

Food purchase and eating behavior during the COVID-19 pandemic: A cross-sectional survey of Russian adults

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ABSTRACT

The Russian government took strong containment measures to prevent the spread of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) with rigid hygiene protocols and restrictions on daily living, such as social distancing and closing businesses and schools. While these measures were crucial to stop the diffusion of SARS-CoV-2, numerous voices highlighted their disorderly psychological, social, and economic impacts on food consumption behavior and lifestyle. Therefore, this paper aims to understand how consumers' food-related habits in Russia have shifted due to the COVID-19 pandemic and potential problems and opportunities this might bring for the Russian food system. The study is based on an online cross-sectional survey using a structured questionnaire administered in Russian through the Survey Monkey platform. A total of 1297 valid answers was collected. The results reveal that diet and food shopping, preparation, and use have been widely affected. Indeed, the survey results suggested (i) a change in the modality of acquiring food, consumers reduced the number of shopping trips and buying more on each trip to minimize store visits; (ii) a surge of stockpiling of non-perishable food items; (iii) a shift toward healthier diets; (iv) an increase in culinary capabilities; (v) a decrease of food waste. The results are expected to inform current emergency plans as well as long-term food-related strategies in Russia.

1. Introduction

The COVID-19 pandemic, caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has had and continues to impact all spheres of human lives worldwide: politics, economy, education, science, health, culture. As the unexpected epidemic of COVID-19 expands globally to achieve pandemic levels and contaminates nearly all countries (WHO, 2020a), its impacts on the entire food chain are becoming progressively evident (FAO, 2020). Global restrictions and limitations on work and commerce have complicated the interactions between various sections of the food system, from field to fork, and has laid bare its vulnerability to externalities (Galanakis, 2020; WHO, 2020b). The COVID-19 pandemic and the related measures are likely to significantly affect food consumption, food access, and food-purchasing

behavior (Pérez-Escamilla et al., 2020). Lockdowns and working from home, combined with reduced wages and more time on people's hands, have contributed to wide-ranging shifts in perceptions and behavior (European Institute of Innovation and Technology, 2020). Indeed, the pandemic has affected food access and acquisition behavior: decreased shopping trips, stockpiling, online shopping, etc. (Accenture, 2020; Ahmed et al., 2020; Akter, 2020; Deloitte, 2020b; Lazzarini & Putoto, 2020), food consumption patterns and diets (Abbas et al., 2020; Ben Hassen et al., 2020; Heck et al., 2020), as well as food wastage behavior (Jribi et al., 2020). In some cases, the pandemic triggered a greater emphasis on health and nutrition (Arshad et al., 2020) and unhealthy eating habits and repeated snacking in some other cases (Robinson et al., 2021), especially for individuals with eating disorders (Brown et al., 2021).

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The influence of COVID-19 pandemic on consumer behaviors has been affected by various variables, including socio-demographic and household preferences and attitudes (Borsellino et al., 2020). However, these changes often rely on factors that could extend beyond the individual level and are more closely linked to decisions and policies at the local, national and global levels (Naja & Hamadeh, 2020). Therefore, the final outcome of COVID-19 is likely to differ from country to country – and even among the socio-economic groups/classes within the same country – based, among others, on particular circumstances relevant to the epidemiological condition, the level of socio-economic development, and the efficacy of domestic healthcare systems (HLPE, 2020). In this respect, Russia, a major hydrocarbons producer with an under-financed and under-equipped health care system, is a particularly interesting case study.

With an average gross domestic product (GDP) per capita (current US \$) of \$ 11,584, in 2019, Russia has an upper-middle economy, ranked as the eleventh largest economy in the world and the fifth in Europe (World Bank, 2020b). In addition, with a total population of 144,373,535 in 2019 and 56 million belonging to the middle class, Russia is the largest consumer market in Europe (USDA Foreign Agricultural Service, 2020). Russia is also Europe's third-biggest customer market regarding turnover, behind Germany and France (Nordea Trade Portal, 2021). Recently, Russia is increasingly becoming a consumer society. Indeed, with rising disposable income and credit over the last two decades, Russians' spending patterns and food consumption behaviors have shifted drastically (Deloitte, 2019).

In recent years, the Russian retail sector has proliferated (Deloitte, 2019). Revenues from Russia's food and beverage manufacturing industries totaled 102.4 billion USD in 2019. Traditional retailers (brand stores, supermarkets, distributors, direct resellers, etc.) are where the most purchases are made. Furthermore, open-air markets account for 20% of sales, with informal stalls accounting for more than half (Nordea Trade Portal, 2021). Meanwhile, e-commerce in Russia has been gradually increasing in recent years, with a 17% rise in 2017. Russian consumers are increasingly purchasing food and beverages online, especially in major cities (e.g. Moscow, St. Petersburg). According to the Euromonitor, food and beverage online sales increased by 20% in 2018, reaching \$736 million, and are expected to hit \$1.8 billion by 2023 (Santander, 2021). Since 2014, with the economic sanctions issued by the European Union (EU) and the USA, as well as Russia's counter embargo on several goods and products, government support for import substitution has increased domestic food production (Gorlov et al., 2020). However, Russia remains a net importer and continues to rely on foreign supplies of several food items such as fresh and dried fruit, nuts, vegetables, beef, dairy, etc. (Erokhin, 2017). Furthermore, about 49% of consumers prefer foreign products over local products (Santander, 2021).

