49 |
| Some online and most in-store | 48 | 16 |
| Same amount online and in-store | 30 | 10 |
| Most online and some in-store | 66 | 22 |
| All groceries online | 12 | 4 |
| **Amount spent online compared to in-store** | n | % |
| Less online | 75 | 44 |
| About the same | 56 | 33 |
| More online | 40 | 23 |

Abbreviations: SNAP = Supplemental Nutrition Assistance Program, EBT = Electronic Benefit Transfer.

a Nine respondents left this question blank (n=301).

b Eight respondents left this question blank (n=302).

c Among those who have ever purchased online (n=177).

d Among those who have purchased online and have received SNAP (n=146).

e Six respondents left this question blank (n=304).

f Among those who have ever purchased online with non-missing responses (n=171).

3.2. Theory of planned behavior constructs and factor analysis

Five factors containing constructs of the TPB to explain individuals’ attitudinal and social determinants of online grocery shopping behavior were identified, including “Facilitators”, “Fees”, “Perceived Control”, “Access”, and “Pick-up” (Supplemental Table 3). A higher standardized score on a particular factor indicates more positive attitudes towards online grocery services. All factors had acceptable Cronbach’s alpha values (0.7) ranging from 0.73 to 0.89 indicating adequate consistency in participants’ responses for each factor (Table 3).

3.3. Attitudinal and social determinants of online grocery shopping behavior by online grocery experience

Families with young children who had shopped for groceries online had more positive attitudes and social norms towards online grocery shopping overall than those who had never shopped online (Factor 1 = “Facilitators”; standardized beta = 0.77 [95% CI 0.61, 0.93]) (Table 3). This can be explained by qualitative findings suggesting less stress related to children during online versus in-person shopping. Many expressed difficulties managing children’s behavior or demands during in-person shopping, which were significantly lessened during online shopping.

In the qualitative phase, many participants noted that the additional fees associated with online grocery service were significant for those shopping on a budget:

“...” (Shopped online).

Families with previous online grocery experience felt more positively towards the fees than those who never shopped for groceries online (Factor 2 = “Fees”; standardized beta = 0.31 [95% CI 0.16, 0.46]). Data from the qualitative phase showed that although families who had never shopped online were aware of online fees (i.e., delivery charges), those with previous experience using online grocery platforms were more knowledgeable of the types of expenses and cost differentials between online and in-store services. Families with online grocery shopping experience coped with online grocery fees by implementing cost-reduction strategies. This included application of coupons online and using different payment methods:

“Online [is easier], ‘cuz I don’t have to sit there and clip all these little paper coupons and worry about the expiration date. Online it’s right there, plain as day and all I have to do is click the button.” (Shopped online)

Table 3
Internal consistency of the 5-factor model and descriptive statistics of attitudinal and social determinants of online grocery shopping, and differences in online grocery experience among SNAP-eligible families living in Maryland (n = 310).

| Standardized Factor Score | Difference in Factor Score | Mean (± SD) | b (95% CI) | P value |
|---------------------------|---------------------------|------------|-----------|---------|
| **Facilitators** (0.89)   | Online (n = 177) vs Never (n = 133) | 0.01 (0.77) | 0.01 (0.31) | <0.001 |
| **Fees** (0.73)           | Online (n = 177) vs Never (n = 133) | 0.01 (0.31) | 0.01 (0.36) | <0.001 |
| **Perceived Control** (0.84) | Online (n = 177) vs Never (n = 133) | 0.02 (0.65) | 0.02 (0.32) | <0.001 |
| **Access** (0.73)         | Online (n = 177) vs Never (n = 133) | 0.02 (0.65) | 0.02 (0.32) | <0.001 |
| **Pick Up** (0.75)        | Online (n = 177) vs Never (n = 133) | 0.02 (0.65) | 0.02 (0.32) | <0.001 |

Abbreviations: SNAP = Supplemental Nutrition Assistance Program, SD = standard deviation, CI = confidence interval.

a Reported previous experience purchasing groceries online.

b Reported never purchasing groceries online.

c Difference in factor scores by online grocery experience estimated using multiple linear regression models with robust standard error controlling for age, sex, race, household size, and frequency of household grocery shopping.

“In store, my six-year-old ... she’ll cry and throw a fit if she doesn’t get something. So, with online, I can just go ahead and order and have it shipped to my door, and she doesn’t know what’s coming because it is in the box (laughs). So, it is a lot easier for me just to do it online.” (Shopped online)

“...” (Shopped online).

