

## Online Grocery Shopping Practices and Intentions Shaped by Pandemic-era Experiences

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### Abstract

This study examines impacts of COVID-19 on preferences for and changes in grocery shopping methods. Fifty-five percent of respondents indicated they would not continue online grocery shopping in the coming year. However, analyses suggest those who initiated online grocery shopping during the pandemic are more likely to shop online in the future. Age, income, education level, money spent grocery shopping online, and previous online grocery shopping behavior were statistically significant in the model of future intentions to shop online. This work provides an understanding of drivers of online grocery shopping, which is of interest to retailers and policy makers.

**Keywords:** consumer behavior; food preferences; grocery; household decision making; online shopping

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## Introduction

Shopping for food and household essentials has changed dramatically over the past several years, partially due to natural evolution of consumer behaviors. Additionally, change was instigated and/or accelerated by behaviors/adaptations to mitigate exposure risks and accommodate stay-at-home practices or caregiving responsibilities during the COVID-19 era. Early in the pandemic and upon concerns of supply disruption or shortages, consumers stockpiled grocery items (Acosta, 2020; Dou et al., 2020; Melo, 2020). During 2020 and 2021 consumers spent less time and money dining out (restaurants or food service facilities) and cooked more meals at home (Bender et al., 2022; Ko, Son, and Kim, 2022). In addition, consumers shopped for food and household consumables less frequently in response to stay-at-home orders (or personal desire) to reduce frequency of potential exposure (Ellison et al., 2020; Kowitt and Lambert, 2020; Melo, 2020; Jensen et al., 2021). Instead, consumers shifted their food expenditures to food delivery services or online grocery shopping (Redman, 2020).

The consumers' shift to online grocery shopping during 2020 and 2021 in response to COVID-19 risks resulted in an increase in online grocery sales. One study found that 45% of consumers are buying more groceries online since the start of COVID-19 (Redman, 2021). Jensen et al. (2021) found that 37% of respondents who have shopped online in 2020 were first-time online shoppers. Online grocery sales in the United States exceeded \$35 billion in 2022 and are projected to reach \$36.3 billion in 2023 (IBIS World, 2023). The annualized growth rate of online grocery sales in the United States is estimated at 15.1% for 2018-2023 (IBIS World, 2023). Considering the gradual growth of online grocery sales before the pandemic, COVID-19 was a situational factor leading shoppers to adopt online grocery shopping much more rapidly than would have been predicted otherwise. Online grocery sales took a giant leap of 54% from \$18.5 billion in 2019 to \$28.4 billion in 2020 (IBIS World, 2023). They rose by only 11% from \$16.6 billion to \$18.5 billion between 2018 and 2019 (IBIS World, 2023).

Prior to 2020, many consumers did not actively adopt online grocery shopping due to concerns of freshness not being guaranteed (Hand et al., 2009; Singh, 2019; Kvalsvik, 2022), dissatisfaction from the fact that immediate product possession is not possible (Rohm and Swaminathan, 2004; Hand et al., 2009; Singh, 2019), the missing experiences of touching and feeling products (Pechtl, 2003), concern about substitution to unsuitable items (Hand et al., 2009), and/or picking wrong items or receiving items close to expiration dates (Hand et al., 2009). Mistrust of online grocery product quality kept online grocery shopping one of the least popular e-commerce segments (Kvalsvik, 2022) despite the supply side technological improvements (Mason, 2019)<sup>1</sup> compared to other product categories such as travel, fashion, electronics, and books/music (Nielson, 2018).

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<sup>1</sup> The continuous growth and optimistic anticipation of online grocery shopping are attributed to recent technological advances in artificial intelligence, big data analytics, machine learning and/or robotics (Mason, 2019). The technologies help overcome such challenges that prior online grocers used to face as managing highly perishable products, differing temperature regimes (chilled, frozen, and ambient), keeping proper stock levels, food waste minimization, wide variation in consumers' tastes, accurate item picking for orders placed in a basket, and last mile delivery (Mason, 2019).

Research has been conducted to examine internal and external triggers in the adoption (and disadoption) of online grocery shopping practices. Internal triggers often cover customers' demographics, attitudes, and perceptions. Younger shoppers are more likely to shop for groceries online due to their familiarity with technology compared to older shoppers (Farag et al., 2007; Van Droogenbroeck and Hove, 2018; Etumnu et al., 2019). Findings are inconsistent regarding gender. Some studies suggest a positive relationship between being female and online grocery shopping adoption (Jaller and Pawha, 2020), while others find the opposite (Farag et al., 2007; Etumnu and Widmar, 2020). Households with younger children may prefer to shop for groceries online (Hansen, 2005; Melis et al., 2016; Etumnu et al., 2019; Jaller and Pawha, 2020) because grocery shoppers with children may find that grocery shopping is more challenging with children in tow (Jensen et al., 2021). Household income has a positive effect on online grocery shopping (Hansen, 2005). Additionally, full-time employment (Van Droogenbroeck and Hove, 2018) and a higher level of education (Etumnu et al., 2019; Jaller and Pawha, 2020) had positive effects on online grocery shopping. Distance from the nearest brick-and-mortar grocery store also affects consumers' willingness to shop online, albeit ambiguously (Melis et al., 2016; Germain, 2020; Jensen et al., 2021). Melis et al. (2016) found that the farther grocery shoppers live from a brick-and-mortar grocery store, the more likely they are to spend a larger share of their grocery budget at online grocery websites. On the other hand, Jensen et al. (2021) pointed out that this finding may not hold true for more rural areas where there are challenges delivering the last mile(s).

External triggers, such as situational factors driving consumers to kick off their online grocery shopping, have also been explored. Previously studied triggers included having a baby, developing health or mobility problems, and sudden uncontrollable events (Hand et al., 2009; Kvalsvik, 2022). Hand et al. (2009) found that situational factors, such as the birth of a child or family circumstances, motivated shoppers to buy groceries online. Kvalsvik (2022) focused more on aging and unfavorable health conditions as situational factors that limit mobility and found that adoption of online grocery shopping among older adults is a result of complicated tradeoffs.

After overcoming the initial hurdle to try online grocery shopping, whether the experience(s) keep consumers shopping online when situational factors resolve is an open question (Hand et al. 2009; Sreeram, Kesharwani, and Desai, 2017; Singh, 2019; Grashuis and Skevas, 2020; Jensen et al., 2021). Jensen et al. (2021) found that slightly more than half of respondents planned to shop online after the pandemic. Conversely, Grashuis and Skevas (2020) suggested that many online shoppers may return to brick-and-mortar grocery stores when the pandemic subsides. Hand et al. (2009) mainly investigated situational factors; finding that many shoppers who adopted online grocery shopping for the first time (because of situational factors) discontinued shopping online once the triggering situation disappeared.