The number of restaurants per capita in Russia is significantly less than in the EU and the United States. However, in recent years, the rise in dining out in Russia has been steady. Traditionally, restaurants have acted as a venue for business or a place for visiting guests, but they are increasingly seen as an alternative to home cooking. Indeed, because of the fast pace of life, particularly in larger cities, people increasingly tend to eat in restaurants instead of spending time in grocery stores and cooking at home. Therefore, the turnover at restaurants, cafes, and bars in Russia grew 4.7% in 2019. The turnover of the fast-food market in 2017 reached the equivalent of US\$ 8.8 billion, a year-on-year increase of 2.1% on 2016's performance. The main driver of development has been multinationals, which continue to expand actively. During the period May 2017 to May 2018, McDonald's, KFC, and Burger King opened more than 200 restaurants in Russia. Between 2013 and 2018, the combined share of street restaurants and fast-food restaurants in the total catering industry turnover increased steadily. The rise in fast-food demand was met by a drop in traditional sit-down full-service restaurants, which dropped by more than 8% in 2017 (USDA Foreign Agricultural Service, 2020).

Simultaneously, Russia has witnessed a 'nutrition transition', with a shift from traditional diets, based on foods high in fiber, such as cereals and legumes, to modern and western diets, with foods rich in saturated fats, sugar, and processed foods, and low in fiber (Maksimov et al., 2020; Wegren et al., 2016). According to Burlayaeva et al. (2020), there is a decrease in the consumption of potatoes, vegetables, fruits, milk and dairy products, and eggs over the past few years. At the same time, there has been a significant, even excessive, increase in meat products and sugar consumption. As wages have risen, the Russian diet has been more comparable to those seen in other developed countries. This structural transition in the diet has been sustained since 2010, despite tough economic times (Wegren et al., 2016).

Despite substantial diversification efforts recently, commodities such as oil and natural gas are still the backbone of Russia's economy and account for nearly 58% of global exports in 2019. Hence, the country's fiscal position is highly exposed to the oil price swing (World Bank, 2020c). Driven by the double-hit from the severe global recession caused by COVID-19 and the significant drop in disposable income due to the sharp fall in oil prices, Russia's GDP growth in 2020 is expected to contract by 6%, an eleven-year low, with negative growth in most sectors (World Bank, 2020c). Under these circumstances, all the challenges and limitations on growth accumulated in the Russian economy over the last decade have been aggravated (Aganbegyan et al., 2020). Further, in March 2020, the ruble fell to a four-year low (Reuters, 2020). Nevertheless, the Russian government adopted several measures to support the economy: additional transfers to regional governments, and support for companies that are 'systemically important' for the Russian economy, and financial incentives to small businesses (European Parliamentary Research Service, 2020). Therefore, a modest rebound is expected in 2021–2022 (World Bank, 2020c).

Russia reported its first two cases of COVID-19 on January 31, 2020, in two Chinese citizens who arrived in Zabaikalye and Tyumenskaya oblast (Western Siberia), and its first death due to the virus on March 19, 2020 (Russian News Agency, 2020). Currently, Russia is one of the most affected countries by SARS-CoV-2; it ranks fourth, just after the USA, India, and Brazil (Worldometers, 2021). As of January 8, 2021, confirmed cases reached 3,355,794 with 2,731,129 recoveries and 60,911 total deaths (WHO, 2020c). Nearly half of the Russian cases are reported in Moscow (Pramanik et al., 2020), as it is a big international transportation hub and the most populated city in the Russian Federation. After announcing the first cases, the Russian government has implemented numerous measures to stop the spread of SARS-CoV-2, including home confinement, social distancing measures, intercity travel restriction, and institutional quarantine. The most severe containment measures were also taken in Moscow. In the middle of December, Russia was on the crest of the second wave of COVID-19 pandemic. Approximately about 25,000 new cases are reported daily, but the amount tends to decrease (Worldometers, 2021).

These measures have had a significant effect on the standards of living of Russian households, at several levels: in education by the suspension of classes; in health care, with the possible saturation of hospitals and mobility, by containment measures that have dramatically limited public and private transport (World Bank, 2020c). Several reports highlighted that with the pandemic, there was a shift in the nature of demand in Russia as well as the way people consume goods and services (Deloitte, 2020a; IPSOS, 2020). According to Deloitte's annual consumption survey in Russia, conducted in June 2020, 51% of Russians report that the pandemic and the related measures impacted their consumer behavior (Deloitte, 2020a). Such measures could have also affected attitudes and behaviors linked to food consumption and food shopping in Russia. Previous crises, such as the 2008–2009 food crisis, have affected consumers' attitudes and behaviors in Russia (World Bank, 2020a).

