

Food purchasing patterns in Quebec, Canada during the first wave of the COVID-19 pandemic

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This is the winning paper in the undergraduate category of the Dr Elizabeth Feniak Award for Excellence in Technical Writing 2020, presented by the Canadian Home Economics Foundation.

Mandana Tavanaei was author of the paper and recipient of the award;
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Abstract

Online grocery ordering has increased during the COVID-19 pandemic, potentially from increased demand as a result of self-isolation periods or from the desire to avoid virus exposure in public settings. An online survey (n=1955) was conducted to evaluate food-purchasing patterns amongst Quebec households during the provincial lockdown period in spring 2020. A decrease in-store grocery-shopping frequency compared to 2019 was observed, along with highly prevalent reports of disinfection of food-product packaging. Use of online grocery ordering was higher among the older age group (60 years or older) and those who were highly concerned about the pandemic, and was lower among those living in the lowest COVID-19-prevalence region. Nearly half of respondents who utilised online grocery ordering reported receiving incomplete grocery orders or experiencing long wait times. The findings of this study may benefit public-health agencies and food retailers in ensuring food availability and the reliability of online grocery shopping as the pandemic evolves.

Introduction

The COVID-19 pandemic, caused by the novel coronavirus SARS-CoV-2, has had severe societal impacts leading to disruption of local and global economies. Of particular relevance to consumer studies and home economics, the retail experience for purchasing food has changed over the course of the pandemic as a result of the lockdowns and physical distancing measures put into effect to mitigate the spread of the virus (Carson, 2020). In particular, use of online grocery shopping has increased since the start of the pandemic, potentially due to concerns over exposure to the virus in public settings and/or to the inconvenience of queues to enter grocery stores (Martin-Neuninger & Ruby, 2020).

The uptake of online grocery shopping had been increasing in recent years and may have been accelerated as a result of the pandemic. According to a 2015 international survey conducted by Nielsen *Global E-commerce and the New Retail Survey* (n = 30 000), 25 per cent of respondents indicated that they already used online grocery shopping with a home-delivery option and 55 per cent reported they were willing to shop online for groceries in the future (Nielsen, 2015). In the Nielsen (2015) study, millennials and Generation Z respondents reported the most use of online grocery shopping for home delivery, and 12 per cent of online grocery users resided in North America. A recent study in Qatar investigated the immediate impact of COVID-19 on food behaviour of consumers and reported a sizeable change in consumers' grocery-shopping methods. Of 539 participants, 35 per cent reported an increase in their use of online grocery shopping and younger respondents reported more frequent use of online grocery shopping than older participants (Ben Hassen et al., 2020).

Given the need for societal adaptations to the pandemic and physical distancing measures, this investigation aimed to evaluate food-purchasing patterns and the characteristics of online grocery shoppers in Quebec, Canada during the spring provincial lockdown from mid-March to early June 2020. Quebec has had the highest number of cases of COVID-19 in the country, but prevalence rates in the spring varied widely by region (Achou et al., 2020; Institut national de santé publique du Québec, 2020). Thus, the province represents a target sample for investigating household food purchasing and planning during the pandemic under various prevalence rates. It was hypothesised that food-purchasing patterns would differ between provincial regions according to COVID-19 prevalence, and that pandemic-specific variables

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would be associated with the use of online grocery shopping (for example, concern about the pandemic, regional prevalence, and self-isolation). Findings from this research are anticipated to assist in informing retail and public-health considerations around food access as the pandemic evolves.

Study design and methodologies

Ethics approval was obtained from the McGill University Faculty of Agriculture and Environmental Sciences' Research Ethics Board (#20-05-021).

The investigation is longitudinal in nature, but in the present analysis only cross-sectional baseline findings are presented.

The survey

An online household open survey was conducted via the SurveyMonkey platform. The survey was advertised on social-media platforms (Facebook, Twitter and Instagram), on Quebec food and agricultural websites, and on a radio broadcast (CBC Radio One). Responses were collected between 20 May and 4 June 2020, capturing information during the final weeks of the lockdown when some measures had begun to be eased in certain regions. Following completion of the consent form, the questionnaire consisted of the following topics: demographics; household job impact due to COVID-19 closures; grocery-shopping frequency and planning; efforts to mitigate virus exposure; and household experience with 14-day self-isolation.

Respondents

The survey respondent was the household member who was primarily responsible for grocery shopping during the strictest lockdown from 13 March to 4 May 2020.

Collation of responses

Postal codes were collected and responses were grouped according to the Institut national de santé publique du Québec (INSPQ) regional COVID-19 prevalence (Institut national de santé publique du Québec, 2020): Montreal/Laval, Montreal Belt, and Other regions, representing high, medium, and low prevalence, respectively, at the time of the investigation.