Previous studies mainly investigated how internal factors, such as age, income, and the presence of children in the household, influence consumers' decision to adopt online grocery shopping (Melis et al., 2016; Van Droogenbroeck and Hove, 2017; Etumnu et al., 2019; Jaller and Pawha, 2020). Now, even though consumers persisted with online grocery shopping during the acute phases of the pandemic, it is unclear if they will continue to shop online after other COVID-19-era practices are discontinued. This study evaluates the COVID-19 pandemic as one situational

factor that limited public mobility, leading consumers to adopt online grocery shopping, and investigates online grocery shoppers' intention to continue shopping online. This study follows Jensen et al. (2021), Grashius and Skevas (2020), and Hand et al. (2009) in the sense that it investigates shoppers' intention to continue online shopping after a certain situational trigger, the COVID-19 pandemic, disappears. Understanding shoppers' future online grocery shopping intentions and factors behind their decision would provide insights for online grocery retailers to improve the quality of online grocery services.

## Methods

### *Data Collection and Survey Instrument*

An online survey was created and hosted using the Qualtrics online survey platform (Qualtrics, 2021). The survey instrument was approved by university IRB. Kantar, an opt-in online panel hosting company, was used to obtain survey respondents. They were required to be 18 years or older. No other exclusionary criteria were included. The proportion of respondents were matched to the 2019 U.S. census (U.S. Census Bureau, 2019a; U.S. Census Bureau, 2019b) using Quotas set in Qualtrics. Targeted demographics included sex, age, education, income (U.S. Census Bureau, 2019a), and U.S. region of residence (U.S. Census Bureau, 2019b). Once a quota category was met, additional respondents from that category were not allowed to continue past the demographic section of the survey. Although the focus of this work is grocery shopping, in order to ensure a representative sample, grocery shopping behavior was not an exclusionary criterion. Data collection took place from January 13, 2021, through January 23, 2021. The test of proportions was used to compare the proportion of respondents in each of the targeted demographic categories to the U.S. census (Acock, 2018). There were 2,250 respondents who entered the survey, and 1,819 respondents completed the demographic section of the survey, which included gender, age, income, household makeup, income, education, as well as region, state, and county of residence. There were 972 respondents who were within the demographic quotas. Of those, 929 respondents completed the survey. The rurality of the respondents was determined using the 9 categories outlined in the USDA rural-urban continuum codes (USDA-ERS, 2020). For example, a code of 1 indicates a county in a metro area with a population of 1 million or more; 4 indicates an urban population of 20,000 or more adjacent to a metro area; and 9 indicates a completely rural county or an urban population of less than 2,500 not adjacent to a metro area. For this analysis we use two categories: metro counties and nonmetro counties. Metro counties included the rural urban continuum codes from 1–3, and nonmetro includes the rural urban continuum codes 4–9 (USDA-ERS, 2020).

In addition to demographic questions, respondents were asked about their dining and grocery shopping behavior and preferences. The survey instrument is available in Appendix A. Questions included the frequency of dining out, which was defined as either take-out or in-restaurant settings. Individual participation in obtaining food was also collected and answer choices ranged from the respondent having a primary role to the respondent having no role in procuring food or household items. The main focus of the paper was determining frequency and motivation for online grocery shopping. Respondents were asked the amount of time and money spent online grocery shopping

as well as the specific method. Online grocery shopping methods included buying groceries online, pick up in store; pick up retailer curbside; delivery by retailer; delivery by third-party food service; and delivery by mail service. Finally, respondents were asked their future expectations for online grocery shopping and why they do, or do not, grocery shop online.

### *Statistical Testing and Econometric Modeling*

The test of proportions was used to compare demographics within the respondent involvement with food procurement categories for the table included in the Appendix (Acock, 2018). The test of proportions was also used to compare the percentages of respondents for time and money expenditures for in-store grocery shopping and online grocery shopping.

### *Logit Model of COVID-19-induced Online Shopping*

A logit model was used to determine the relationship between demographics and beginning to shop online during the COVID-19 pandemic. A logit model was specified because the belief that participants would shop online was a binary response (Greene, 2012). The model estimated was as follows:

$$\begin{aligned}
 ShopOnlineCOVID = & \beta_1 Female + \beta_2 Age1824 + \beta_3 Age2534 + \beta_4 Age3554 + \\
 & \beta_5 Age5565 + \beta_6 Income024 + \beta_7 Income2549 + \beta_8 Income5074 + \beta_9 Income7599 + \\
 & + \beta_{10} EducationNoHigh + \beta_{11} EducationHigh + \beta_{12} EducationNoBach + \\
 & \beta_{13} EducationBach + \beta_{14} Northeast + \beta_{15} South + \beta_{16} Midwest + \beta_{17} Metro + \beta_{18} Child + \\
 & \beta_{19} Veg + \beta_{20} HouseholdSize + \varepsilon
 \end{aligned} \tag{1}$$

where *ShopOnlineCOVID* is a binary variable indicating the respondent began shopping online during COVID-19. *Age1824*, *Age2534*, *Age3554*, and *Age5565* are age binary variables using the census age categories and in reference to the age category of 65-plus. *Income024* (\$0-\$24,999), *Income2549* (\$25,000-\$49,999), *Income5074* (\$50,000-\$74,999), and *Income7599* (\$75,000-\$99,999) are income binary variables using the census income categories and in reference to the income category of more than \$100,000. The education binary variables are *EducationNoHigh* (did not graduate from high school), *EducationHigh* (graduated from high school, did not attend college), *EducationNoBach* (attended college, no degree earned), *EducationBach* (attended college, Associate's or Bachelor's degree earned), and are in reference to attended college, graduate or professional degree earned. Regions of residence binary variables are *Northeast*, *South*, and *Midwest*. Regional binary variables are in reference to the region West. *Child* indicates the respondent has at least one child in the household. *Veg* indicates the respondent has a vegan or vegetarian family member in the household. *HouseholdSize* is a continuous variable indicating the number of adults and children in the household.

*Logit Model of Respondents' Future Online Shopping*

A logit model was used to determine the relationship between demographics, previously shopping online, and the respondent's belief they would shop online in the 12 months following January 2021. A logit model was specified because the belief that they would shop online was a binary response (Greene, 2012). The model estimated was as follows:

$$\begin{aligned}
 \text{ShopOnlineFuture} = & \beta_1 \text{Female} + \beta_2 \text{Age1824} + \beta_3 \text{Age2534} + \beta_4 \text{Age3554} + \\
 & \beta_5 \text{Age5565} + \beta_6 \text{Income024} + \beta_7 \text{Income2549} + \beta_8 \text{Income5074} + \beta_9 \text{Income7599} + \\
 & + \beta_{10} \text{EducationNoHigh} + \beta_{11} \text{EducationHigh} + \beta_{12} \text{EducationNoBach} + \\
 & \beta_{13} \text{EducationBach} + \beta_{14} \text{Northeast} + \beta_{15} \text{South} + \beta_{16} \text{Midwest} + \beta_{17} \text{Metro} + \beta_{18} \text{Child} + \\
 & \beta_{19} \text{Veg} + \beta_{20} \text{HouseholdSize} + \beta_{21} \text{PrimaryShopper} + \beta_{22} \text{FemalePrimaryShopper} + \\
 & \beta_{23} \text{ObtainsFood} + \beta_{24} \text{FemaleObtainsFood} + \beta_{25} \text{PlacesOnlineOrder} + \\
 & \beta_{26} \text{FemalePlacesOnlineOrder} + \beta_{27} \text{MoneyStore100199} + \beta_{28} \text{MoneyStore200plus} + \\
 & \beta_{29} \text{TimeStore60149} + \beta_{30} \text{TimeStore150plus} + \beta_{31} \text{MoneyOnline100199} + \\
 & \beta_{32} \text{MoneyOnline200plus} + \beta_{33} \text{TimeOnline60149} + \beta_{34} \text{TimeOnline150plus} + \\
 & \beta_{35} \text{OnlinePreCOVID} + \beta_{36} \text{OnlineCOVID} + \beta_{37} \text{PickUp} + \beta_{38} \text{Delivered} + \varepsilon
 \end{aligned} \tag{2}$$