The pandemic generated several pieces of research on different aspects, mainly in the spheres of health and medicine (Karamnova & Drapkina, 2020; Kozlovskaya et al., 2020; Pramanik et al., 2020) and

economics (Aganbegyan et al., 2020; Разин et al., 2020). However, there are no investigations dealing with changes in food-related behavior during the pandemic. In this context, the purpose of this paper is to examine how people's food-related habits in Russia have shifted as a consequence of COVID-19 and what potential problems and opportunities this might bring for the Russian food system. Two questions are addressed in this research: first, how the COVID-19 pandemic affected food consumption patterns and diets in Russia? Second, how the pandemic affected food-shopping behavior in Russia? To the best of our knowledge, this is the first article that analyses the immediate impacts of the pandemic on food purchase, nutrition, and consumption patterns in Russia. Before presenting and debating the study findings, we present the methodology.

2. Methodology

The study is based on an online survey conducted in Russia through a Computer Assisted Web Interview (CAWI). The survey used on a structured questionnaire developed and adapted based on the COVID-19 Survey of the United Nations System Standing Committee on Nutrition (UNSCN) (UNSCN, 2020) and the Food Consumption Changes 2020 survey of the West Michigan University (Western Michigan University, 2020). The research was part of an international project titled "Consumer Agency, Food Consumption Behavior and Novel Coronavirus (COVID-19) Outbreak" promoted by the Food Industry Research and Education Center (FIRE) at Western Michigan University; teams from the United States, Qatar, China, the United Kingdom, Germany, the Netherlands, and Turkey collaborated in the research study (Western Michigan University, 2020).

The questionnaire was conducted in Russian from October 12 to November 16, 2020, via the Survey Monkey Platform (www.surveymonkey.com). The survey link was circulated via email and local and international social media [e.g. VKontakte (VK), Odnoklassniki (OK), Instagram, Facebook, Twitter]. The study adopted the snowball-sampling technique, and participants were asked to roll out the online questionnaire to their acquaintances and relatives. The study targets the general adult population (age >18 years) in Russia. We used the non-probability sampling method. The study was performed in compliance with the Helsinki Declaration guidelines. All procedures relevant to study participants were approved by the Western Michigan University Human Subjects Institutional Review Board (HSIRB). Participation in the survey was voluntary, and there was no compensation to participate. At the beginning of the study, each participant was informed of the study objective and context and provided their digital informed consent regarding privacy and information management policies.

The questionnaire consisted of 24 questions on the impact of the COVID-19 pandemic on food-related habits, including food buying, food preparation, consumption, and waste. The questionnaire comprised different types of questions (one option and multiple choice), grouped into three sections: 1) 9 questions on the socio-demographics of the respondents (e.g., profession, educational background, wage, etc.); 2) 13 questions on food buying and consumption behavior (e.g., food purchasing behavior, food consumption habits, food wastage, etc.; and 3) 2 questions on emotions (Appendix A).

Prior to distribution, the questionnaire was validated based on two steps. Firstly, qualitative content validity was carried out by an expert panel to help strengthen the validity and reliability of the study. Irrelevant items were removed based on experts' opinions, and modifications were made to the remaining items to make them more accurate and increase clarity. In the next step, a pre-test was performed with 23 participants to assure data quality, and feedback was used to adjust the survey before its administration. Finally, the same questionnaire was used previously in a survey conducted in Qatar (Ben Hassen et al., 2020).

Valid survey responses totaled 1297. The survey results were downloaded for analysis in SPSS (Statistics Package for Social Sciences) version 25.0. Descriptive statistics (means, standard deviations,

percentages, frequencies) have been measured. Multiple response analysis was undertaken to assess the percentages of responses and cases. As the variables were nominal and ordinal, non-parametric tests have been used. In specific, the U-Mann Whitney test was used for dichotomous, categorical independent variables (e.g., No = 0/Yes = 1), while the Kruskal-Wallis test was run for multi-choice answers analysis (e.g., emotions). The chi-square (χ^2) test was used to analyze the relationship between separate variables and the respondents' socio-demographic features. Statistical significance for all tests was set at a p-value of 0.05.

3. Results

The results of the cross-sectional survey reveal that diet and food shopping, preparation, and use in Russia have been widely affected by the COVID-19 pandemic. We first introduce the socio-demographic characteristics of the survey participants (3.1) then analyze the effects of the pandemic on food shopping (3.2) and consumption behavior (3.3).

3.1. Socio-demographic characteristics of the cohort

As revealed in Table 1, the respondents' socio-demographic characteristics indicate that 64.61% of them are women, 81.26% live in urban areas or villages, and 43.79% live with parents. In terms of

Table 1
Socio-demographic characteristics of the study participants (n = 1297).