Analyses

Statistical analyses were conducted with SPSS version 24 and all P values were two-sided with alpha level of 0.05. As per ethics requirements, no questions on the survey were compulsory, thus only complete case analyses were performed.

Chi-square tests and tests for trend were used to compare responses between INSPQ (2020) regions.

Bivariate associations and adjusted odds ratios were examined for the following socio-demographic predictors:

- total household income:
 - over \$100 000 (reference), \$50 000–\$100 000, and under \$50 000
 - age:
 - under 60 (reference), and 60 years and older
 - gender:
 - female (reference), male, and gender non-conforming
 - marital status:
 - married (reference), single, and divorced/separated/widowed
 - number of children:
 - 0 (reference), 1, 2, and 3 or more
 - urban/rural region of residence:
 - large population centre (reference), small/medium population centre, and rural.
- Due to the unprecedented nature of the pandemic, separate models were used to explore associations between pandemic-specific methods and use of online grocery ordering including the following variables:
- regional COVID-19 prevalence:
 - Montreal/Laval [reference], Montreal Belt, and Other regions
 - household job impact due to lockdown-related closures (i.e., job loss, reduced hours, retirement, temporary layoff):
 - no [reference], or yes
 - household experience with 14-day self-isolation:
 - no [reference], or yes
 - primary mode of transportation when grocery shopping:
 - car [reference], or public transit/walking/cycling.

The bivariate models with the pandemic-specific variables were repeated, adjusted for the socio-demographic variables described above.

Results

Participant characteristics

A total of 2093 individuals responded to the survey. After removal of those responses that did not answer any questions after providing consent and those from respondents who did not reside in Quebec, a sample of n=1955 individuals remained. These respondents resided in 17 of the 18 health regions of the province (Santé et Services sociaux Québec, 2020). The mean

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proportion of missing responses was 6 per cent and the survey completion rate was 91 percent (n=1786 responded to the final question).

Table 1 displays respondent characteristics compared to 2016 Census data (Statistics Canada, 2017). The average household size of the recruited sample aligned with that of the average size of a Quebec Census family, and the most commonly reported total household

income aligned with the median total household income of Quebec Economic families (\$79 378) (Statistics Canada, 2017). Thus, the present sample appears to be similar in demographic composition to Quebec families living in urban regions. However, the characteristics of respondents in the survey sample and those in the general provincial population differed by age, gender and income.

Table 1. Participant characteristics

Characteristic	Survey Respondents	Quebec 2016 Census n=8 164 360	
Age group (years) (n=1950)			
18–39	806 (41%)	2 061 555 (32%)	
40–69	1047 (54%)	3 332 705 (52%)	
70 and older	97 (5%)	1 007 015 (16%)	
Gender (n=1952)			
Female	1700 (87%)	4 147 605 (51%)	
Male	239 (12%)	4 016 760 (49%)	
Non-conforming	13 (1%)	Not available	
Language (French) (n=1955)	1014 (52%)	4 032 640 (50%) [§]	
Total household income (n=1898)			
<\$20 000	103 (5%)	403 920 (11%)	
\$20 000–\$49 999	315 (17%)	1 053 575 (30%)	
\$50 000–\$99 999	681 (36%)	1 214 135 (34%)	
\$100 000–\$149 999	426 (22%)	531 540 (15%)	
\$150 000–\$199 999	218 (12%)	192 155 (5%)	
\$200 000	155 (8%)	136 335 (4%)	
Marital status (n=1901)			
Never married	403 (21%)	2 010 580 (29%)	
Married/Common-law	1310 (69%)	3 844 145 (56%)	
Separated	41 (2%)	103 625 (2%)	
Divorced	123 (7%)	483 195 (7%)	
Widowed	24 (1%)	389 555 (6%)	
Urban vs rural* (n=1911)			
Large population centre	1484 (78%)	4 836 549 (59%)	
Medium population centre	109 (6%)	702 696 (9%)	
Small population centre	118 (6%)	1 033 810 (13%)	
Rural	200 (10%)	1 591 306 (19%)	
Household size (n=1848)		Private Dwelling n=3 531 665	Census Family n=2 257 560
Single individual	350 (19%)	1 175 230 (33%)	N/A
2	640 (35%)	1 227 765 (35%)	1 204 955 (54%)
3	289 (16%)	489 460 (14%)	466 310 (21%)
4	352 (19%)	426 250 (12%)	412 160 (18%)
5 or more	217 (12%)	212 960 (6%)	174 140 (8%)
Mean number	2.7 ± 1.3	2.3	2.8

* Derived from forward sortation area.