where *ShopOnlineFuture* indicates the respondent stated their household would shop online in the 12 months following January 2021. The demographic variables are as described in equation 1. *PrimaryShopper* is a binary variable indicating the respondent selected "they have the primary role in selecting the food and household items." *FemalePrimaryShopper* is an interaction term between female and primary shopper. *ObtainsFood* is a binary variable indicating the respondent selected they "obtained the food and household items in-store." *FemaleObtainsFood* is an interaction term between female and obtains food. *PlacesOnlineOrder* is a binary variable indicating the respondent "places the order online for food and household items." Binary variables for in-store spending include *MoneyStore100199* (spends between \$100 and \$199 in-store) and *MoneyStore200plus* (spends more than \$200 in store). The reference category for spending in store is \$0–\$99. Binary variables for time spent in-store include *TimeStore60149* (spends between 60 and 140 minutes) and *TimeStore150plus* (spends more than 150 minutes in store). The reference category for spending in store is \$0–\$99. Binary variables for online spending include *MoneyOnline100199* (spends between \$100 and \$199 in-store) and *MoneyOnline200plus* (spends more than \$200 in store). The reference category for spending online is \$0–\$99. Binary variables for time spent online include *TimeOnline60149* (spends between 60 and 140 minutes) and *TimeOnline150plus* (spends more than 150 minutes in store). The reference category for spending online is \$0–\$99. Previous shopping behavior is represented by the binary variables

*OnlinePreCOVID* (shopped online before COVID) and *OnlineCOVID* (began shopping online during COVID, but not before). Previous shopping is in reference to never shopped online. *PickUp* is a binary variable indicating the respondent had picked up online groceries in the past. *Delivered* is a binary variable indicating the respondent had online groceries delivered in the past.  $\varepsilon$  is the error term.

## Results and Discussion

The demographics of the sample of survey respondents closely matched the U.S. population as described in the U.S. census (see Table 1). Statistical differences were found in age, with the 18–24 and 25–34 categories representing a smaller percentage of the sample than the population. The age categories 34–44 and 55–65 years old represented a larger percentage of the sample than the population. The percentage of the sample who did not graduate from high school (2%) was statistically lower than the population (11%). The percentage of the sample with education categories—attended college, associate’s or bachelor’s degree earned (34%), and graduate or professional degree earned (15%)—were statistically higher than the U.S. population (29%, 13%). A lower percentage of respondents were from the West (18%) when compared to the U.S. population (24%). Only 8% of respondents self-reported as vegetarian, while 4% of respondents self-reported as vegan.

**Table 1.** Demographic Information ( $n = 929$ )

Demographic Variable	Percentage of Respondents	U.S. Census <sup>2</sup>
Gender		
Male	46	49
Female	54	51
Age		
18–24	8 <sup>ψ</sup>	12
25–34	13 <sup>ψ</sup>	18
35–44	19 <sup>ψ</sup>	16
45–54	16	16
55–65	20 <sup>ψ</sup>	17
65 +	23	21
Income		
\$0–\$24,999	19	18
\$25,000–\$49,999	22	20
\$50,000–\$74,999	16	17
\$75,000–\$99,999	13	13
\$100,000 and higher	29	31
Education		
Did not graduate from high school	2 <sup>ψ</sup>	11
Graduated from high school, did not attend college	27	27
Attended college, no degree earned	21	21
Attended college, associate’s or bachelor’s degree earned	34 <sup>ψ</sup>	29
Attended college, graduate or professional degree earned	15 <sup>ψ</sup>	13

**Table 1.** Continued

Demographic Variable	Percentage of Respondents	U.S. Census <sup>2</sup>
Region of residence		
Northeast	18	17
South	41	38
Midwest	22	21
West	18 <sup>ψ</sup>	24
Rurality		
Metro	74	
Non metro	26	
Household make-up	Average number	
Adults (over 18 years) <i>n</i> = 911 <sup>1</sup>	2.04	
Children ages 0–4 <i>n</i> = 751	0.16	
Children ages 5–10 <i>n</i> = 764	0.26	
Children ages 11–15 <i>n</i> = 768	0.24	
Children ages 16–18 <i>n</i> = 743	0.13	
Vegetarianism		
Self	8	
A member of household	5	
A close friend or family member is	9	
Veganism		
Self	4	
A member of household	5	
A close friend or family member is	7	

Notes: <sup>ψ</sup>Indicates the percentage of respondents is statistically different than the U.S. census at the 0.05 level.

<sup>1</sup>Not all respondents indicated their household makeup, *n* is as given.

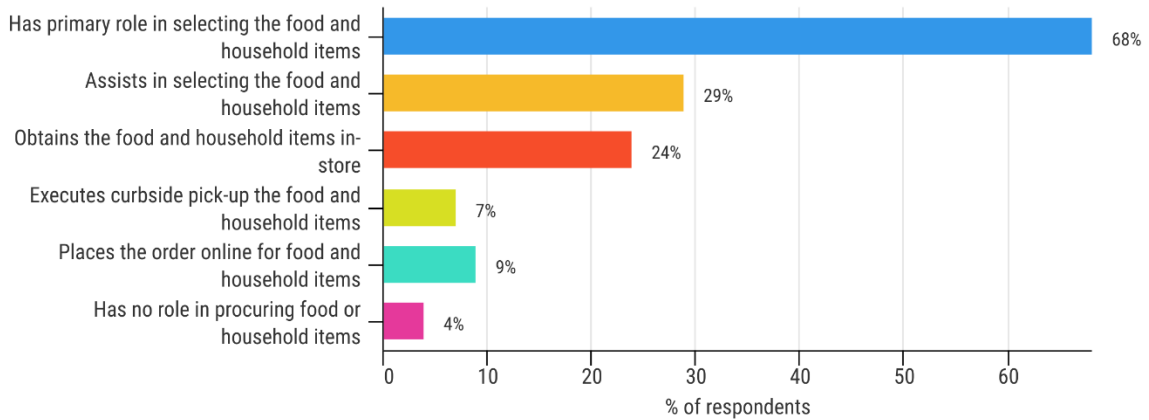
<sup>2</sup>U.S. Census Bureau, 2019a; U.S. Census Bureau, 2019b

Regarding the role the participants played in selecting food and household items, 68% indicated that they had a primary role, while 29% indicated they assisted, in selecting food and household items (see Figure 1). Just under a quarter (24%) = of respondents indicated they obtain the food and household items in-store. Online grocery ordering was reported by 9% of respondents , and 7% used curbside pick-up for the food and household items. Only 4% of respondents had no role in procuring food or household items. An additional breakdown of demographics and food procurement is available in Appendix B.