Variable	Answer options	Frequency	Valid Percent
Gender	Female	838	64.6
	Male	459	35.4
Living place	Urban	1054	81.2
	Rural	243	18.8
Age	18–24	783	60.3
	25–34	238	18.3
	35–44	167	13
	45–54	79	6
	55 and over	30	2.3
Level of education	No formal education	17	1.3
	Basic general education	99	7.6
	Secondary general education	377	29.
	Vocational school	319	24.6
	University degree	459	35.4
Income comparison	Higher degree (MSc or PhD)	26	2.
	Much lower than most other Russian households	139	10.7
	Slightly lower than most other households	282	21.7
	About the same as most other households	683	52.6
	Slightly higher than other households	162	12.5
Occupation	Much higher than other households	31	2.4
	In paid work (full-time or part-time)	565	43.5
	Student	602	46.4
	Unemployed and looking for work	55	4.2
	Home duties	50	3.9
Household composition	Retired/age pensioner	25	1.9
	Single person household	141	11
	Living with parents	568	43.8
	Married with children	269	20.8
	Married without children	95	7.3
Job loss or salary reduction	Extended family	139	10.7
	Shared household, non-related	85	6.5
	Yes	239	18.4
	No	1058	81.6

employment status and income, 43.56% of respondents are economically engaged, and 52.66% receive the same income as other households in Russia. Much of the respondents were young (60.37% were between 18 and 24 years of age). Overall, the sample is highly educated, as 37.39% of the respondents possessed a university degree, master, or Ph. D. Also, 18.43% of the cohort lost their jobs or had a reduction in their salary due to COVID-19 (Table 1).

3.2. Food shopping behavior during COVID-19 pandemic

As indicated in Appendix B, the results regarding food sourcing during the COVID-19 pandemic in Russia suggest evident changes in consumers' behavior related to food shopping. First, 41.86% of the cohort ate out less (e.g., restaurants/cafeteria/fast-food), 19.51% ordered less take-away or fast-food meals with deliveries (all by including "slightly less" and "much less" answer options). Second, only 11.56% of the respondents reported that they order more groceries online, and 57.67% never did that. Third, some participants indicated that they buy less food in person from large supermarkets (15.19%) or small supermarkets (20.74%) (all by including "slightly less" and "much less") (Appendix B).

Regarding shopping behavior, 25.29% of the participants stated making fewer grocery-shopping trips during the pandemic than usual, and 16.97% specified that they buy more or a lot more than usual on each trip (including "a lot more" and "more" answer options). Further, 28.53% of the respondents stocked up food (Table 2).

The findings also indicated that the most stocked items during the COVID-19 pandemic are non-perishable products such as cereals products (41.25% of the respondents), sugar (21.67%), canned food (20.66%), and meat and meat products (19.81%). Also, the results reveal that some food items were less available during the pandemic, such as cereals products (27.06% of the respondents) and fruits and vegetables (12.64%); consequently, respondents highlighted price increase for these items (Table 3).

Food-use behavior and perceptions also changed. For instance, regarding food wastage, 89.9% of the respondents indicated that they are not wasting more food than usual since the COVID-19 outbreak and 14.5% stated that their food waste became less. Also, 71.94% are more aware of how much food they waste.

3.3. Food consumption behavior during COVID-19 pandemic

Moreover, as indicated in Appendix B, the pandemic triggered some changes in food-related activities. Notably, 37.58% of the participants ate more with family members, 45.96% cooked and prepared food much more frequently, and 33.54% ate more between meals (e.g., snacks) (all by including "moderately more" and "much more") (Appendix B).

Further, the results suggest evident changes in consumers' diet

Table 2
Shopping behavior changes during COVID-19 (n = 1297).

Variable		Frequency	Valid Percent
Shopping behavior change	I go shopping less than usual	328	25.29
	I go shopping like I used to	914	70.47
	I go shopping more than usual	55	4.24
Change of food purchase	I buy a lot more than usual	60	4.63
	I buy more than usual	160	12.34
	I buy as same as usual	875	67.46
	I buy less than usual	151	11.64
	I buy a lot less than usual	51	3.93
Stocking up food	Yes	370	28.53
	No	927	71.47

during the COVID-19 pandemic in Russia. Indeed, 16.73% of the respondents consumed less meat, 32.39% consumed less unhealthy foods (e.g. fast-food), 21.59% less unhealthy snacks, and 22.2% less sweets, cookies, cakes and candies (all figures include "much less" and "slightly less" answer options) (Fig. 1).

The survey findings also show that the respondents' socio-demographics moderate different food-related behaviors during the COVID-19 pandemic (Table 4). For instance, buying local food is significantly associated with gender and is positively affected by education and income. Similarly, food deliveries are associated with age and income; these services are generally rather expensive and affordable by households with high income.

4. Discussion and conclusions

This paper examines the immediate impact of the COVID-19 pandemic on food dynamics in Russia. With the COVID-19 epidemic, behaviors linked to food buying, preparation, and eating have been widely affected. The results showed various key consumer patterns in Russia that are currently affecting diet and food behavior.

