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5-2021

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Quarantine**

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LOMA LINDA UNIVERSITY

School of Allied Health Professions

Department of Nutrition and Dietetics

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**Food Selection and Consumption During the COVID-19 Pandemic/Quarantine**

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May 2021

## **ABSTRACT**

**Background:** The Coronavirus disease 2019 (COVID-19) created an unexpected outbreak that led to a pandemic and the fear of scarcity regarding food. Due to those who shopped in panic, grocery stores began to limit the number of specific items purchased per family. The COVID-19 is a novel disease that has changed society by wearing face-coverings when out in public, temporarily closing indoor dining at restaurants, and converting schools online. The over-purchase of toilet paper and water caused many grocery and department stores to exhaust their inventory. This situation may have instilled fear of scarcity and leave to the over-purchase of other items, such as meat products and rice.

**Objectives:** The purpose of this study is to determine if there was a significant change in food selection, food practices, and consumption during the COVID-19 pandemic/quarantine.

**Methods:** The anonymous online survey was created via Qualtrics, and we recruited all eight schools (students, faculty, and staff) from Loma Linda University to join. The invitation was also posted to social media and by word of mouth. Participants should be 18 years or older and be responsible for buying groceries for family or themselves to join the survey. After completion, participants could sign up for an interview if they wanted to provide in-depth information on the changes in grocery shopping habits during the COVID-19. We randomly selected 10 out of the first 20 participants from the sign-up list.

**Results:** Three hundred and twenty adults (232 females, 85 males, and three prefer not to say), with mean age  $30.9 \pm 10.7$  years, attempted to complete an anonymous survey via Qualtrics. Eleven of the participants did not complete the anonymous survey; therefore,  $n=309$ . Grocery shopping practices changed during the COVID-19 pandemic/quarantine. The majority of participants (68.4%) responded “yes,” they have noticed a change in their grocery practices during the

pandemic/quarantine. The chi-square independence test showed a statistically significant association between grocery shopping practices with emergency food kit preparation ( $p = 0.006$ ) and the change of their appetite/diet pattern under stress ( $p = 0.018$ ).

**Conclusion:** This research may help shape society's shopping habits to become well-prepared during the COVID-19 pandemic and future occurrences. Dietitians are responsible for increasing public health awareness regarding nutrition to optimize health during a biothreat outbreak. Dietitians can educate the public on a variety of foods for sustainability during global emergencies. We can become well-prepared to improve response strategies during global emergencies and future occurrences. Being well-prepared may reduce stress and anxiety, essential for wellness to enhance health and life quality.

## INTRODUCTION

Coronavirus disease 2019 (COVID-19) is a respiratory illness that transmits from person to person. COVID-19 is a novel virus identified after an outbreak in Wuhan, China, on Dec 31, 2019.<sup>1,2</sup> On Jan 21, 2020, the United States confirmed its first positive case in Washington.<sup>3</sup> The individual infected traveled to Wuhan earlier.<sup>3</sup> On Mar 31, 2020, there were 754,933 confirmed cases and 36,522 deaths globally, in which 140,640 confirmed cases and 2,398 deaths occurred in America.<sup>4</sup> Within two weeks, the numbers had risen to 1,995,983 confirmed cases (45% increase) and 131,037 deaths (56% increase) globally, in which 604,070 confirmed cases (62% increase) and 25,871 death (83% increase) occurred in America.<sup>4</sup> The symptoms of this disease vary from mild to severe and may appear 2-14 days after exposure.<sup>5</sup> Individuals may experience fever, cough, and shortness of breath.<sup>5</sup> The high-risk population for severe illness from COVID-19 includes, but are not limited to, older adults and individuals regardless of age, who have pre-existing medical conditions.<sup>6</sup>