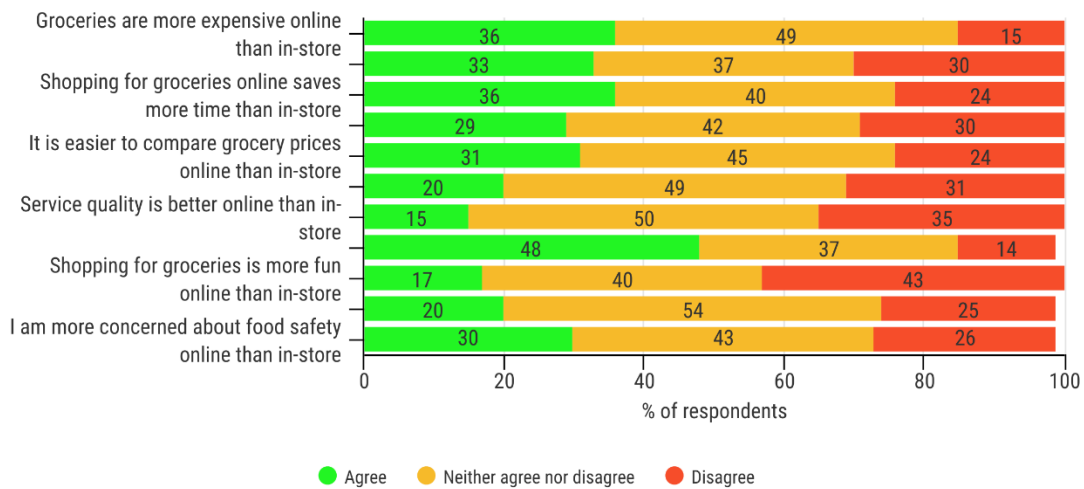


# January 2021 U.S. Household Food & Eating Behaviors (n=929)

## Respondent's Role in food and household essentials procurement



## Level of Agreement/Disagreement with Statements About Online & In-Store Grocery Shopping



**Figure 1.** Food Procurement and Eating Behaviors by U.S. Households in 2021

A high percentage (42%) of respondents indicated they spent 30–59 minutes grocery shopping in-store during an average week since March 2020 (see Table 2). March 2020 was selected as a focal point, as this was around the time most people became aware of the prevalence of COVID-19 in the United States. Of the respondents who indicated they grocery shopped online, 51% spent less than 30 minutes. Approximately a third (34%) of respondents indicated they spent between \$50–\$99 in-store grocery shopping, and 26% indicated they spent between \$100–\$149. There were 41% of respondents who indicated they spent less than \$50 on online groceries. There are several potential explanations for the differences in time and money spent shopping online when compared to in-store. Respondents spent both less money and time shopping online. This finding could be reflective of the number of items purchased, as well as the ease of online shopping. Future research should include questions regarding the specific items purchased to further analyze spending behavior online.

**Table 2.** Estimated Time and Money the Household Spends on Online Grocery Shopping and In-store Grocery Shopping

	In-store Grocery Shopping	Online Grocery Shopping
Time spent	<i>n</i> = 887	<i>n</i> = 492
Less than 30 mins	17 Ψ	51 Ψ
30 mins to 59 mins	42 Ψ	25 Ψ
60 mins to 89 mins	23 Ψ	12 Ψ
90 mins to 119 mins	8	6
120 mins to 149 mins	6 Ψ	3 Ψ
150 mins to 179 mins	2	1
180 mins and above	2	2
Money spent	<i>n</i> = 882	<i>n</i> = 477
Less than \$50	15 Ψ	41 Ψ
\$50 to \$99	34 Ψ	22 Ψ
\$100 to \$149	26 Ψ	18 Ψ
\$150 to \$199	13 Ψ	9 Ψ
\$200 to \$249	7	6
More than \$250	5	4

Note: Ψ Indicates the percentage of respondents is statistically different (< 0.05) between the in-store grocery shoppers and online grocery shoppers.

This table shows the estimated time and money spent by household in an average week since March 2020. Online grocery shopping includes ordering via an app, website, or via phone for pick up in-store or curbside, or for delivery. Percentage of self-reported respondents who shopped in that way. (*N* is given in table.)

Of the respondents who bought groceries online and picked them up in a retail store (*n* = 274), a high percentage did so at least once a week (44%) or at least once in three months (41%) (see Table 3). For those who buy groceries online and pick them up at the retailer curbside (*n* = 311), a high percentage did so at least once in three months (48%). The same percent of respondents (*n* = 275) also indicated they bought groceries online and had them delivered by the retailer at least once a month. High percentages of respondents who bought groceries online and had them delivered by a third-party food service (*n* = 236) did so at least once a week (39%) or at least once

a month (40%). There were 48% of respondents who buy groceries online and have them delivered by mail service ( $n = 272$ ) do so at least once in three months.

**Table 3.** Online Grocery Shopping Type and Frequency

	At Least Once a Week	At Least Once in Three Months	At Least Once in the Past Year
Buy groceries online, pick up in retailer store ( $n = 274$ )	44	41	15
Buy groceries online, pick up at retailer curbside ( $n = 311$ )	38	48	14
Buy groceries online, delivery by retailer ( $n = 275$ )	38	48	14
Buy groceries online, delivery by third-party food service ( $n = 236$ )	39	40	21
Buy groceries online, delivery by mail service ( $n = 272$ )	34	48	18

Note: Percentage of respondents who participate in that type of online shopping.  $N$  given in table.

Just over half (55%) of respondents indicated they would not online shop in the 12 months after January 2021, which is consistent with Grashius and Skevas (2020) and Hand et al. (2009). Jensen et al. (2021) found that 58% of respondents plan to continue online grocery shopping regardless of pandemic conditions. Table 4 specifies reasons why 55% of respondents indicated they would not shop online in the 12 months after January 2021. A high percentage of respondents (65%) indicated the reason they would not shop online was because they like to see and choose products in person before buying them. About half (52%) of respondents would not shop online because they enjoy shopping for groceries in store. “I do not like paying charges for delivery/curbside” was selected as a reason to not shop online by 31% of participants. Surprisingly, only 1% of respondents indicated they would not shop online due to limited internet access. This finding may be reflective of increases in rural broadband (Smith, 2023), as well as the prevalence of cellular data.

**Table 4.** Reasons Why Respondents Indicated They Would Not Online Shop

Reason for Not Online Shopping	Percentage of Respondents
I like to see and choose products in person before buying them.	65
I enjoy shopping for groceries in-store.	52
I do not like paying charges for delivery/curbside.	31
I do not like to plan my grocery shopping in advance.	9
I find it inconvenient waiting for a delivery.	15
My favorite/preferred grocery retailer does not offer this service in my area.	3
Online grocery shopping is not available from any retailer in my area.	2
I find picking up an order at the store inconvenient.	7
Previous bad experience with online grocery shopping.	5
I have limited internet access.	1
I do not trust online grocery retailers.	18
Other reasons(s)	4

Note: This table represents a period over 12 months after January 2021. Percentage of respondents, multiple selections allowed.  $N = 513$ .