§ Census item “Knowledge of only French”

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The characteristics of respondents in the survey sample and those in the general provincial population differed by age, gender and income
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Grocery patterns and food purchasing during the Spring 2020 lockdown

Table 2 presents patterns of grocery-shopping behaviours in the overall sample and by region. The majority of respondents selected that they went grocery shopping in store either once per week or one to three times per month during the lockdown period. Eleven per cent selected that they never or very infrequently (less than once per month) went grocery shopping in

store. Most respondents indicated that only one member of the household was responsible for grocery shopping during the lockdown period.

Few regional differences were observed among these patterns, although a significantly greater proportion of respondents from Montreal/Laval (where COVID-19 prevalence was highest) indicated that they never went grocery shopping in store compared to the Other regions (where prevalence was lowest).

Table 2. Grocery shopping patterns during the lockdown period among Quebec households and by prevalence region

	Overall	Montreal/Laval (highest prevalence of COVID-19)	Montreal Belt	Other regions (lowest prevalence of COVID-19)
Between the period of 13 March 2020 and 4 May 2020, which of the statements below best describes your household's approach to in-store grocery shopping?				
I was the only person responsible for in-store grocery shopping during that time period.	56%	54%	59%	58%
Another household member (not me) was responsible for in-store grocery shopping during that time period.	10%	7% ^a	12% ^b	14% ^b
More than one household member went grocery shopping over that time period.	24%	27% ^a	20% ^b	20% ^b
Not applicable; I/we did not grocery shop in-store during that time period (i.e., used delivery or pick-up methods only).	10%	12% ^a	10% ^{ab}	8% ^b
n	1831	897	238	696
In the year BEFORE COVID-19 (January to December 2019), who in your household was primarily responsible for grocery shopping?				
Me	64%	62%	65%	66%
My partner/spouse	4%	4%	5%	4%
Another household member	2%	2%	1%	1%
The responsibility was shared between different household members	30%	32%	29%	29%
n	1832	894	240	694
Overall, between 13 March 2020 and 4 May 2020 how often did you/your household delegate physically go in to a store to shop for groceries? (n=1813)				
Daily or more	<1%	<1%	<1%	<1%
4 to 6 times per week	<1%	1%	0%	<1%
2 to 3 times per week	12%	13%	9%	11%
Once per week	45%	43% ^a	46% ^{ab}	49% ^b
1 to 3 times per month	31%	29%	34%	31%
Less than once per month	5%	5%	5%	5%
Never	6%	9% ^a	6% ^{ab}	3% ^b
n	1809	883	239	687

Different letter superscripts indicate statistically significant differences (p<0.05). If the superscripts 'a' and 'b' are used within a row, there is a significant difference between the 'a' and the 'b'. However, the 'ab' superscript indicates no significant difference.

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Eleven per cent selected that they never or very infrequently... went grocery shopping in store
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The majority of respondents indicated that their household planned a grocery-shopping schedule during the lockdown, engaged in meal planning, and designated one household member to shop for groceries (see Figure 1).

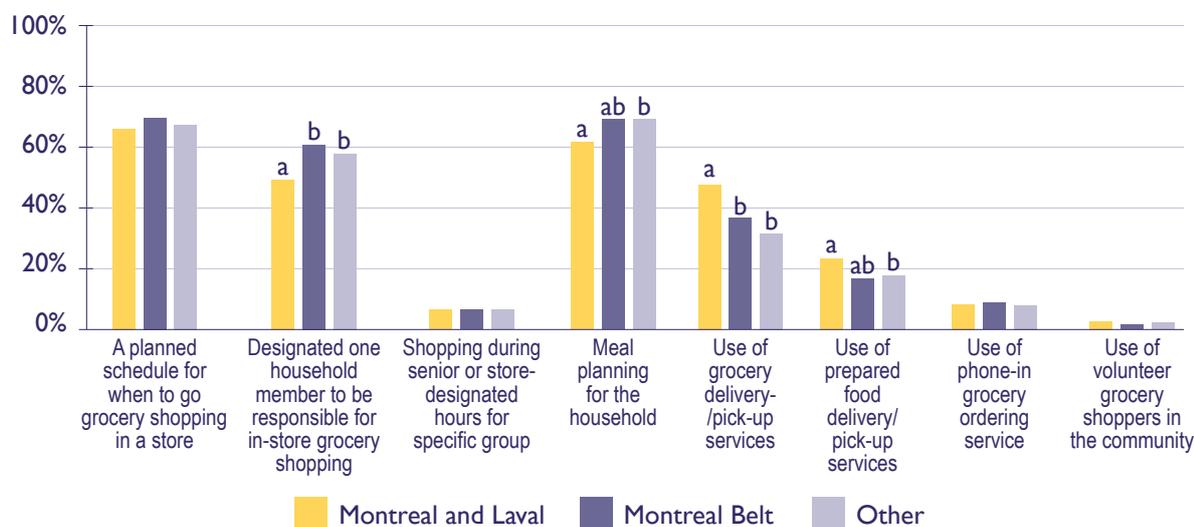
Food-preparation methods before and during COVID-19

Household mode of meal preparation was also assessed before (in 2019) and during the lockdown (see Table 3). Respondents reported increases in the frequency of cooking meals at home and decreases in the frequency of ordering prepared food during the lockdown period as compared to 2019 (pre-pandemic).