The Academy of Nutrition and Dietetics (AND) provided guidelines at their website EatRight.org on grocery shopping during the COVID-19 quarantine to help individuals make healthier and sustainable food choices. The guidelines include purchasing shelf-stable products such as canned food that are low in sodium, dried beans, whole grains: such as brown rice, quinoa, oats, and pasta, nuts and seeds, dried herbs, and pouched or canned fish and poultry.<sup>7</sup> This selection was suitable for limiting the number of trips to the supermarket while the stay-at-home order was in place.<sup>7</sup> Another guideline concerning frozen and fresh foods consists of purchasing whole foods and minimally processed foods, such as broccoli, cauliflower, carrots, brussels sprouts, and fruits such as berries, cherries and bananas, and poultry.<sup>7</sup> To maximize food

retention, the Academy of Nutrition and Dietetics recommends utilizing food already on hand and freezing leftovers to reduce waste.<sup>7</sup>

Caloric intake possibly increased during this COVID-19 quarantine. The Academy of Nutrition and Dietetics recommended managing caloric intake without compromising nutrition. The Academy of Nutrition and Dietetics suggested that food should be served on smaller dishware; additionally, this may help food last longer by limiting the overconsumption of food.

Lastly, AND recommended that the interpretation of best-by and sold-by dates should be understood correctly. These dates refer to the quality of food and not necessarily an expiration date.<sup>7</sup> The best-by date indicates the product's optimal flavor and quality. The sell-by date refers to how long a store may have this product in inventory.<sup>8</sup>

During the Ebola virus disease (EVD) in 2014-2016, many who experienced this epidemic expressed that nutrition should have been a priority during this time.<sup>9</sup> Many felt that both healthcare professionals and the community did not value nutrition as necessary.<sup>9</sup> There were market disruptions that restricted food commodity imports and exports, market closures, and product prices increased.<sup>9,10</sup> This led to food insecurity, which ultimately compromised the nutrition status of infants and children.<sup>9,10</sup>

In this COVID-19 pandemic, many communities were frightened because this virus is novel. Proper education concerning the virus, food safety, nutrition, and sterile techniques could positively impact social attitudes regarding the COVID-19 pandemic/quarantine. Ebola virus disease affected food production, food storage, food distribution (transport and trade), and food retailing.<sup>10</sup> Through interrelated connections, the impact on health and nutrition by infectious diseases such as EVD and COVID-19 can be negatively affected. Safety measures and

preparedness with regards to nutrition is essential when dealing with infectious diseases to maintain immune health.<sup>10</sup>

Puerto Rico experienced Hurricane María in 2017, which brought much devastation. The U.S. Department of Agriculture (USDA) activated the Disaster Supplemental Nutrition Assistance Program to distribute food to the Puerto Rican community. The supplemental program should have complied with the Dietary Guidelines for Americans (DGA).<sup>11</sup> The Dietary Guidelines for Americans (DGA) are recommendations used as a guide to help improve food choices to balance meals.<sup>11</sup> More than half of the food distributed to Puerto Rico was high in sodium, saturated fat, and added sugars.<sup>11</sup> The distribution of these foods may have been chosen due to the shelf-life stability of canned products and the prepackaged ready-to-eat items compare to fresh produce and whole foods. Other reasons for the distribution of these items are purchase affordability and the calorie content of the food.

In this COVID-19 pandemic, Americans could adopt these similar practices of obtaining food items like those dispersed to Puerto Rico due to shortage. The stay-at-home order demanded Americans to practice social distancing. Many individuals shopped in fear of the lack of food; to ensure having enough food and supplies in the home and limit the number of trips to the store, many may over purchase.<sup>12,13,14</sup> High-demand items in most grocery stores were long-shelf-life items, such as meat, juices, microwaveable meals, and processed foods.<sup>12,14</sup> States with stay-at-home orders in place had a threefold increase in grocery spending.<sup>15</sup> With an increase in grocery shopping, further investigation is needed to explore if society is nutritionally well-prepared during the COVID-19 pandemic/quarantine. Nutrition education was necessary to help shape the community's shopping habits to become well-prepared during the COVID-19 pandemic/quarantine and future occurrences.

The coronavirus is a novelty virus; people are trying to be well-prepared to the best of their ability to remain healthy. Therefore, the purpose of our graduate student research study was to determine if there was a significant change in food selection, food practices, and consumption during the COVID-19 pandemic/quarantine.