Level of agreement/disagreement with statements about online and in-store grocery shopping (see Figure 1) may provide some insights surrounding intentions of not continuing online grocery shopping after the situational factor occurred—COVID-19. Agreement with negative statements about online grocery shopping, such as “Groceries are more expensive online than in-store” and “I am more concerned about food safety online than in-store” may motivate a return to in-store shopping. Despite the belief by some that groceries are more expensive online, respondents spent less money online grocery shopping. This finding could be a result of purchasing fewer items, or there may be some shoppers who find discounts or purchase only lower cost items online. Disagreement with such positive statements about online grocery shopping as, “Service quality is better online than in-store” and “Shopping for groceries is more fun online than in-store” would also suggest a desire to return to in-store experiences. Even though respondents agree that it is easier to compare grocery prices online than in-store, the results suggest that consumers are still wary of the quality of some food items and the service from online grocers.

On the other hand, 45% of respondents indicated they would shop online in the 12 months after January 2021. Table 5 illustrates why 45% of the respondents would continue to shop for groceries online. Half (50%) of respondents indicated they shop online to lessen contact with other people due to COVID-19 or related health concerns. These respondents may be looking to return to stores after the pandemic subsides further. There were 46% percent of respondents who indicated online shopping saves them time, while 38% indicated it helps avoid lines. Online shopping lets them order groceries “anytime from anywhere” was reported by 35% of respondents, and 26% indicated it was easy to choose the delivery time.

**Table 5.** Reasons Why Respondents Indicated They Would Online Shop

<b>Reason for Online Shopping</b>	<b>Percentage of Respondents</b>
I can order groceries anytime from anywhere.	35
I can easily choose the delivery time.	26
It helps me avoid lines/queues.	38
It allows me to compare prices easily.	22
It is easier for me to search for grocery items online.	25
I have access to more stores and grocery items.	17
I have physical constraints.	10
I dislike grocery shopping in stores.	10
It saves me time.	46
I can avoid impulse buying.	22
To lessen contact with other people due to COVID-19 or related health concerns.	50
Other reasons	8

Note: This table represents a period over 12 months after January 2021. Percentage of respondents, multiple selections allowed. *N* = 416

*Logit Model of COVID-19-induced Online Shopping*

Surprisingly, few demographics were statistically significant in the logit model of COVID-19-induced online shopping. Gender, age, income, education level, household size, region of residence, and rurality were not statistically significant (see Table 6). Having a child increased the likelihood of starting to shop online during COVID-19 (marginal 2.42). Previous studies recorded that shoppers may find it more challenging to grocery shop at brick-and-mortar stores with young children, which would increase the appeal of online shopping (Hansen, 2005; Melis et al., 2016; Etumnu et al., 2019; Jaller and Pawha, 2020; Jensen et al., 2021). The COVID-19 vaccine was available later for children, starting with those aged 5–11 on November 2, 2021 (Kates, Tolbert, and Rouw, 2021). This delay may have been the catalyst for some families to shop online in order to minimize children’s exposure. Respondents with a vegan or vegetarian in the household were also more likely to begin shopping online during COVID-19. Pymnts (2023) found that 50% of meat eaters indicated they would not purchase meat online. This, coupled with the ease of shipping dry goods and potential refrigeration and delivery availability concerns, may make vegan/vegetarian purchases easier.

**Table 6.** Logit Model of Respondents Who began Online Shopping during the COVID-19 Pandemic *N* = 929.

Independent variables	Coefficient	Robust SE	Marginal
Female	0.240	0.196	0.031
Age			
18–24	0.026	0.440	0.003
25–34	0.447	0.375	0.057
35–44	0.438	0.345	0.056
45–54			
55–65	0.065	0.339	0.008
65+	Omitted	Omitted	Omitted
Income			
\$0–\$24,999	-0.175	0.318	-0.022
\$25,000–\$49,999	0.079	0.277	0.010
\$50,000–\$74,999	0.112	0.287	0.014
\$75,000–\$99,999	0.025	0.290	0.003
\$100,000 or greater	Omitted	Omitted	Omitted
Education			
Did not graduate from high school	0.061	0.575	0.008
Graduated from high school, did not attend college	-0.469	0.338	-0.060
Attended college, no degree earned	-0.377	0.324	-0.048
Attended college, associate’s or bachelor’s degree earned	-0.194	0.286	-0.025
Attended college, graduate or professional degree earned	Omitted	Omitted	Omitted
Region of residence			
Northeast	0.067	0.316	0.009
South	0.188	0.269	0.024
Midwest	-0.030	0.312	-0.004
West	Omitted	Omitted	Omitted
Lives in a metro area	-0.059	0.217	-0.007

**Table 6.** Continued

Independent variables	Coefficient	Robust	
		SE	Marginal
Has children	0.711**	0.296	0.091**
Vegetarian or vegan in the family	0.938***	0.230	0.120***
Household size	-0.075	0.093	-0.010
Constant	-1.952	0.445	

Note: \* statistically significant at the 0.10 level, \*\*0.05 level, \*\*\*< 0.0001 level. Model is statistically significant at < 0.001, pseudo R squared 0.0766. <sup>1</sup>Omitted indicates the dummy variable category used as the reference category.

### *Logit Model of Belief That Households Will Shop Online in the Future*

Varying degrees of the restricted model of shopping online in the future are available in Appendix C. In the logit model of belief that respondents' households will shop online in the 12 months following January 2021, results are somewhat different from previous studies (see Table 7). Gender was not statistically significant. Respondents aged 45–54 were more likely to shop online (marginal 0.074) when compared to those 65 and older. Prior research found that older people were less likely to shop online (Etumnu et al., 2019; Van Droogenbroeck and Hove, 2018; Farag et al., 2007). This finding may be attributed to technological barriers and/or a need for more social interaction while shopping in brick-and-mortar stores (Hand et al., 2009; Kvalsvik, 2022). Jensen et al. (2021) presents somewhat different results; they found that for each additional year in age, the probability of planning to shop online in the future increases by 0.4%. Older shoppers may appreciate online grocery shopping due to difficulties with transportation or health-related issues.