Firstly, as observed in many countries across Europe (European Institute of Innovation and Technology, 2020), we observed significant shifts in food shopping habits in Russia with the pandemic. In fact, according to Deloitte's annual consumption survey in Russia (Deloitte, 2020a), because of SARS-CoV-2, only 39% of Russians feel safe inside a shop. With these anxieties around shopping for food (fear of the virus, fear of getting close to others, long queues in stores, etc.), people changed the way they shop. Consumers in Russia have decreased the number of shopping trips and have been shopping less than usual, spending more on each trip to minimize store visits and thereby limiting their perceived risk of exposure to the virus. Meanwhile, certain Russian customers are buying less than usual, which may be due to the drop in purchasing power triggered by the pandemic. Indeed, in 2020, overall household consumption in Russia is projected to decrease by 4.9% in value. Even after containment measures are lifted, households are expected to curtail consumption to rebuild precautionary savings (World Bank, 2020c). Almost one out of five participants in our cohort (18.43%) lost their jobs or had pay reduction due to COVID-19, affecting their purchasing power. Overall, Russia's unemployment rate rose from 4.6 percent in October 2019 to 6.3 percent in October 2020, the highest level in eight years. Further, the effect of job losses and reduced incomes resulted in a significant drop in real disposable income: 8.4% in the second quarter and 4.8% in the third quarter of 2020 (World Bank, 2020d).

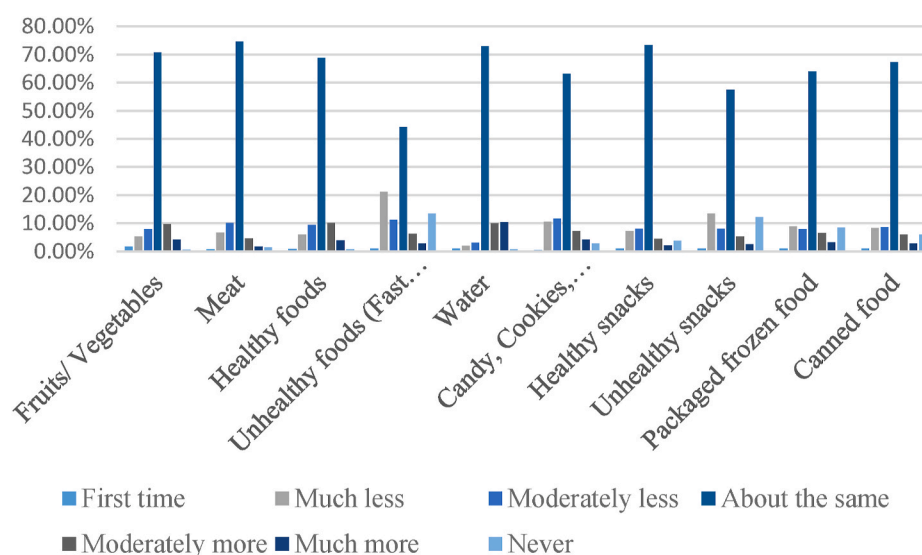
Second, more and more consumers are ordering their groceries online to avoid busy stores. Meanwhile, some customers have tended to keep purchasing food in person. Indeed, we did not notice the same surge in online food shopping as observed in other European countries [Finland, Germany, France, Poland, Romania, etc.], where 45% of the consumers are shopping grocery online more often (European Institute of Innovation and Technology, 2020). In fact, for several reasons, shopping online is, in general, not yet widely accepted among Russian consumers. Firstly, Russian still believe that purchasing food is a concrete process requiring checking the markets and products personally. Secondly, Russians prefer checking the quality and freshness of food, which cannot be done online. Moreover, there was a decrease in buying food from a small supermarket, as they were considered less safe than the large ones (Deloitte, 2020a).

Third, as indicated above, before the pandemic, the spread of modern eating and drinking habits, and particularly fast-food consumption, mainly in larger cities, people increasingly tend to eat in restaurants and fast-food instead of spending time in grocery stores and cooking at home (Hovhannisyan et al., 2020; Maksimov et al., 2020). However, the pandemic changed these behaviors. On the one hand, self-isolation has had the most significant effect on fast-food restaurants, bars, and pubs, where there has been a substantial drop in customers (Deloitte, 2020a).

Table 3

Types of foods stocked up, change in food availability, and food price increase during the COVID-19 pandemic (n = 1297).

	Type of food stocked up			Notice of less available food			Notice of any food price increase		
	Responses		Percent of Cases	Responses		Percent of Cases	Responses		Percent of Cases
	N	Percent		N	Percent		N	Percent	
Cereals and their products (bread, rice, pasta, flour, etc.)	535	18.8	41.2	351	17.7	27.1	660	14.1	50.9
Roots and tubers (potatoes, etc.)	177	6.2	13.6	63	3.2	4.9	314	6.7	24.2
Legumes (e.g. peas, chickpeas)	61	2.1	4.7	46	2.3	3.5	230	4.9	17.7
Sugar	281	9.9	21.7	130	6.6	10.0	475	10.2	36.6
Oil	240	8.4	18.5	70	3.5	5.4	389	8.3	30.0
Fruits and vegetables	124	4.3	9.6	164	8.3	12.6	583	12.5	44.9
Meat and meat products	257	9.0	19.8	128	6.5	9.9	498	10.6	38.4
Fish and seafood	113	4.0	8.7	86	4.3	6.6	417	8.9	32.2
Milk and dairy products	101	3.5	7.8	80	4.0	6.2	417	8.9	32.2
Canned food	268	9.4	20.7	79	4.0	6.1	327	7.0	25.2
None	694	24.3	53.5	786	39.6	60.6	369	7.9	28.5
Total	2851	100.0	219.8	1983	100.0	152.9	4679	100.0	360.8

**Fig. 1.** Consumers' behavior trends during COVID-19 pandemic (n = 1297).

* Scale: never = 0; first time = 1; much less = 2; slightly less = 3; about the same = 4; moderately more = 5; much more = 6.