## **SUBJECTS**

We recruited 320 male and female participants. Participants took part in an anonymous online survey. The survey was distributed through the Loma Linda University Health email contact list, social media accounts, and by word of mouth. The flyer and information letter were contained in the emails and social media feed that introduced the study. The inclusion criteria were male and female participants, 18 years and older, and responsible for grocery shopping for themselves or their household. All methods and procedures were approved by the Loma Linda University Institutional Review Board (IRB).

## **METHODS**

This graduate research project was a mixed study design. The graduate student investigators created the anonymous online survey through Qualtrics, distributed electronically through the Loma Linda University email with the attached link and Q.R. code. Once the participant clicked on the link, it was considered informed consent. The information letter regarding the study was sent through email, posted through approved social media accounts, and word of mouth by the student investigators. The anonymous online survey took participants 5-10 minutes to complete. The survey questions included demographics and grocery shopping experience. The demographic section consisted of age, gender, ethnicity, household size, zip code, occupation, income level, and education level. The grocery shopping experience section of



the survey consisted of frequency of grocery shopping, prior emergency kit preparation, changes of grocery selection due to the over-purchase of others, eating out, dietary practices, and stress level. There was a total of 19 multiple-choice questions (8 demographics and 11 main study questions). Some examples of the survey questions are: Before the COVID-19 pandemic/quarantine, did you prepare an emergency food kit? During the COVID-19 pandemic/quarantine, has your grocery shopping practices changed? Lastly, questions regarding their shopping trends and noticeable changes?

The focus group consisted of those who were interested in participating in a semi-structured interview via *Zoom*. We randomly picked 10 participants out of the first 20 who contacted us and signed up for the interview. The interviews took approximately 20-30 minutes to complete. With the participants' verbal consent, the interviews were recorded and transcribed by the student investigators. After transcription, the recording was destroyed. The *Zoom* interview included further elaboration about changes in their grocery shopping experience and food consumption. The interview questions focused on grocery shopping practices before and during the COVID-19 pandemic/quarantine, how shortages affect grocery shopping, and if nutritious foods were considered a factor for purchase. The focus group interview was pre-scheduled and consisted of questions developed by the student investigators. Examples of the interview questions that were asked included: Before the COVID-19 pandemic/quarantine, what groceries did you usually buy and why? During the COVID-19 pandemic/quarantine, what grocery selections have changed and why? How has the over-purchasing of others affected your ability to purchase what you need?

Although there was no direct benefit to our participants, this study may help society reshape their shopping habits and food selection to become nutritionally prepared during the

COVID-19 pandemic/quarantine. Nutritional and shopping recommendations from Eatright.org, written by the Academy of Nutrition and Dietetics, were provided to all anonymous survey participants. The link to this information was presented after the completion of the survey. The content of this information included managing food on hand, mastering the shelf-life of foods to limit the number of store trips, shopping for quality foods, and safe food handling.