Table 3. Reported methods of food preparation before (2019) and during COVID-19

	Daily or more	4–6 times per week	2–3 times per week	Once per week	1–3 times per month	<Once per month /Never
In the year BEFORE COVID-19 (January–December 2019), on average how often did your household:						
Cook meals at home? (n=1833)	60%	30%	7%	2%	<1%	<1%
Go out to eat at a sit-down restaurant? (n=1820)	1%	2%	11%	23%	39%	24%
Order prepared food (takeaway or delivered)? (n=1822)	<1%	1%	6%	19%	35%	38%
Thinking about the recent period between 13 March 2020 and 4 May 2020, how often did your household:						
Cook meals at home? (n=1825)	84%	13%	3%	<1%	<1%	<1%
Order prepared food (takeaway or delivered)? (n=1819)	<1%	1%	5%	20%	25%	49%

Figure 1. Household planning for food purchasing, by region (n=1396)†



†This figure displays follow-up response selections for those who answered ‘Yes’ to the question, ‘During the recent period of 13 March 2020 to 4 May 2020, as a result of COVID-19, did your household make any specific plans about how to purchase or prepare food?’ (76% of n=1828 who responded to this question). Different letter superscripts indicate statistically significant differences (p<0.05). If the superscripts ‘a’ and ‘b’ are used within a planning strategy, there is a significant difference between the ‘a’ and the ‘b’. However, the ‘ab’ superscript indicates no significant difference.

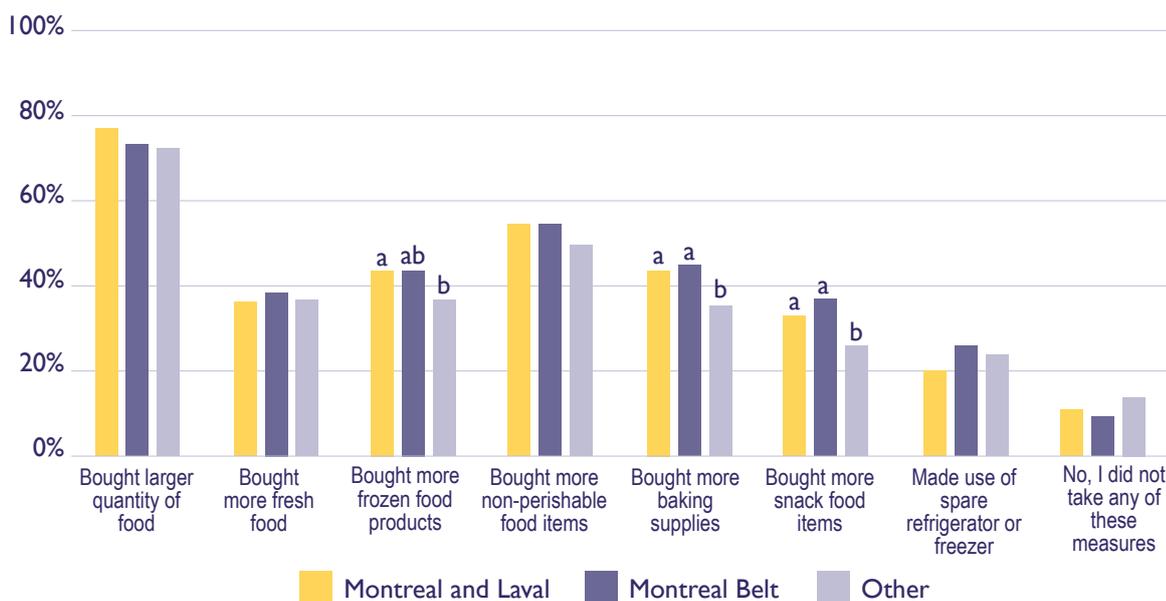
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Ninety per cent of respondents selected that they were, ‘a bit worried’ (56 per cent) or ‘very worried’ (34 per cent) about being exposed to the SARS-CoV-2 virus when grocery shopping in store
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Nearly all respondents reported taking measures to try to ensure their households had the food they needed during the lockdown, primarily by purchasing both more food than usual, and more frozen and non-perishable items (see Figure 2). A significantly greater proportion of respondents from the regions with higher prevalence of COVID-19 reported purchasing more frozen foods, baking supplies and snack foods compared with those from the lowest prevalence region.