The COVID-19 pandemic struck the Russian foodservice industry extremely hard as it trapped citizens in their homes and limited foreign travel. In most cities, food service outlets have been authorized to open their doors at the end of June, albeit under strict conditions. According to the [USDA Foreign Agricultural Service \(2020\)](#), pp. 10–30% of hotel and restaurant establishments would soon be out of operation. Overall, the restaurant and catering industry decreased by 24.5% during the January–July 2020 period compared to 2019 ([USDA Foreign Agricultural Service, 2020](#)). On the other hand, there is an increase in home cooking, a decrease in ready meal use, switch to proper meal times, and eat with other family members. Additionally, consumers have moved from out-of-home to home-based eating, culminating in more cooking and baking at home. Moreover, with restaurants and coffee shops closed, entertainment options became restricted, and eating with family and cooking turned into new entertaining activities ([Ben Hassen et al., 2020](#)).

Fourth, the results suggest a move toward healthier diets. Indeed, Russian consumers reduced the consumption of unhealthy foods such as snacks, cakes, cookies, and pastries during the pandemic and adopted healthier consumption patterns, comprising more fruits and vegetables. As observed in several countries, this shift was probably driven by pro-

healthy diet concerns due to a stronger focus on health and nutrition in consumers' minds. This constitutes a positive change toward a healthy, sustainable diet compared to the pre-COVID-19 situation.

Fifth, the results indicate a surge of stockpiling and panic buying of non-perishable food items, which affected the availability of cereals products. Indeed, during March 2020, Russia's retail sales increased by 5.6% in year-on-year and 10.2% in month-on-month terms, fueled by panic purchasing ahead of the lockdown and by the ruble plunge boosted demand for imported products before shelf prices rise. Retail turnover was driven by increasing demand for food and staple goods ([Reuters, 2020](#)). While authorities have warned against panic buying, many Russian rushed off to stores to stock up on buckwheat — or *grechka*, as it is known locally. Buckwheat is the staple of choice among poor households since it is cheap and can be stored for a long time. Indeed, this grain is a barometer of Russia's economic fears and is especially sought after in times of crisis. According to market analysis firm Nielsen Russia, sales of buckwheat soared 66% in March 2020 compared to March 2019 ([The Moscow Times, 2020](#)).

Sixth, food-use behavior and perceptions also changed. The results indicate a reduction in food waste. This move may indicate that, since the pandemic, customers have embraced a wide variety of positive food

Table 4

Socio-demographic effects on food behavior and consumption during the COVID-19 pandemic (n = 1297).

Variables	Gender	Age	Education	Income	Occupation
	χ^2	χ^2	χ^2	χ^2	χ^2
Buying local food	32.02**	21.85	83.72**	61.45**	29.29
Ordering groceries online	36.05**	40.89*	68.92**	60.89**	25.10
Buying food in person from a large supermarket	11.29	44.80**	68.49**	65.70**	59.52**
Buying food in person from a small supermarket	14.04*	25.57	55.20**	63.56**	36.78*
Having meals delivered directly to my home from a full-service restaurant	7.18	65.12**	38.23	66.78**	30.65
Shopping behavior change	6.52*	5.40	31.71**	40.18**	3.09
Change of food purchase	0.95	16.23	13.90	70.36**	37.38**
Eating at home alone	11.59	52.27**	49.55*	45.93**	28.61
Eating with family members	6.59	45.98**	61.17**	46.23**	49.28**
Eating out (e.g. restaurants/cafe/terrace/fast food)	47.09**	79.91**	65.23**	45.74**	28.50
Ordering take-away or fast food meals with deliveries	26.76**	127.07**	40.78	64.06**	44.52**
Cooking and preparing food	26.48**	27.54	81.62**	63.25**	41.97*
Spending a lot of time cooking	19.91**	43.46**	71.99**	43.34**	37.89*

*: Significant at 0.05; **: Significant at 0.01.

management techniques, such as better planning of food shopping, improved in-house food storage, and increased usage of leftovers. This suggests an interesting change toward a more sustainable food consumption behavior. As has been observed in many countries, such as Tunisia (Jribi et al., 2020), Qatar (Ben Hassen et al., 2020), the US (Rodgers et al., 2021), or Italy (Principato et al., 2020), the COVID-19 pandemic has induced a positive behavioral shift in food waste in Russia. Indeed, prior to the pandemic, around 17 million tons, about a third of all food produced for human consumption in Russia, was wasted every year. Food waste is responsible for 2.4 million tons of methane emissions per year (RBC, 2019). Due to the lack of technology, modern equipment, and expertise to reuse food waste, 94% of food wasted in Russia ends up in landfills, making it 34% of landfill waste composition (Fedotkina et al., 2019; Filimonau & Ermolaev, 2021). Hence, contributing to carbon footprint build-up and environmental pollution (RBC, 2019). This is considerably more than the volume of FW landfilled in Europe, i.e. 37% (Scherhauser et al., 2018). Also, Russia lacks mature programs for managing food waste and donating unsold goods to charity. The primary factor is the lack of legal and financial incentives and low societal interest (PWC, 2020). However, this rational behavior could be motivated more by the socio-economic context of the COVID-19 lockdown (i.e. food supply, limited movements, loss of income), than by a pro-environmental concern. Further research should examine how these factors are targeted to reduce food waste after the pandemic.