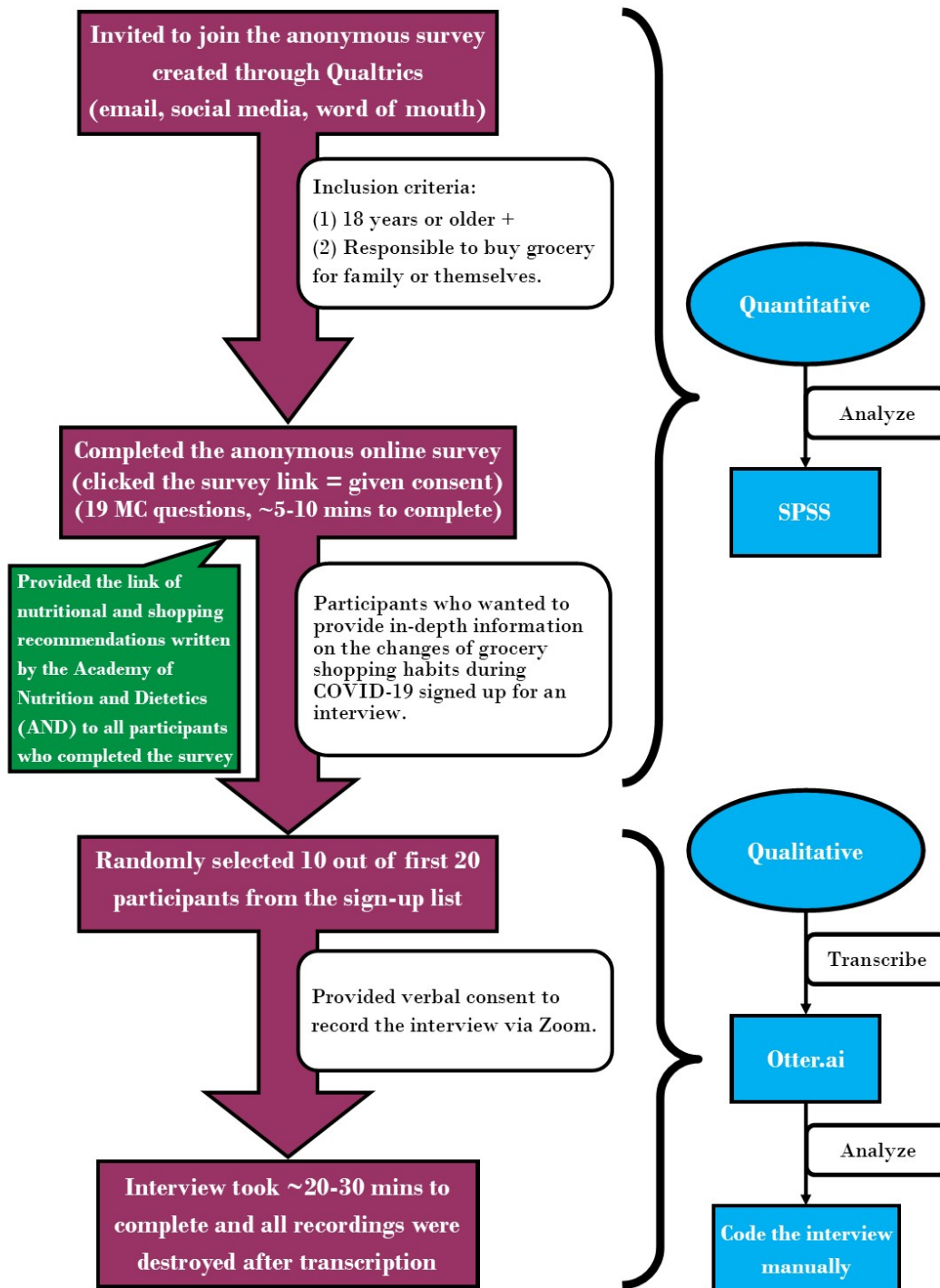


Figure 1. Flow Chart of The Methods

## **PROCEDURES**

An invitation to take our anonymous online survey was sent through Loma Linda University Health email, posted on social media, and by word of mouth. A flyer was attached to the email announcement so participants could join our study by scanning a Q.R. code or entering the link provided. By clicking on the link of the survey, the participant indicated his or her consent. The survey consisted of 19 multiple choice questions that took approximately 5-10 minutes to complete. At the end of the survey, participants contacted graduate student investigators if they were interested to participate in the focus group interview. An article link called “Grocery shopping guidelines during the COVID-19,” written by the Academy of Nutrition and Dietetics was also provided at the end of the survey. The focus group interview was conducted through *Zoom*. Ten participants were randomly chosen out of the first 20 who expressed interest in joining the interview. A time and date were assigned to each participant for the *Zoom* interviews. The student investigators sent an email that provided available time slots for participants to choose from to schedule the time and date with the participants. The *Zoom* interview took approximately 20-30 minutes to complete. All the *Zoom* interviewees received a \$25.00 gift card for their participation; therefore, the budget for this study was \$250.00.

### **Statistical Analysis**

Our graduate research was a mixed-method study consisting of a quantitative survey and a qualitative interview. Data collected were analyzed with SPSS, a statistical program. The statistical tests that were performed were power analysis, Chi-square analysis, and correlation analysis. Otter.ai was the program used to upload the audio recording and then transcribed manually by the graduate student investigators.