**Table 7.** Logit Model of Respondent's Belief Their Household Will Shop Online

Independent Variables	Coefficient	Robust	
		SE	Marginal
Female	0.123	0.590	0.011
Age			
18–24	0.169	0.704	0.015
25–34	0.105	0.460	0.009
35–44	0.159	0.361	0.014
45–54	0.861**	0.316	0.074**
55–65	0.006	0.293	0.001
65+	Omitted	Omitted	Omitted
Income			
\$0–\$24,999	-0.154	0.435	-0.013
\$25,000–\$49,999	-0.350	0.352	-0.030
\$50,000–\$74,999	-0.675*	0.374	-0.058*
\$75,000–\$99,999	0.735**	0.360	0.063**
\$100,000 or greater	Omitted	Omitted	Omitted
Education			
Did not graduate from high school	-1.668	1.050	-0.144
Graduated from high school, did not attend college	-0.633	0.394	-0.055
Attended college, no degree earned	-0.213	0.358	-0.018

Table 7. Continued

Independent Variables	Coefficient	Robust SE	Marginal
Attended college, associate's or bachelor's degree earned	-0.498*	0.298	-0.043*
Attended college, graduate or professional degree earned	Omitted	Omitted	Omitted
Region of residence			
Northeast	0.013	0.380	0.001
South	0.116	0.368	0.010
Midwest	0.295	0.387	0.025
West	Omitted	Omitted	Omitted
Lives in a metro area	0.124	0.273	0.011
Has children	-0.224	0.391	-0.019
Vegetarian or vegan in the family	-0.050	0.418	-0.004
Household size	0.042	0.107	0.004
Is the primary shopper	0.572	0.407	0.049
Interaction of female and primary shopper	-0.371	0.613	-0.032
Obtains the food in store	0.246	0.413	0.021
Interaction of female and obtains the food in store	-0.872	0.564	-0.075
Places the online order	-0.120	0.887	-0.010
Interaction of female and places the online order	2.239**	1.093	0.193**
Money spent grocery shopping in store			
\$0–\$99	Omitted	Omitted	Omitted
\$100–\$199	0.026	0.272	0.002
Greater than \$200	0.579	0.578	0.050
Time spent grocery shopping in store			
0–30 minutes	Omitted	Omitted	Omitted
60–149 minutes	0.030	0.263	0.003
150 minutes and greater	-1.195	0.874	-0.103
Money spent grocery shopping in online			
\$0–\$99	Omitted	Omitted	Omitted
\$100–\$199	0.742*	0.417	0.064*
Greater than \$200	2.595**	1.305	0.224**
Time spent grocery shopping online			
0-30 minutes	Omitted	Omitted	Omitted
60-149 minutes	0.801	0.518	0.069
150 minutes and greater	-1.652	1.155	-0.142
Previous online shopping behavior			
Never shopped online	Omitted	Omitted	Omitted
Shopped online before COVID	2.154***	0.270	0.186***
Began shopping online during COVID, but not before	2.073***	0.395	0.179***

**Table 7.** Continued

Independent Variables	Coefficient	Robust SE	Marginal
Picked up online groceries in the past	1.521***	0.295	0.131***
Had online groceries delivered in the past	1.770***	0.253	0.153***
Constant	-3.206***	0.626	

Note: \* statistically significant at the 0.10 level, \*\*0.05 level, \*\*\* < 0.0001 level

This table presents a period over the 12 months after January 2021.  $N = 929$ . Model is statistically significant at <0.001, pseudo R squared 0.5766.

<sup>1</sup>Omitted indicates the dummy variable category used as the reference category.

Respondents with an income of \$50,000–\$74,999 were less likely to shop online (marginal -0.058), and those with an income of \$75,000–\$99,999 were more likely to shop online (marginal 0.063) when compared to those with an income of \$100,000 or greater. This finding was less clear than prior studies that found household income had a positive impact on online grocery shopping (Hansen, 2005). Curbside pickup and the SNAP program for lower income shoppers can be used online, which may mitigate some barriers those with lower income face when shopping online (Day, 2020; USDA-FNS, 2020). Curbside pickup options did not incur extra delivery cost (Redman, 2020; Jensen et al., 2021) in many cases in 2021, due to many stores waiving curbside fees during the pandemic. Waived delivery fees also may have also served to level the online shopping playing field.

Attending college and associate's or bachelor's degree earned decreased the probability the respondent would continue to shop online (marginal -0.498) when compared to those who attended college and obtained a graduate or professional degree. Previous studies present similar results that show grocery shoppers with higher education levels would continue to shop online (Van Droogenbroeck and Hove, 2018; Etumnu et al., 2019; Jaller and Pawha, 2020; Jensen et al., 2021).

Rurality and region of residence were insignificant in our model. Previous studies were split on the benefits of online shopping for those in rural communities. Very remote shoppers may incur extra costs for delivery, or delivery may not be available (Jensen et al., 2021). Conversely, if rural consumers are far from brick-and-mortar stores but within reach of delivery services for online groceries, rurality may increase online grocery shopping (Melis et al., 2016). The lack of significance of rurality in our model may be reflective of the dichotomy in terms of usefulness for rural shoppers found in previous research.

Surprisingly, having a child did not increase the probability of continuing to shop online in the future. It is possible that other shopping behavior variables included in the model, such as spending and previously shopping online, are better indicators of shopping behavior than the simple presence of children in the household. Similarly, despite previous studies indicating people would not buy meat online (Pymnts, 2023), having a vegetarian or vegan in the family did not increase the likelihood of shopping online. Even heavy meat eaters could be buying other non-meat products online and simply reserving meat purchases for in-store shopping trips. Household size was also not statistically significant. Further research asking respondents specifics regarding product type and purchasing frequency online could shed more light on this issue.



Being the primary shopper, being the person who obtains food in the store, and placing the online order were not statistically significant. However, the interaction term between female and placing the online order was statistically significant, and being a female who placed the online order increased the likelihood of shopping online in the future (marginal 0.193). This information may be of use to those developing marketing surrounding online shopping.

The amount of time and money spent grocery shopping in store was not statistically significant. However, spending \$100–\$199 (marginal 0.064) and spending greater than \$200 (marginal 0.224) increased the likelihood of shopping online in the future, compared to spending \$0–\$99. Time spent grocery shopping online was not statistically significant. For retailers with online shopping platforms, focusing on retention of lower dollar customers or understanding their preferences could be an avenue to increase online shopping participation.

Respondents who shopped online before COVID-19 were more likely to shop online in the future (marginal 0.186) when compared to those who never shopped online. Similarly, those who began shopping online during COVID-19, but not before, were more likely to shop online in the future (marginal 0.179), suggesting the pandemic, a situational factor, might have led consumers to initiate online grocery shopping. Positive experiences with online grocery shopping during the pandemic may be expanding their intention of shopping online to the near future. Prior studies suggest somewhat different results where situational factors introduced online grocery shopping to consumers, resulting in shoppers who do not plan to continue online grocery shopping after the pandemic is no longer a threat (Hand et al., 2009; Grashius and Skevas, 2020; Jensen et al., 2021). There is a consensus that the COVID-19 pandemic in 2020 led consumers to adopt online grocery shopping for the first time, but there is disagreement on whether online grocery shopping will continue post-pandemic. Results from prior studies (Yeo, Goh, and Rezaei, 2017; Singh, 2019; Singh and Söderlund, 2020), in combination with our result that 55% of respondents will not continue shopping for groceries online, show that a consumer's intention to continue shopping online may be a direct result of their online shopping experience during the pandemic. Other respondents may be satisfied with their online grocery shopping experience during their first experience during the pandemic and will continue procuring grocery items online. Additionally, respondents who picked up groceries purchased online in the past (marginal 0.131), and those who had online groceries delivered in the past (marginal 0.153) were more likely to shop online in the future. This finding may indicate that consumers enjoy the ease of choosing the items online, with the actual method of obtaining the groceries being a secondary personal preference.