The final outcomes of the COVID-19 pandemic will probably differ from a country to another, depending not only on the epidemiological situation but also, among others, on the baseline situation and resilience to shocks (HLPE, 2020). In this context, the study results are valuable country-specific inputs for designing evidence-based policies during the post-pandemic recovery phase in Russia. For instance, some positive effects of the crisis (e.g. adoption of more sustainable diets, reduction of food wastage) can be seized to foster the transition towards more sustainable consumption patterns in the country. While the present study focused on immediate, short-term impacts of the pandemic, which is not over yet, future studies are needed to elucidate its medium- and long-term impacts on food-related behaviors (e.g., food shopping/sourcing, consumption, preparation, wastage) as well as on food and nutrition security in the country. This and other future studies would become an essential framework for government preparedness for future shocks and pandemic crises.

However, some limitations relating to the survey method and tool, which affect the sample representativeness, should be noted. Indeed, the main limitation of this study is the sample bias. The survey participants were chosen randomly and recruited on a voluntary basis. As a self-

administered questionnaire, it was run on volunteers, who are not paid, so only people motivated by interest in the topic took part in the survey (cf. self-selection of the sample). Furthermore, online surveys tend to exclude those people who are not web-illiterate as well as elder people. The above-listed limitations are common in CAWI, which is nowadays widely used in surveys (Couper, 2000; Evans & Mathur, 2018; Monzon & Bayart, 2018). This bias limits the possibilities to generalize the survey results to the whole Russian population. However, as a consequence of the COVID-19 pandemic, online surveys offer the possibility to gather data remotely, a clear advantage when social distancing is required, and face-to-face interviews are difficult and risky. Also, to the best of our knowledge, this is the first study about the perceptions on the impacts of COVID-19 on food-related behaviors in Russia and sets a baseline for future studies on the impacts of the pandemic in the Russian Federation.

Ethical statement

This study was performed in compliance with the Helsinki Declaration guidelines. All procedures relevant to study participants were approved by the Western Michigan University Human Subjects Institutional Review Board (HSIRB). Participation in the research was voluntary. At the beginning of the study, each participant was informed of the study objective and context and provided their written informed consent regarding privacy and information management policies.

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Author contributions

Conceptualization, T.B.H., H.E.B. and S.B.; methodology, T.B.H., H.E.B. and M.S.A.; software, M.S.A.; validation, M.S.A.; formal analysis, T.B.H., H.E.B. and M.S.A.; investigation, T.B.H. and O.F.; data curation, M.S.A.; writing—original draft preparation, T.B.H. and H.E.B.; writing—review and editing, T.B.H. and H.E.B.; project administration, T.B.H. and H.E.B. All authors have read and agreed to the published version of the manuscript.

Declaration of competing interest

The authors have no conflicts of interest to disclose.

Appendix A. Questionnaire

Section 1: Socio-demographics

- 1 Gender
- 2 Where do you live? Urban region/Rural area
- 3 Age
- 4 Level of education
- 5 How would you describe your household income compared to other households in your country?
- 6 Occupation
- 7 What is your household composition?
- 8 How many people are currently living in your home?
- 9 Have you lost your job or had any pay reduction in your salary due to COVID-19? Yes/No

Section 2: Food buying and consumption behavior

10 Below is a list of food-related behaviors. Please indicate how that behavior has changed for you as a result of the coronavirus (COVID-19) becoming serious in your country (7-point response scale: never = 0; first time = 1; much less = 2; slightly less = 3; about the same = 4; moderately more = 5; much more = 6.)

- Buying local food (produced in your country)
- Ordering groceries online
- Buying food in person from a large supermarket
- Buying food in person from a small supermarket or grocery store
- Having meals delivered directly to my home
- 11 What has changed in your shopping behavior during the outbreak of COVID-19 and lockdown?
 - I go shopping less than usual
 - I go shopping like I used to
 - I go shopping more than usual
- 12 What has changed in the extent of your purchase during the outbreak of COVID-19 and lockdown?
 - I buy a lot more than usual
 - I buy more than usual
 - I buy as same as usual
 - I buy less than usual
 - I buy a lot less than usual

- 13 Since the coronavirus (COVID-19) became serious in your country, have you eaten or drunk more or less of the following foods? (7-point response scale)
- Fruits/Vegetables
 - Meat
 - Healthy food
 - Unhealthy food (Fast food)
 - Water
 - Can
 - Candy, Cookies, cakes, and pastries
 - Healthy Snacks
 - Unhealthy snacks
 - Packaged frozen foods
 - Canned food