## RESULTS

Three hundred and twenty anonymous online surveys were recorded; of those, 11 were initiated but incomplete. We sent the invitation via email to all eight schools at Loma Linda University to faculty and students. Of the eight schools, two schools responded to the invitation and shared it amongst their department. Shown in table 1 are the demographics of the participants in the anonymous survey. The majority of the participants were female (72.5%) with an average age of  $30.9 \pm 10.7$  years. The bulk of the participants were Asian/Pacific Islander, Caucasian (38.1% and 28.1%, respectively), and 73.1% lived in North America. There were 50.3% of students who completed the anonymous survey, and 47.8% had a bachelor's degree. The majority of participant's yearly household income made either below \$10,000 or over \$70,000 (30.6% and 24.1%, respectively), with a household size of two (26.3%) during the pandemic/quarantine. Participants who were non-vegetarian made up 76.9% of completed anonymous surveys.

**Table 1. Mean (S.D.) and Frequency (%) Demographics of the Survey Participants (n=320)**

Age (mean $\pm$ S.D.)	<b>30.9<math>\pm</math>10.7</b>
	<b>Frequency (%)</b>
Gender	
<b>Female</b>	<b>232 (72.5)</b>
Male	85 (26.6)
Prefer not to say	3 (0.9)
Race	
African American	36 (11.3)
<b>Asian/Pacific Islander</b>	<b>122 (38.1)</b>
<b>Caucasian</b>	<b>90 (28.1)</b>
Hispanic or Latino	51 (15.9)
Native American or American Indian	3 (0.9)
Others	18 (5.6)

Location	
Asia	53 (16.6)
Australia	26 (9.1)
Europe	7 (2.2)
<b>North America</b>	<b>234 (73.1)</b>
Occupation	
Business owner/Self-employed	12 (3.8)
Company employee (work from home)	55 (17.2)
Company employee (work from office)	66 (20.6)
Retired	1 (0.3)
<b>Student</b>	<b>161 (50.3)</b>
Unemployed	4 (1.3)
Others	21 (6.6)
Education	
Doctoral / Professional degree	16 (5.0)
Master's degree	52 (16.3)
<b>Bachelor's degree</b>	<b>153 (47.8)</b>
Associate degree	46 (14.4)
Some college but no degree	40 (12.5)
High school graduate or less	13 (4.1)
Household income (US \$ per year per household)	
<b>Below \$10,000</b>	<b>98 (30.6)</b>
\$10,000 - \$30,000	57 (17.8)
\$30,001 - \$50,000	51 (15.9)
\$50,001 - \$70,000	37 (11.6)
<b>Over \$70,000</b>	<b>77 (24.1)</b>
Household size	
1	45 (14.1)
<b>2</b>	<b>84 (26.3)</b>
3	68 (21.3)
4	66 (20.6)
5	36 (11.3)
6 and more	21 (6.6)
Diet practice	
Lacto-ovo-vegetarian	6 (1.9)
<b>Omnivore / Non-vegetarian</b>	<b>249 (77.8)</b>
Pescatarian	6 (1.9)
Vegan	14 (4.4)
Vegetarian	22 (6.9)
Others	15 (4.7)

We conducted a chi-square test and compared all survey questions to question 11, our focus question (Table 2 and 3). Grocery shopping practices changed during COVID-19, with 68.4% of participants in the survey responded “Yes” and 28.1% responded “No” to grocery shopping changes (refer to Table 2, question 11). The chi-square independence test showed a statistically significant association between grocery shopping practices with emergency food kit preparation ( $p = 0.006$ ) and appetite/diet pattern change when under stress ( $p = 0.018$ ). However, there was no statistically significant association between the shift in grocery shopping practices with availability, the degree of appetite changes, the exercise level, mealtime food preference, and snack-time food preference. Questions 12, 13, 15, 16, 17, 18, 19 showed no association with our focus question; p-values of (0.476, 0.279, 0.101, 0.511, 0.066, 0.058, 0.284) respectively.