Virus-exposure mitigation behaviours

Respondents were asked if they were worried about exposure to the SARS-CoV-2 virus when grocery shopping in store (options: ‘not at all worried’, ‘a bit worried’, and ‘very worried’). Ninety per cent of respondents selected that they were, ‘a bit worried’ (56 per cent) or ‘very worried’ (34 per cent) about being exposed to the SARS-CoV-2 virus when grocery shopping in store. A significantly higher proportion of respondents from the regions of Montreal/Laval and the Montreal Belt (those with the highest prevalence of COVID-19) were ‘very worried’ (35 and 42 per cent, respectively) compared to the Other regions (with the lowest prevalence of COVID-19) (27 per cent) ($p < 0.0001$).

Figure 2. Measures taken to ensure sufficient food in household, by region (n=1719)†

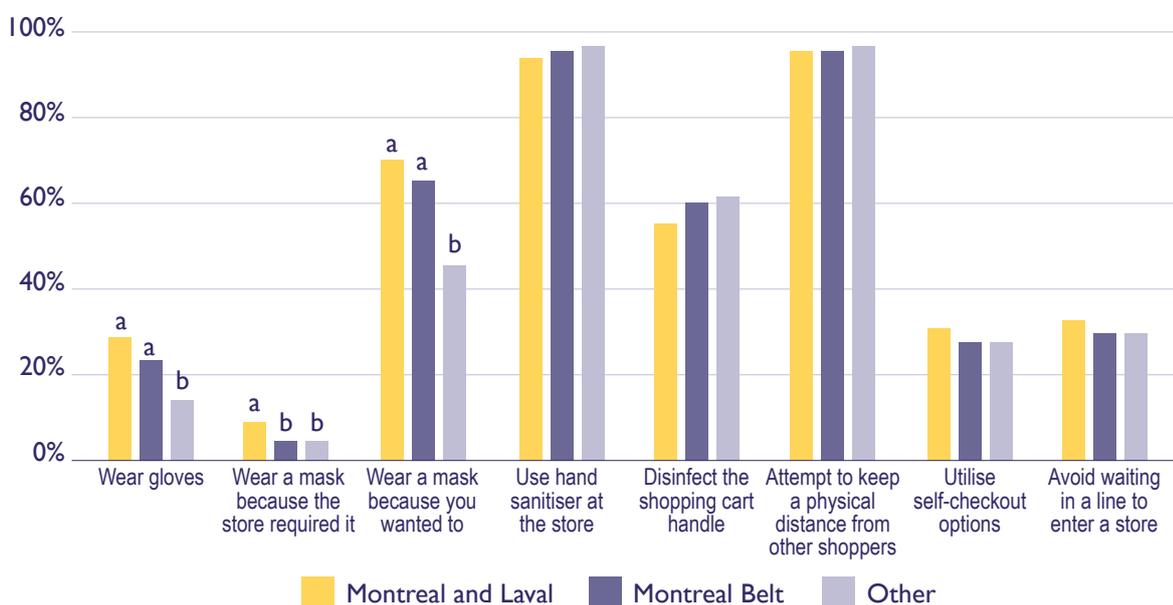


†This figure displays responses for those who answered the question, ‘Between 13 March and 4 May 2020, did you take any of the below listed measures to try to ensure that your household had the food you needed?’ (respondents were asked to ‘Select all that apply’). Different letter superscripts indicate statistically significant differences ($p < 0.05$). If the superscripts ‘a’ and ‘b’ are used within a planning strategy, there is a significant difference between the ‘a’ and the ‘b’. However, the ‘ab’ superscript indicates no significant difference.

Nearly all respondents (99.5 per cent) indicated that they utilised one or more risk-mitigation strategies. A significantly greater proportion of respondents from the higher-prevalence regions reported wearing gloves and a mask when grocery shopping compared to the lowest-prevalence region (see Figure 3) (note: at the time of this investigation, masks were not required when grocery shopping). When asked, ‘Between 13 March and 4 May 2020 did anyone in your household take measures to disinfect product packaging after getting your groceries?’ (respondents were asked to, ‘Select

all that apply’), 43 per cent indicated they, ‘disinfected packaging with wipes/spray’, and 38 per cent, ‘threw away unnecessary packaging’. A significant difference by region was observed among respondents who reported disinfecting or discarding packaging (Montreal/Laval: 67 per cent, Montreal Belt: 62 per cent, Other regions: 56 per cent; $p < 0.0001$). Analysis of free-text responses ($n = 241$) revealed two additional measures: washing produce with soap, vinegar or diluted bleach ($n = 160$); and leaving non-perishable items in a ‘quarantine space’ for hours to days before use ($n = 81$).