- 14 Since the coronavirus (COV-19) became serious in your country, have you done more or less of the following food related activities than you used to? (7-point response scale)
- Eating at home alone
 - Eating with family members
 - Eating out (e.g. restaurants/cafeteria/fast food)
 - Eating at someone else's place (e.g. family, friends)
 - Ordering take-away or fast food meals with deliveries
 - Cooking and preparing food
 - Spending a lot of time cooking
 - Making easy meals (e.g., instant foods, etc.)
 - Eating between meals (e.g. snacks)

- 15 Have you stocked up on food and beverages because of the coronavirus (COVID-19)? Yes/No
- 16 What type of food you stocked up the most during the outbreak of COVID-19 and lockdown? (Please select all that apply)
- Cereals and their products (bread, rice, pasta, flour, etc.)
 - Roots and tubers (potatoes, etc.)
 - Legumes (e.g. peas, chickpeas)
 - Sugar
 - Oil
 - Fruits and vegetables
 - Meat and meat products
 - Fish and seafood
 - Milk and dairy products
 - Canned food
 - None

- 17 Since the COVID-19 outbreak, did you notice that any of these items is less available? (Please select all that apply)
- Cereals and products (bread, rice, pasta, flour, etc.)
 - Roots and tubers (potatoes, etc.)
 - Legumes (e.g. peas, chickpeas)
 - Sugar
 - Oil
 - Fruits and vegetables
 - Meat and meat products
 - Fish and seafood
 - Milk and dairy products

(continued on next page)

(continued)

Section 1: Socio-demographics									
<ul style="list-style-type: none"> • Canned food • None 									
18 Since the COVID-19 outbreak, did you notice any price increase for any of these items? (Please select all that apply)									
<ul style="list-style-type: none"> • Cereals and products (bread, rice, pasta, flour, etc.) • Roots and tubers (potatoes, etc.) • Legumes (e.g. peas, chickpeas) • Sugar • Oil • Fruits and vegetables • Meat and meat products • Fish and seafood • Milk and dairy products • Canned food • None 									
19 How does stocking up on items make you feel? (5-point response scale: 1 (not at all),...5 (very much))									
<ul style="list-style-type: none"> • Stocking up on items makes me feel less anxious • Stocking up on items makes me feel more secure • Stocking up on items comforts me • Stocking up on items gives me a sense of control 									
20 Please indicate how concerned you have been since COVID-19 became serious in your country about the following food-related issues? 5-point response scale: 1 (not at all),...5 (very much))									
<ul style="list-style-type: none"> • Obtaining enough food • Obtaining a variety of food • Access to healthy and safe food • Food prices rising • Food spreading COVID-19 									
21 Regarding changes in your food related behaviors since the outbreak of COVID-19: Yes/No									
<ul style="list-style-type: none"> • Do you buy more food out of fear or anxiety? • Do you eat more food out of fear, anxiety or boredom? • Are you wasting more food than usual? • Are you more aware of how much food you waste? 									
22 How has your food wastage changed during the outbreak of COVID-19 and lockdown?									
<ul style="list-style-type: none"> • It has become much less • Less • Has not changed • More • Much more 									
Section 3: Emotions									
23 Please indicate your negative feelings since the onset of COVID-19 (5-point response scale: 1 (not at all),...5 (very much))									
<ul style="list-style-type: none"> • Nervous • Worried • Depressed • Sad • Scared • Bored 									
24 Please indicate your positive feelings since the onset of COVID-19 (5-point response scale: 1 (not at all),... 5 (very much))									
<ul style="list-style-type: none"> • Calm • Optimistic • Excited • Happy 									

Appendix B. Change of Food Shopping Behavior and food-related activities during COVID-19 Pandemic (n = 1297)

Item	Percentage							Mean	V. R.*
	Never	First Time	Much Less	Slightly Less	About the same	Moderately more	Much more		
Buying local food	2.00	1.85	4.09	6.25	77.56	2.78	5.47	3.86	0.22
Ordering groceries online	57.67	2.47	6.63	3.93	17.73	6.01	5.55	1.62	0.42
Buying food in person from a large supermarket	1.80	0.80	6.20	8.90	69.50	4.20	8.40	3.90	0.31
Buying food in person from a small supermarket	9.41	2.00	13.49	7.25	60.14	3.93	3.78	3.34	0.40
Having meals delivered directly to my home from a full-service or fast food restaurant	44.87	2.16	9.56	5.40	25.98	7.79	4.24	2.06	0.55
Eating with family members	2.78	0.62	4.24	4.63	75.40	4.63	7.71	3.94	0.25
Cooking and preparing food	1.54	0.93	2.85	4.32	70.55	8.87	10.95	4.12	0.29
Spending a lot of time cooking	1.85	0.93	3.70	6.01	71.40	9.02	7.09	4.00	0.29
Eating between meals (e.g. snacks)	12.88	0.62	7.56	7.56	58.75	8.33	4.32	3.41	0.41
Eating at someone else's place	10.72	0.69	27.60	11.33	45.57	2.70	1.39	2.94	0.54

*V.R. Variability ratio.

* Scale: never = 0; first time = 1; much less = 2; slightly less = 3; about the same = 4; moderately more = 5; much more = 6.

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