Before and during the pandemic, healthiness was one of the main concerns while grocery shopping, as seen in table 3. However, concerns of availability followed healthiness during the pandemic, and before the pandemic, the price was a concern that followed healthiness while grocery shopping. Food preferences during mealtime and snack-time may have influenced alterations in grocery shopping practices. Most of the participants ate more home-cooked meals, mostly made of raw ingredients at Mealtime (Table 3), and preferred home-cooked meals (Table 4). Processed foods like chips, cookies, cake, candy were consumed more at snack time.

**Table 2. Frequency (%) and The Association Between Grocery Shopping Practice Changes During COVID-19 (n=309)**

	Frequency (%)	P-value*
11. Grocery shopping practices changed during COVID-19		
<b>Yes</b>	<b>219 (68.4)</b>	---
No	90 (28.1)	
10. Emergency food kit preparation before COVID-19		
Yes	65 (20.3)	<b>0.006</b>
<b>No</b>	<b>244 (76.3)</b>	
14. Appetite/diet pattern change when under stress		
<b>Yes</b>	<b>235 (73.4)</b>	<b>0.018</b>
No	74 (23.1)	

\* Chi-square test

**Table 3. Frequency (%) of Other Factors That May Have Influenced Grocery Shopping Changes Before and During COVID-19 (n=309)**

Factors Comparison Before and During COVID-19 Pandemic	Frequency (%)
12. Factor concerned with while grocery shopping during COVID-19	
<b>Availability</b>	<b>102 (33.0)</b>
Easy to serve	22 (7.1)
<b>Healthiness</b>	<b>106 (34.3)</b>
Price	57 (18.4)
Shelf-life of the products	22 (7.1)
13. Factor concerned with while grocery shopping prior COVID-19	
Availability	35 (10.9)
Easy to serve	19 (5.9)
<b>Healthiness</b>	<b>137 (42.8)</b>
<b>Price</b>	<b>103 (32.2)</b>
Shelf-life of the products	15 (4.7)
15. How does your appetite/diet pattern change when stressed	
Decreased	108 (33.8)
<b>Increased</b>	<b>129 (40.3)</b>
Maintain (choose this if answered “No” on Q14)	72 (22.5)
16. Exercise level during the COVID-19	
<b>Decreased</b>	<b>163 (50.9)</b>
Increased	77 (24.1)
Maintain	69 (21.6)
17. How stress level changed during COVID-19	
Decreased	17 (5.3)
<b>Increased</b>	<b>227 (70.9)</b>
No Change	65 (20.3)



18. Foods that are consumed more frequently at Mealtime during the COVID-19	
Fast foods	25 (7.8)
Home-cooked meals (mainly processed products)	71 (22.2)
<b>Home-cooked meals (mostly raw ingredients)</b>	<b>184 (57.5)</b>
Restaurant take-out	29 (9.1)
19. Foods that are consumed more frequently at snack-time during the COVID-19	
I do not snack	37 (11.6)
<b>Processed foods (chips, cookies, cake, candy, etc.)</b>	<b>186 (58.1)</b>
Whole foods (seeds, nuts, carrots, celery sticks, fruit, etc.)	86 (26.9)

The *Zoom* interview was analyzed into five themes: shopping values, impactfulness, weight changes, preparedness, and meal preferences (Table 4). For shopping values, participants shopped based on health consciousness, diet preferences, and cultural preferences before COVID-19. *“We do usually select organic when possible when it’s on a, you know, good price. I use gluten-free items when possible.”* Health consciousness remained a concern during the pandemic, and the purchase of extra food according to availability. *“Every time we would go to the grocery store, we would pick up one or two extras, and just to have it stocked, so we were pretty well prepared when everything shut down.”*

For impactfulness, those who were impacted due to the over-purchase of others expressed a decrease in the availability of regular items they would usually purchase. There was an increase in the food cost of substituted items, and they worried about food scarcity. *“It made me go to several stores. I just gave up; I’m fine with what I have.”* In contrast, participants were not impacted by the over-purchasers because they always buy in bulk or had a garden. *“I think it was pretty much because we buy bulk already. We have a family of six, a lot of people in one’s household, so we always have extra stock.”*