Figure 3. In-store grocery shopping exposure-mitigation actions, by region ($n = 1648$)†



†This figure displays responses to the question, ‘When shopping for groceries in a store did you ... ?’ (respondents were asked to, ‘Check boxes if Yes and select all that apply’). This question appeared to $n = 1703$ respondents who did not answer ‘Never’ to the question, ‘Overall, between 13 March and 4 May 2020 how often did you/your household delegate physically go in to a store to shop for groceries?’. Different letter superscripts indicate statistically significant differences ($p < 0.05$). If the superscripts ‘a’ and ‘b’ are used within a planning strategy, there is a significant difference between the ‘a’ and the ‘b’. However, the ‘ab’ superscript indicates no significant difference.

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Use of online grocery-shopping methods

Frequency

Respondents who reported using online grocery-shopping methods (delivery or store pick-up) at least once per week were significantly more likely to have reported having never/rarely (less than once per month) gone grocery shopping in store during the lockdown period (Odds Ratio 6.34; 95 per cent Confidence Interval: 4.63, 8.67). Table 4a presents information about the frequency of online grocery-shopping methods.

Reliability

Table 4b presents information about the frequency and reliability of online grocery-shopping methods:

- Nearly half of the respondents reported items missing when they received their online orders.
- Approximately 60 per cent of respondents reported receiving their grocery orders within 1 to 3 days, with the remaining 40 per cent reporting delivery times of 4 days or longer.

Table 4a. Use of no-contact grocery-shopping methods during the lockdown period

Between 13 March and 4 May 2020 how often, if at all, did your household utilise grocery pick-up or home delivery?							
	Daily or more	4 to 6 times per week	2 to 3 times per week	Once per week	1 to 3 times per month	Less than once per month/Never	Never
Grocery pick-up (n=1691)	<1%	0	<1%	7%	10%	7%	76%
Home delivery (n=1735)	<1%	<1%	1%	10%	12%	8%	69%

Table 4b. Reliability of no-contact grocery shopping among those who reported using these methods

If you used grocery pick-up or delivery, were all of the products your household ordered included in what you received?				
	Yes, everything	Almost everything	Some products were not included	Many products were not included
Grocery pick-up (n=404)	16%	29%	35%	20%
Home delivery (n=531)	24%	26%	35%	15%
If you used grocery pick-up or delivery, on average, after placing your order how long did you have to wait to receive your groceries?				
	1–3 days	4–7 days	8–13 days	2 weeks or more
Grocery pick-up (n=388)	58%	32%	9%	1%
Home delivery (n=521)	56%	32%	10%	2%

Socio-demographic predictors of users of online grocery shopping

Table 5 reports socio-demographic predictors of users of online grocery shopping. In the adjusted model: age was significantly associated with use of online grocery ordering, with adults over 60 years of age having higher odds of using the service.

Table 5. Associations between socio-demographic variables and reported use of online grocery shopping

Variable	Unadjusted Odds Ratio¹(95% Confidence Interval)	Adjusted Odds Ratio (adjusted for all other variables in the table) (95% Confidence Interval)
Total household income		
\$100000 and more	Reference	Reference
\$50000 to under \$100000	0.79 (0.52, 1.18)	0.82 (0.57, 1.17)
Under \$50000	0.90 (0.62, 1.32)	0.91 (0.58, 1.41)
Age		
Under 60 years	Reference	Reference
60 years and up	1.86 (1.33, 2.58)	1.85 (1.24, 2.78)
Gender		
Female	Reference	Reference
Male	0.52 (0.30, 0.92)	0.18 (0.04, 1.06)
Non-conforming	1.86 (0.39, 8.83)	0.39 (0.08, 1.93)
Marital status		
Married	Reference	Reference
Single	1.26 (0.88, 1.79)	1.42 (0.93, 2.18)
Separated/Divorced/Widowed	1.45 (0.92, 2.28)	1.29 (0.78, 2.14)
Number of children		
None	Reference	Reference
1	1.08 (0.71, 1.66)	1.41 (0.88, 2.26)
2	0.76 (0.49, 1.18)	1.03 (0.63, 1.67)
3 or more	0.89 (0.51, 1.56)	1.27 (0.69, 2.34)
Urban/rural region		
Large population centre	Reference	Reference
Medium + Small population centre	0.82 (0.51, 1.32)	0.90 (0.55, 1.46)
Rural	0.99 (0.62, 1.59)	1.04 (0.64, 1.71)

¹ An odds ratio (OR) is a measure of association between an exposure and an outcome. The OR represents the odds that an outcome will occur given a particular exposure, compared to the odds of the outcome occurring in the absence of that exposure.