## Conclusion

Although online grocery shopping had grown prior to 2020, it grew gradually, and many consumers were hesitant due to concerns regarding freshness, dissatisfaction from delayed possession of products, and the desire to touch and feel grocery items (Pechtl, 2003; Rohm and Swaminathan, 2004; Singh, 2019; Kvalsvik, 2022). The COVID-19 pandemic, a situational factor, accelerated the adoption of online grocery shopping by consumers who wanted to avoid exposure and alleviate related health threats (Hand et al., 2009; Kvalsvik, 2022).

Predictions of consumers' intention to continue online grocery shopping initiated by the pandemic are not consistent in previous studies (Hand et al., 2009; Grashius and Skevas, 2020; Jensen et al., 2021). This study explored COVID-19 as a situational factor that led shoppers to purchase groceries online and furthered understanding by examining intentions to continue to shop for groceries online after 12 months. In the model "began shopping online during COVID," only having children in the household and having a vegan/vegetarian in the household were statistically significant. This study finds that those who started shopping for groceries online during the pandemic were more likely to say they will continue to do so in the future. Gender, region, rurality, having children, having a vegetarian/vegan in the family, household size, shopping role, money spent in-store, and time spent in-store and online were not statistically significant in the model for future intentions of online grocery shopping. Statistically significant variables were age, income, education level, money spent grocery shopping online, and previous online grocery shopping behavior. In addition to prior studies that examine what and how internal and external factors lead shoppers to online grocery shopping, a better understanding of drivers of continuous online grocery shopping would be of interest not only to the grocery retailing industry but also to policy makers. Retailers may not consider the sudden rise of online grocery shopping during COVID-19 as a continuous shopping behavior after the pandemic subsides when evaluating business strategies.

This cross-sectional study should be interpreted within the context of the data collection timing and survey's focus. Future research should consider discrepancies in preferences across food categories in terms of perishability, such as packaged breakfast cereals and snacks, processed deli items, or fresh fruits and vegetables. In addition, consumers' online grocery shopping experiences could be examined to find what factors keep them purchasing groceries online after their initial adoption during COVID-19. It would be advantageous to monitor online grocery shopping for a longer time period after the pandemic subsides. As health concerns continue to lessen, it is expected that more "normal" online versus in-person shopping patterns may emerge compared to those observed in this research during a time where the most acute phases may have subsided, but health concerns impacting everyday activities were still widespread.

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## Appendix A. Survey Instrument

I am:

- Male
- Female

I am \_\_\_\_\_ years old.

- Under 18
- 18 - 24
- 25 - 34
- 35 - 44
- 45 - 54
- 55 - 64
- 65 +

Please enter the number of household members - including adults and children - within each age bracket currently living in your household. Please include yourself in the count.

	Total number of household members
Adults (over 18 years)	
Children ages 0 to 4 years	
Children ages 5 to 10 years	
Children ages 11 to 15 years	
Children ages 16 to 18 years	

My annual pre-tax, household income is:

- \$0-\$24,999
- \$25,000-\$49,999
- \$50,000-\$74,999
- \$75,000-\$99,999
- \$100,000 and higher

The best description of my educational background is:

- Did not graduate from high school
- Graduated from high school, Did not attend college
- Attended College, No Degree earned
- Attended College, Associate's or Bachelor's Degree earned
- Attended College, Graduate or Professional Degree earned

My region of residence is: \_\_\_\_\_. Select one option from the drop down menu.

- Northeast
- West
- South
- Midwest

State and county of residence was asked using a drop-down menu based on the previous response to region. The full list of counties was not included for brevity.

Do you participate in obtaining food and household essentials for your household in any of the following ways? (Check All That Apply)

- I have the primary role in selecting the food and household items
- I assist in selecting the food and household items
- I obtain the food and household items in-store
- I curbside pick up the food and household items
- I place the order online for food and household items
- I have no role in procuring food or household items

How much time would you estimate that your household spends on online grocery shopping and in-store grocery shopping in an average week since March 2020? Note that online grocery shopping includes ordering via an app, website, or via phone for pick up in-store or curbside, or for delivery.

	Amount of time spent per week							
	Less than 30 mins	30 mins to 59 mins	60 mins to 89 mins	90 mins to 119 mins	120 mins to 149 mins	150 mins to 179 mins	180 mins and above	None
In-store grocery shopping								
Online grocery shopping								

How much would you estimate your household spends on groceries in an average week since March 2020? Note that online grocery shopping includes ordering via an app, website, or via phone for pick up in store or curbside, or for delivery.

	Amount of money spent per week							
	Less than \$50	\$50 to \$99	\$100 to \$149	\$150 to \$199	\$200 to \$249	More than \$250	None	



Q2.4 Which of the following best describes your household's use of online grocery services, including ordering online and picking up curbside or in-store, during COVID-19? (Select All That Apply)

- I do none of my grocery shopping online
- I do a small amount of my grocery shopping online (e.g. less than one-quarter)
- I do some of my grocery shopping online (e.g. between a quarter and a half)
- I do most of my grocery shopping online (i.e. between a half and three quarters)
- I do almost all of my grocery shopping online (between three quarters and all of it)
- I started shopping for groceries online during COVID-19 but had not done so before
- I greatly increased my online shopping for groceries due to COVID-19
- My grocery shopping behaviors did not change due to COVID-19
- I spend more money at the grocery store in an average week due to COVID-19

How often does your household use each of the following online grocery shopping delivery methods during COVID-19?

	At least once a week	At least once in three months	At least once in the past year	Never
Buy groceries online, pick up in retailer store				
Buy groceries online, pick up at retailer curbside				
Buy groceries online, delivery by retailer				
Buy groceries online, delivery by third party food service				



Buy groceries  
online, delivery  
by mail service

Does your household expect to buy groceries online in the next 12 months? Note that online grocery shopping includes ordering via an app, website, or via phone for pick up in store or curbside, or for delivery.

- Yes
- No

\*Displayed if household did not purchase groceries online\*

Which of the following are reasons why you do not expect to buy groceries online in the next 12 months.

- I like to see and choose products in person before buying them
- I enjoy shopping for groceries in-store
- I do not like paying charges for delivery/curbside
- I do not like to plan my grocery shopping in advance
- I find it inconvenient waiting for a delivery
- My favorite/preferred grocery retailer does not offer this service in my area
- Online grocery shopping is not available from any retailer in my area
- I find picking up an order at the store inconvenient
- Previous bad experience with online grocery shopping
- I have limited internet access
- I do not trust online grocery retailers
- Other reasons(s) \_\_\_\_\_

\*Displayed if household did purchase groceries online\*

- Which of the following are the reasons why you expect to buy groceries online in the next 12 months? Please select all that apply.
- I can order groceries anytime from anywhere
- I can easily choose the delivery time
- It helps me avoid lines/queues
- It allows me to compare prices easily
- It is easier for me to search for grocery items online
- I have access to more stores and grocery items
- I have physical constraints
- I dislike grocery shopping in stores
- It saves me time
- I can avoid impulse buying
- To lessen contact with other people due to COVID-19 or related health concerns
- Other reasons \_\_\_\_\_