Half of the participants noticed the change in their weight during the pandemic/quarantine, and half maintained their weight. Weight increased because they lack

exercise, had more accessibility to food while at home, and enjoy eating with family. *“I gained weight, maybe three or five pounds. I was enjoying being home with my husband and kids and eating probably a little bit more.”* Some reported a decrease in weight because they increased physical activity and started eating healthier to improve their immune system. The other half did not have any weight changes during the pandemic because they continued the same diet, maintained physical activity, and worked out with family members. *“It’s partly due to my diet. I try to eat healthy, but I also exercise a lot.”*

As for the preparedness, four participants stated they were fully stocked with food before the pandemic because they always prepared for disasters. Six participants did not prepare because they thought it was unnecessary or did not think about preparation. Out of those six who did not prepare, four stated that they would start to prepare because they knew the importance of extra food and other necessary items. The remaining two of those six said that the situation is improving; there is no need to prepare for situations like this due to food availability and the accessibility of online shopping. *“There’s probably some things that we’ll just continue to purchase online because they don’t charge a delivery fee, and we don’t have to actually in the in the store.”* Lastly, the majority of the participants prefer home-cooked meals before and during the pandemic/quarantine. Some participants stated that they have started making their meals from scratch and learning new recipes. *“I try and make it as much from scratch as possible, but it kind of depends on time.”*

**Table 4. Interview Themes of Shopping Values, Impactfulness, Weight Changes, Preparedness, and Food Preferences Before and During COVID (n=10)**

<b>SHOPPING VALUES</b>		
<b>Pre-COVID</b>		<b>During COVID</b>
<ul style="list-style-type: none"> <li>• Health-conscious</li> <li>• Diet preference (vegetarian)</li> <li>• Cultural preference</li> </ul>		<ul style="list-style-type: none"> <li>• Health-conscious</li> <li>• Purchased extra foods</li> <li>• Purchased according to availability</li> </ul>
<b>IMPACTFULNESS</b>		
<b>Impact due to over-purchasers</b>		<b>No impact due to over-purchasers</b>
<ul style="list-style-type: none"> <li>• ↓ Availability</li> <li>• ↑ Food cost</li> <li>• ↑ Food scarcity</li> </ul>		<ul style="list-style-type: none"> <li>• Always shop in bulk</li> <li>• Already had a garden</li> </ul>
<b>WEIGHT CHANGES</b>		
<b>Factors of increased weight</b>	<b>Factors of maintained weight</b>	<b>Factors of decreased weight</b>
<ul style="list-style-type: none"> <li>• Lack of exercise</li> <li>• Easier access to food while at home</li> <li>• Enjoy eating with family</li> </ul>	<ul style="list-style-type: none"> <li>• Same diet as before</li> <li>• Maintained exercise level</li> <li>• Physically active with family</li> </ul>	<ul style="list-style-type: none"> <li>• Increased exercise level</li> <li>• Started eating healthier</li> </ul>
<b>PREPAREDNESS</b>		
<b>Pre-COVID</b>		<b>During COVID- (the 6 who did not prepare)</b>
<p><b>Those who were prepared (4 participants)</b></p> <ul style="list-style-type: none"> <li>• Fully stocked with foods</li> <li>• Always prepared for disasters</li> </ul> <p><b>Those who did not prepare (6 participants)</b></p> <ul style="list-style-type: none"> <li>• Thought it was unnecessary</li> <li>• Did not think about it at all</li> </ul>		<p><b>Those who will start to prepare (4 participants)</b></p> <ul style="list-style-type: none"> <li>• Food and other items should be on hand</li> <li>• In case of another outbreak</li> </ul> <p><b>Those who will not prepare (2 participants)</b></p> <ul style="list-style-type: none"> <li>• The situation will get better</li> <li>• Availability and accessibility of online stores are increasing</li> </ul>
<b>MEAL PREFERENCES</b>		
<b>Pre-COVID</b>		<b>During COVID</b>
<ul style="list-style-type: none"> <li>• Home-cooked meals</li> </ul>		<ul style="list-style-type: none"> <li>• Home-cooked meals <ul style="list-style-type: none"> <li>○ From scratch</li> <li>○ Ready-to-cook</li> </ul> </li> </ul>