Families with previous online grocery experience felt more positively towards the fees than those who never shopped for groceries online (Factor 2 = “Fees”; standardized beta = 0.31 [95% CI 0.16, 0.46]). Data from the qualitative phase showed that although families who had never shopped online were aware of online fees (i.e., delivery charges), those with previous experience using online grocery platforms were more knowledgeable of the types of expenses and cost differentials between online and in-store services. Families with online grocery shopping experience coped with online grocery fees by implementing cost-reduction strategies. This included application of coupons online and using different payment methods:

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In the qualitative phase, many participants noted that the additional fees associated with online grocery service were significant for those shopping on a budget:

“...” (Shopped online).

“...” (Shopped online).

“...” (Shopped online).
honey, I better go in this car and go ahead and crank it up going around into this grocery store, because I’m not trying to pay extra $18 for this for these forty dollars’ worth of groceries.” (Shopped online)

Furthermore, online service and delivery fees appeared to influence consumers’ delivery preferences (i.e., home delivery, curbside, in-store pick-up), outweighing factors such as ease and convenience. One participant noted:

“My ultimate decision depends on the cost, what’s available financially, and then okay, say, I am like online ordering and pick up at the store, I can get it cheaper than having them send it to me. I would pick that option if I needed those items immediately.” (Shopped online)

Qualitative data corroborated the quantitative differences in perceptions of “Curbside Pick-up” between those who had never shopped online and those with previous online grocery experience (Factor 5 – “Pick-up”; standardized beta = 0.33 [95% CI 0.16, 0.50]). Online shoppers felt curbside pick-up offered a convenient alternative to in-store shopping, while those who never shopped online did not see much additional value to the service:

“If I gotta go to curbside pickup and pick it up, I might as well just go ahead and go to the store and take the time to go shop.” (Never shopped online)

“I have really been appreciating curbside when I can use it. I find it much easier. I have a four-year-old and I just think to myself ‘Man, if they had curbside when I had a newborn, that would have been amazing’. When he was sleeping and I would be like starving and need food somewhere and didn’t want to wake him up to go in, curbside would have changed my life. But I appreciate it now too.” (Shopped online)

Table 3 also shows that families with previous experience purchasing groceries online had greater perceived behavioral control (Factor 3 – “Perceive Control”; standardized beta = 0.36 [95% CI 0.23, 0.49]), more access to online grocery services (Factor 4 – “Access”; standardized beta = 0.32 [95% CI 0.17, 0.46]) than families who had never used online groceries services.

Findings from the qualitative phase highlighted feeling in control of grocery purchases as a significant challenge with online grocery platforms. The unpredictability of purchases due to past negative experiences with out-of-stock items and product substitutions was a barrier to using online grocery services. A participant stated:

“If I order like a very small thing of sour cream, knowing I just need a small thing, and they replace it with like a half a gallon of sour cream. Then I’m like, what am I going to do with all this?” (Shopped online)

3.4. Purchasing frequency online

Table 4 presents the analysis of the difference between the frequency of items purchased comparing frequency of online grocery orders with the frequency of purchasing the same items in-store (Table 4).

Families who shopped for groceries online had approximately 70% lower odds of frequently buying fresh fruits (OR = 0.34 [SE 0.07], p-value <0.001), fresh vegetables (OR = 0.30 [0.07], p-value <0.001), meats and seafood (OR = 0.29 [0.06], p-value <0.001) online compared to purchasing these items in-store (Table 4, difference online vs in-store). This finding was supported by qualitative data indicating mistrust of shoppers hired to select and deliver groceries and concerns about being unable to personally check the quality of fresh items (e.g., importance of looking at meat and feeling produce before purchasing):

“The meats and produce worry me sometimes because you don’t know what they are going to pick out. Hopefully you get somebody who knows what they are looking for. But I haven’t had any issues at all, having people bring meat or produce, thank goodness, but it still is a little worrisome because you don’t know if they are gonna take the time to be worried about what they get for you.” (Shopped online)

Lower frequency of purchasing sweets online compared to one’s own purchases in-store (OR = 0.54 [SE 0.12], p-value = 0.005) may be related to fewer impulse purchases online from in-store nudge5 and less pressure from children while online shopping, as supported by the qualitative findings. Many participants suggested that greater unhealthy purchases in-store were due to child-driven impulse buying:

“… when they look at you, with their little beady eyes and really want that chocolate bar or the, you know (laughs), they cleaned their room, and they did this … (Interviewer: Hard to say no?) Right.” (Never shopped online)

4. Discussion

Three major findings emerged from this mixed methods investigation of differences in online grocery shopping behaviors among low-income SNAP-eligible families who varied in previous experience purchasing groceries online. First, food selection and fees were the most prominent barriers to online grocery shopping uptake. Second, families with previous experience shopping for groceries online had a more positive attitude toward – and fewer perceived barriers to – using online grocery services than families who never shopped for groceries online. Third, families purchased healthy foods (e.g., fresh produce), protein

### Table 4

| Grocery Item       | Online Purchase Frequency (Per Online Order) | Difference in Purchase Frequency | OR (SE)   | P value |
|--------------------|--------------------------------------------|---------------------------------|----------|---------|
|                    | Never (%) | Sometimes (%) | Every other order (%) | Every order (%) | Online vs In-store [ref] |                                  |
| Fresh fruit        | 30 (17.9) | 53 (31.5)     | 23 (13.7)           | 62 (36.9) | 0.34 (0.07) | <0.001                           |
| Fresh vegetable    | 41 (24.6) | 42 (25.1)     | 28 (16.4)           | 61 (35.9) | 0.30 (0.07) | <0.001                           |
| Meat and seafood   | 48 (28.7) | 30 (18.0)     | 30 (18.0)           | 59 (35.3) | 0.29 (0.06) | <0.001                           |
| Chips              | 26 (15.7) | 76 (45.8)     | 29 (17.5)           | 35 (21.1) | 0.66 (0.14) | 0.053                            |
| Soda               | 46 (27.9) | 54 (32.7)     | 27 (16.4)           | 38 (23.0) | 0.75 (0.16) | 0.183                            |
| Water              | 41 (24.7) | 28 (16.9)     | 31 (18.7)           | 66 (39.8) | 0.66 (0.14) | 0.055                            |
| Juice              | 28 (16.8) | 54 (32.3)     | 41 (24.6)           | 44 (26.3) | 0.68 (0.14) | 0.069                            |
| Sweets             | 37 (22.3) | 72 (43.4)     | 31 (18.7)           | 26 (15.7) | 0.54 (0.12) | 0.005                            |

Abbreviations: SNAP = Supplemental Nutrition Assistance Program, OR = odds ratio, SE = standard error.

* Ordered logit models examined whether the frequency of purchasing a grocery item differed by store type (online versus in-store), after controlling for age, race, household size, and frequency of household grocery shopping (n = 177).
foods (e.g., meat and seafood) and unhealthy items (e.g., sweets) less frequently online than in-store.

Prior research has reported mixed attitudes towards online grocery shopping among low-income consumers, with some studies reporting a general lack of interest in online service resulting in part from low perceived control over food selection (Martinez et al., 2018; Rogus, Guthrie, Niculescu, & Mancino, 2020), and others reporting more positive perceptions of online compared to in-store shopping due to challenges related to transportation and shopping with children (Appelhans et al., 2013; Jilcott Pitts et al., 2020). When contextualizing these mixed findings from past research with the results from the present study, individuals’ experience purchasing groceries online may have shaped attitudes towards such services. Although the TPB does not explicitly include past experience as a construct, the quality of previous online grocery experience may inform behavioral beliefs and ultimately attitudes towards the behavior. Moreover, this study was comprised of families with young children, who may have different perceptions and needs related to grocery shopping than other families (Wig & Smith, 2009), potentially explaining differences in psychosocial factors with previous studies.

Findings also suggest that many SNAP-eligible families purchased groceries online due to convenience. However, concerns around food selection and fees associated with online grocery services were the most prominent barriers to online grocery shopping that emerged in the qualitative investigation. The psychosocial factors from the qualitative phase largely aligned with previous studies. For example, a previous qualitative study with SNAP participants in New Mexico identified cost, distrust, and concerns about produce quality as major barriers to online grocery shopping (Rogus et al., 2020). Similarly, participants of the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) in North Carolina considered delivery fees and lack of control over fresh items to be deterrents to online grocery shopping, but also noted benefits like convenience, ease of use and time-saving capacity (Jilcott Pitts et al., 2020).