To what extent do you agree or disagree with the following statements regarding online and in-store grocery shopping

	Agree	Neither agree nor disagree	Disagree
Groceries are more expensive online than in-store			
Shopping for groceries is more convenient online than in-store			
Shopping for groceries online saves more time than in-store			
It is easier to search for grocery items online than in-store			
It is easier to compare grocery prices online than in-store			
Grocery retailers have a lot more varieties online than in-store			
Service quality is better online than in-store			
Shopping online for groceries is safer during COVID-19 than shopping in-store			
Shopping for groceries is more fun online than in-store			
Online reviews are more helpful for buying groceries online than in-store			
I am more concerned about food safety online than in-store			

## Appendix B

Ways Respondent Participates in food and Household Essentials in their Household by Demographic. Multiple Selections Permitted ( $n = 929$ )

	Selects food and household items	Assists in selecting food and household items	Obtains items in store	Places the order online	Executes curbside pick-up	Has no role in procuring food or household items
Gender						
Male $n = 429$	59a <sup>1</sup>	36a	28a	8a	8a	5a
Female $n = 500$	76b	23b	20b	9a	6a	4a
Age						
18–24 $n = 79$	37b	52a	30a	16a	14a	6a
25–34 $n = 122$	70ac	29b	21a	7b	8ab	7a
35–44 $n = 181$	72ac	29b	25a	11ab	10a	3a
45–54 $n = 152$	76c	22b	20a	9ab	7ab	7a
55–65 $n = 183$	72ac	25b	24a	7b	4b	3a
65+ $n = 212$	67a	30b	24a	6b	4b	3a
Income						
\$0–\$24,999 $n = 181$	70a	28a	15a	7a	7a	6a
\$25,000–\$49,999 $n = 202$	69a	27a	19ab	10a	6a	3a
\$50,000–\$74,999 $n = 154$	72a	26a	25bc	7a	5a	4a
\$75,000–\$99,999 $n = 118$	67a	31a	30c	8a	7a	3a
\$100,000 and higher $n = 274$	65a	32a	29c	9a	9a	5a
Education						
Did not graduate from high school $n = 20$	70ab	27a	23a	8a	7a	4a
Graduated from high school, did not attend college $n = 250$	62a	32a	20a	10a	9a	6ab
Attended college, no degree earned $n = 200$	70ab	27a	23a	8a	7a	4b
Attended college, associate's or bachelor's degree earned $n = 318$	71b	29a	26a	8a	5a	4b
Attended college, graduate or professional degree earned $n = 141$	72b	28a	26a	10a	7a	4b
Region of residence						
Northeast $n = 171$	73a	28a	26a	5a	6a	5a
South $n = 382$	68a	27a	23a	9ab	8a	4a
Midwest $n = 208$	67a	34a	20a	8ab	7a	4a
West $n = 168$	65a	29a	27a	13b	8a	5a

Note: 1 Mismatched letters indicate the percentage within that participation method and demographic category are statistically different at the 0.05 level. For example, the percentage of men who selected food and household items was statistically different than the percentage of women

### Appendix C

Varying degrees of the restricted logit model of respondent’s belief their household will shop online in the 12 months after January 2021. *N* = 929. All models were statistically significant. Pseudo R Squared: Model A 0.0974, Model B 0.1219, Model C 0.5766

Independent variables	Model A		Model B		Model C	
	Coefficient	Robust SE	Coefficient	Robust SE	Coefficient	Robust SE
Female	-0.099	0.147	-0.033	0.152	0.123	0.590
Age						
18–24	1.334***	0.302	0.968**	0.340	0.169	0.704
25–34	1.750***	0.258	1.284***	0.287	0.105	0.460
35–44	1.519***	0.231	1.164***	0.258	0.159	0.361
45–54	1.200***	0.241	0.991***	0.250	0.861**	0.316
55–65	0.296	0.234	0.240	0.236	0.006	0.293
65+	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted
Income						
\$0–\$24,999	-0.317	0.246	-0.228	0.259	-0.154	0.435
\$25,000–\$49,999	-0.158	0.218	-0.105	0.225	-0.350	0.352
\$50,000–\$74,999	-0.240	0.221	-0.230	0.229	-0.675*	0.374
\$75,000–\$99,999	0.578**	0.241	0.442*	0.247	0.735**	0.360
\$100,000 or greater	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted
Education						
Did not graduate from high school	-0.903*	0.524	-0.931*	0.561	-1.668	1.050
Graduated from high school, did not attend college	-0.707**	0.262	-0.704**	0.266	-0.633	0.394
Attended college, no degree earned	-0.285	0.252	-0.319	0.258	-0.213	0.358
Attended college, associate’s or bachelor’s degree earned	-0.530**	0.221	-0.534**	0.226	-0.498*	0.298
Attended college, graduate or professional degree earned	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted
Region of residence						
Northeast	-0.395*	0.237	-0.391	0.244	0.013	0.380
South	0.002	0.196	-0.014	0.204	0.116	0.368
Midwest	-0.141	0.229	-0.116	0.235	0.295	0.387
West	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted
Lives in a metro area	0.072	0.169	0.080	0.173	0.124	0.273
Has children			0.630	0.228	-0.224	0.391
Vegetarian or vegan in the family			0.992	0.219	-0.050	0.418
Household size			-0.082	0.069	0.042	0.107
Is the primary shopper					0.572	0.407
Interaction of female and primary shopper					-0.371	0.613

Note: \* statistically significant at the 0.10 level, \*\*0.05 level, \*\*\*< 0.0001 level

<sup>1</sup>Omitted indicates the dummy variable category used as the reference category.

**Appendix C. Continued**

Independent variables	Model A		Model B		Model C	
	Coefficient	Robust SE	Coefficient	Robust SE	Coefficient	Robust SE
Obtains the food in store					0.246	0.413
Interaction of female and obtains the food in store					-0.872	0.564
Places the online order					-0.120	0.887
Interaction of female and places the online order					2.239**	1.093
Money spent grocery shopping in store						
\$0–\$99					Omitted	Omitted
\$100–\$199					0.026	0.272
Greater than \$200					0.579	0.578
Time spent grocery shopping in store						
0–30 minutes					Omitted	Omitted
60–149 minutes					0.030	0.263
150 minutes and greater					-1.195	0.874
Money spent grocery shopping online						
\$0–\$99					Omitted	Omitted
\$100–\$199					0.742*	0.417
Greater than \$200					2.595**	1.305
Time spent grocery shopping online						
0–30 minutes					Omitted	Omitted
60–149 minutes					0.801	0.518
150 minutes and greater					-1.652	1.155
Previous online shopping behavior						
Never shopped online					Omitted	Omitted
Shopped online before COVID					2.154***	0.270
Began shopping online during COVID, but not before					2.073***	0.395
Picked up online groceries in the past					1.521***	0.295
Had online groceries delivered in the past					1.770***	0.253
Constant	-0.514*	0.308	-0.462	0.352	-3.206***	0.626

Note: \* statistically significant at the 0.10 level, \*\*0.05 level, \*\*\*< 0.0001 level

<sup>1</sup>Omitted indicates the dummy variable category used as the reference category.