## **DISCUSSION**

During this global emergency, people all around the world were greatly impacted. To stop the spread of this highly infectious virus, we needed to wear a mask and practice social distancing. Therefore, many industries implemented safety measures like working from home and having online meetings. Many people tried to limit unnecessary traveling, and online grocery shopping helped decrease the risk of exposure. Many participants noticed a change in their shopping habits during the pandemic due to their appetite changes because of stress and not being physically prepared with an emergency food kit. The majority of the participants were concerned about healthiness before the pandemic, then the concern for healthiness slightly decreased during the pandemic. One of the reasons may be due to the availability of the foods in the markets. Maslow's hierarchy of needs expresses that physiological and safety needs (basic needs) should be satisfied before psychological and self-fulfillment needs. As a result, many participants said they would start preparing an emergency food kit for global emergencies and future occurrences. However, some people were panic shopping. We may feel panic when unsure of how to respond to the situations like this pandemic. In order to feel secure, over-purchase started stocking up extra foods and essential home items to ensure they can survive this crisis. It is unhealthy to stay in this stress mode for a long period of time, leading to other chronic diseases such as high blood pressure.

We noticed a positive correlation between the changes in grocery shopping practices and appetite under stress. Since many of our participants stated that their stress level increased during the pandemic, we may conclude that majority have increased food consumption during the pandemic. Some of the interview participants reported that their weight increased, and the survey results showed that most participants' exercise levels decreased. A decrease in exercise during

stressful situations may influence weight-related diseases in the future. In addition, many participants answered that they consumed more processed snacks during the pandemic, which can be alarming for their health as most processed snacks contain high sugar and sodium.

Many people started taking supplements to boost their immune systems. The most common supplements include vitamin C, vitamin D, and zinc. They all claim to help improve the immune system. There have been studies about vitamin C and vitamin D and their protective effects against the virus while optimizing the individual's health.<sup>16,17</sup> Foods rich in these vitamins (natural source and fortified) may be essential to have on hand in preparation for future biothreat outbreaks. In hospitals, patients suspected of having the COVID-19 infection would be placed on a COVID protocol. The COVID protocol consisted of high-dose vitamin C and vitamin D either via IV or orally.<sup>16, 17</sup> However, research is still ongoing. There are conflicting results regarding the effectiveness of taking these supplements against the coronavirus. Taking high doses of vitamins and minerals may have adverse effects per individual as well. Therefore, we recommend consulting with a healthcare professional before taking supplements. Being prepared for the COVID-19 pandemic was the primary reason for changes in grocery shopping practices.

The limitations of this research were the inability to interview all participants for a semi-structured, in-depth interview. Knowing how their food selection and consumption have changed and other factors that were not considered to influence grocery shopping practices could have been beneficial to the study. One strength of the study is that it was a mixed-method study, which consisted of quantitative and qualitative results.

## **CONCLUSION**

Limitations when grocery shopping, restrictions of the pandemic, and the over-purchase of others caused changes in food selection and consumption in totality. This research may help

shape society's shopping habits to become well-prepared during the COVID-19 pandemic/quarantine and future occurrences. Dietitians are needed to increase public awareness regarding nutrition to optimize health during a biothreat outbreak. Dietitians can educate the public on various foods for sustainability during global emergencies to minimize stress and worry concerning food availability for their families. Individuals can become well-prepared to improve response strategies during global emergencies and future occurrences to influence safety for all. Response strategies can enhance the clarity of the situation, help eliminate the cause of threat quicker, and a smoother approach to public health protocols and protective measures. A traumatic event can alter behavior that would not otherwise be done, especially when there is a threat concerning lives and health.

Most importantly, being well prepared may reduce stress and anxiety. Stress and anxiety are two essential elements for mental and physical wellness to enhance health and life quality. It is necessary to have a healthy and well-balanced diet, maintain physical activity, and limited stress to improve the body's immune system, mainly during a biothreat outbreak.

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