Purchase frequency of specific grocery types differed by shopping venue (online versus in-store). In the present study, families reported purchasing fresh fruits and vegetables less frequently online than in-store. However, previous studies among low-income families have reported greater purchases of healthier items online compared to in-store (Appelhans et al., 2013; Lagisetty et al., 2017). Although online grocery services have been thought to positively influence healthful purchases due to planning orders in advance and preservation of individual choice autonomy (Milkmam, Rogers, & Bazerman, 2010), qualitative phase findings highlighted that food selection, particularly of fresh items, was a major concern in online grocery services. Distrust of online hired shoppers’ choices and consumers’ lower perceived behavioral control online may undermine enthusiasm toward online shopping for fresh items.

In addition to purchasing fresh produce less frequently online, many families also reported purchasing sweets less often compared to in-store purchases. Similarly, past observational and experimental research have reported that consumers spent less on sweet items like candies and sweet desserts online than in-store (Huysge et al., 2017; Zatz et al., 2021). Qualitative data from the present study suggest that families make fewer impulse purchases online compared to in-store, particularly when shopping with young children. These findings highlight the potential of online grocery services to reduce common impulse buys like sweets that are highly marketed in physical stores. However, marketing practices are evolving in online retail settings with personalized promotions, recommendations, and advertisements that may increase purchases of certain items (Frank & Peschel, 2020; Wen, Yang, & Estrin, 2019), especially processed foods.

This study took place during the COVID-19 pandemic, at a time when interest in and availability of online grocery services rapidly increased relative to prior studies (Grashuis, Skevas, & Segovia, 2020). Online grocery shopping became a safer option for many. Concomitantly, the OPP that was initially planned to roll out in eight states expanded to other states with additional retailers. Attitudes, barriers, and purchasing behaviors that were different than those reported by previous studies may have been influenced by the context of the pandemic (Hao, Wang, & Zhou, 2020), which will be further explored in future analyses of the qualitative data from this study.

The following limitations should be acknowledged. First, the study was conducted during the COVID-19 pandemic when in-person data collection was not feasible. The use of an online survey and online-based interviews may have introduced bias toward those who are comfortable with and have access to the Internet. Furthermore, qualitative participants self-selected into the study, introducing bias toward those who had opinions about online grocery shopping and were available during the focus group hours. Second, the present study examined association between online grocery experience and TPB constructs and described differences between groups; however, prior attitudes and barriers to online grocery purchase uptake are unknown and directionality cannot be determined. Furthermore, no causal inference can be drawn due the cross-sectional nature of this study. Third, selection bias may exist towards those who shopped online, even after attempting to mitigate it using regression models adjusting for potential confounding variables. Fourth, the sample was majority female, although this is common in grocery shopping studies (Van Droogenbroeck & Van Hove, 2020). Fifth, purchasing data were self-reported and social desirability bias may have occurred. Moreover, the quantity of items purchased was not assessed to minimize participant burden. Lastly, findings from this study may not be generalizable given regional variability and variability in grocery stores participating in the SNAP OPP.

5. Conclusions

In this sample of low-income families, previous experience shopping for groceries online was associated with a positive attitude toward and few perceived barriers to online grocery services. Families with children reported buying unhealthy items less frequently online compared to in-store, possibly due to fewer impulse purchases online. However, families also reported buying healthy items, such as fresh produce, less frequently online than in-store. Additional barriers remain to effectively promote equitable food access, such as decreasing delivery fees and improving the online food selection process so families with limited access to healthy food can make the best use of online grocery services.

Author contributions

ACBT designed the study. SHA and JLM collected the qualitative data. SHA and GMV analyzed the qualitative data. ACBT and CML analyzed the quantitative data. ACBT wrote the first draft with contributions from SHA, CML, GMV, JLM, EH, and MMB. All authors reviewed and commented on subsequent drafts of the manuscript. All authors have reviewed and approved the final version for submission.

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Data availability

All data used in the study are available upon reasonable request. The lead author has full access to the data reported in the manuscript.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence
the work reported in this paper.

Ethical statement

The study’s protocol was submitted to the University of Maryland, Baltimore (UMB) Institutional Review Board (IRB) and it was deemed exempt for review under 45 CFR 46.101(b) (HM-HP-00090624-2). Participants in the qualitative phase of the study electronically signed a written consent prior to answering the online survey. Participants in the qualitative phase also electronically signed a written consent when completing the pre-interview survey in addition to providing verbal consent immediately before the interview took place and was audio recorded.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.appet.2022.106038.

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