Odds ratios are used to compare the relative odds of the occurrence of the outcome of interest (for example, disease or disorder), given exposure to the variable of interest (for example, health characteristic or aspect of medical history). The odds ratio can also be used to determine whether a particular exposure is a risk factor for a particular outcome, and to compare the magnitude of various risk factors for that outcome.

- OR=1 Exposure does not affect odds of outcome
- OR>1 Exposure associated with higher odds of outcome
- OR<1 Exposure associated with lower odds of outcome.

The 95% confidence interval (CI) is used to estimate the precision of the OR. A large CI indicates a low level of precision of the OR, whereas a small CI indicates a higher precision of the OR. It is important to note, however, that unlike the P value, the 95% CI does not report a measure's statistical significance.

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Age was significantly associated with use of online grocery ordering, with adults over 60 years of age having higher odds of using the service

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Pandemic-specific variables and online grocery shopping

Table 6 reports associations between pandemic-specific variables and online grocery shopping:

- Respondents who resided in the areas with lowest COVID-19 prevalence (Other regions) had significantly lower odds of using online grocery shopping than those living in the regions with highest prevalence.
- Those who were more concerned about the pandemic had significantly higher odds of grocery shopping online.
- Those who did not report a car as their primary mode of transportation for grocery shopping had significantly higher odds of grocery shopping online.

Discussion

Our findings indicate that Quebec residents organised themselves around purchasing food in a manner that adhered to government directives for physical distancing.

Frequency of grocery shopping

The most common grocery-shopping frequencies (once per week or once every other week) represent a decrease from the Retail Council of

Canada’s 2019 estimate of 1.3 grocery trips per week (Tarry, 2019).

Disinfecting packaging

Many respondents reported disinfecting food packaging, which is counter to public-health information that the potential to contract the virus through food is very low (Government of Canada, 2021). This finding is concerning as it parallels reports of increases in calls to poison-control centres about disinfectant exposure since the beginning of the pandemic, and because improper food storage can increase the risk of food-borne illness (Chang et al., 2020; Marin, 2020).

Nature of purchases

Our findings also echo a recent analysis from the *Consumer Price Index* that provided strong evidence of panic buying in Canada at the start of the pandemic in March 2020 (Statistics Canada, 2020). In particular, a surge in sales of non-perishable foods was observed, which aligns with our finding of households reporting purchasing more non-perishable items (and more food in general) to ensure a sufficient food supply.

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Table 6. Associations between pandemic-specific variables and reported use of online grocery shopping

Variable	Unadjusted Odds Ratio (95% CI)	Adjusted Odds Ratio (95% CI)†
INSPQ COVID-19 region		
Montreal	Reference	Reference
Montreal Belt	0.72 (0.46, 1.14)	0.65 (0.39, 1.08)
Other regions	0.56 (0.40, 0.78)	0.44 (0.28, 0.71)
Household job impact		
No	Reference	Reference
Yes	1.17 (0.86, 1.59)	0.92 (0.66, 1.27)
Concern about the pandemic		
Low/Neutral	Reference	Reference
High	2.46 (1.79, 3.37)	2.32 (1.66, 3.24)
Household 14-day isolation		
No	Reference	Reference
Yes	1.07 (0.69, 1.66)	0.95 (0.59, 1.55)
Primary transportation for grocery shopping		
Car	Reference	Reference
Walking/cycling/public transit	1.86 (1.35, 2.56)	1.91 (1.30, 2.80)

†Adjusted for age, gender, income, marital status, number of children, urban/rural region

Age-related online grocery shopping

Approximately 10 per cent of respondents reported never or rarely grocery shopping in store. It was not ascertained whether these individuals had utilised online grocery shopping to a similar extent prior to the pandemic. However, it was observed that older age was significantly associated with online grocery shopping, which is counter to findings from previous studies that reported that younger adults were more likely to use online grocery shopping. For example, the 2015 Nielsen *Global E-commerce and the New Retail Survey* concluded that millennial and Generation Z populations tended to use online grocery shopping to a greater extent than any other generation group (Nielsen, 2015). Since age (60 years and older) is a risk factor for severe illness from COVID-19 (Government of Canada, 2020), it is conceivable that our observation reflects efforts of older adults to avoid grocery shopping in store due to concerns over possible exposure to COVID-19 in public areas.

COVID prevalence and online grocery shopping

Respondents from the provincial region with lowest COVID-19 prevalence were significantly less likely to report online grocery shopping, potentially because of a lower level of concern about virus exposure. A recent study conducted by the University of Missouri concluded that during the COVID-19 pandemic consumers living in more affected areas preferred using online grocery shopping over shopping at a supermarket in person, whereas in areas with lower COVID-19 prevalence consumers preferred physically going into a supermarket to buy their food (Grashuis et al., 2020). That research group hypothesised that the change in consumer behaviour of grocery-shopping method was partly due to consumer fear of contracting the SARS-CoV-2 virus, which our findings support. Therefore, a household's level of concern about the COVID-19 pandemic likely plays a significant role in their choice of grocery-shopping method.

Urban/rural residency and online grocery shopping

There was no observation of significant associations between urban/rural regions and use of online grocery shopping, despite a previous report (Skrovan, 2017) suggesting that residents of urban areas use online grocery shopping more often than rural residents. While this may have been due to differences in the availability of

online grocery options between urban and rural regions at that time, responses to the pandemic may also have rapidly increased the availability of online grocery shopping in rural regions (Meyersohn, 2020).

Mode of transport when grocery shopping

Respondents who reported a primary mode of transportation for grocery shopping that was not a car were more likely to report using online grocery shopping. This may be due to apprehension about using public transportation to travel to grocery stores during the lockdown period, or to the reduced hours of public transportation operation. A limited number of studies exist on mode of transportation for grocery shopping; however, as reported by Jiao et al. (2011), a study by Chen et al. (2005) noted that car availability plays a major role in a household's method of grocery shopping. A report by Handy (1998) argued that car owners use their cars for shopping purposes in an effort to save time and for the convenience of using it. Additional research on the relationship between primary mode of transportation and grocery access is warranted, particularly as the pandemic evolves, as those who do not own or have the use of a car may face complex barriers to accessing food supplies, such as apprehension about using public transportation or limited transit hours.

Limitations of online grocery shopping

This study showed that experiences with online grocery shopping during the lockdown revealed limitations with the approach, with nearly 50 per cent of respondents reporting receipt of incomplete grocery orders and approximately 40 per cent reporting a wait time of 4 to 13 (or more) days. Prior to the pandemic, grocery shopping was done as needed, so encountering a wait time to receive groceries is a relatively new experience. Households that do not maintain an abundant supply of food (or those that have limited storage capacity) may experience challenges with food sufficiency when faced with wait times for receiving groceries. This is particularly relevant in the case of mandatory 14-day self-isolation, when compliance may be improved by access to efficient and reliable grocery delivery. Public-health messages that communicate proper ways of maintaining an adequate food supply at home may be beneficial as the pandemic evolves, to both assist individuals with being prepared in the event of a need to self-isolate and also to prevent panic buying.

“ Respondents from the provincial region with lowest COVID-19 prevalence were significantly less likely to report online grocery shopping ”

Limitations

Although online methods of recruitment are increasingly recognised for their efficiency and effectiveness (Ali et al., 2020; King et al., 2014), the physical distancing measures in place at the time of this investigation limited the options for recruitment. Hence, while the investigation's provincial coverage and collection of data during the lockdown were strong, a number of limitations were present.

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The sample
underrepresented
older adults and
low-income groups
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Firstly, the sample was comprised of a large proportion of women and high-income households from mostly large urban regions. Therefore, the sample underrepresented older adults and low-income groups.

Information was not collected on certain demographic variables that are linked to challenges with food access (for example, ethnic minorities, Indigenous peoples and newcomers) (Community Food Centres Canada, 2020). Closures of local food suppliers and food shortages during the pandemic increased vulnerability to food insecurity and related health concerns, having a disproportionate impact on vulnerable groups (Ammar et al., 2020; Fitzpatrick et al., 2020; Marmot, 2005; Wolfson & Leung, 2020), but the sample in this study was not representative of vulnerable groups such as these.

Finally, responses were self-reported, which is subject to potential biases and measurement errors, and the voluntary option to respond to all survey questions may have resulted in some response bias being present in results.

Conclusion

The findings reflect patterns of grocery shopping and food-purchasing behaviours in Quebec households during the provincial lockdown in spring 2020. Novel characteristics of individuals who reported primarily utilising online grocery ordering during the lockdown were described, along with mitigation strategies for virus exposure when grocery shopping that our sample reported. Opportunities exist for public-health communication regarding food-purchasing strategies as the pandemic evolves (to ensure sufficient household food supply while mitigating panic buying) as well as messages about appropriate food handling and appropriate use of chemical disinfectants. Food retailers and public-health agencies may wish to monitor regional availability and reliability of online grocery-shopping methods to ensure equitable access and reliable service, especially in times of need.

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