The Influence of the COVID-19 Pandemic on the Food Supply in the Emergency Food System: A Case Study at 2 Food Pantries

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ABSTRACT

Background: The onset of the coronavirus disease 2019 (COVID-19) pandemic increased demand for emergency food assistance and has caused operational shifts in the emergency food system.

Objective: This research explored how the initial phase of the COVID-19 pandemic influenced the food supply of 2 food pantries.

Methods: A case study approach was applied to collect data during the initial phase of the COVID-19 pandemic. Food supply data were collected weekly at 2 food pantries in southwest Montana for 17 wk in 2020. Surveys and interviews were conducted with food pantry clients and staff, respectively. Descriptive statistics and inferential statistics were applied to analyze quantitative data. Food supply data were analyzed using the Healthy Eating Index (HEI)-2015, NOVA system, and Unprocessed Pantry Project (UP3) Framework. Thematic analysis was applied to qualitative data.

Results: The food boxes collected between the 2 food pantries ($n = 43$) had a mean ($\pm$ SD) total HEI-2015 score of 76.41 ± 7.37 out of a possible score of 100. According to both the NOVA and the UP3 Framework, 23.4% of the total food distributed was ultra-processed food. Of the food distributed, 50.0% and 48.3% was fresh, unprocessed food according to NOVA and UP3 Frameworks, respectively. From staff interviews, 3 themes arose that describe the food pantry operations that experienced change during the COVID-19 pandemic, including food procurement, distribution preparation, and food distribution. Nine supporting subthemes describing the causes and consequences of the operational themes were identified. Staff perceived that the nutrient quality of the food boxes increased from food distributed previously to the COVID-19 pandemic, whereas over one-third (39.4%) of food pantry clients who responded to surveys preferred the food box model.

Conclusions: The COVID-19 pandemic has caused enormous operational challenges within food pantries. Food pantries overcame these challenges by swiftly and effectively altering operations so as to continue to distribute nutritious food boxes to pantry clients. *Curr Dev Nutr* 2021;5:nzab115.

Introduction

The onset of the coronavirus disease 2019 (COVID-19) pandemic has spurred food insecurity and a monumental shift in the ways the emergency food system (EFS) acquires and distributes food (1). In the United States, it is projected that 17 million more people experienced food insecurity than did prior to the COVID-19 pandemic (1). Lower socioeconomic populations experience food insecurity and develop obesity and noncommunicable chronic disease at higher rates than the general public (2–5), a situation that was further exasperated during COVID-19 for lower socioeconomic populations (6).

Food insecurity is defined as the condition of being unable to obtain enough nutritious food consistently and reliably, in a safe and socially acceptable manner (7, 8). Research demonstrates that low-income and food-insecure populations are less likely to achieve dietary recommendations compared with more affluent and food-secure populations (9, 10). Simultaneously, low-income and food-insecure individuals often consume lower-quality diets due to the higher cost of healthy food,

including ultra-processed foods (UPFs), which have been shown to contribute to deleterious health outcomes (11–14).

To reduce food insecurity in America, a network of food banks, food pantries, and soup kitchens, known collectively as the EFS, work to provide food to those in need. Over 40 million Americans access this system annually, frequently through food pantries where the food available is supplied through purchases, donations, and disbursements from state and regional food banks (15–17).

Since the 1980s, many food pantries have shifted to providing a self-choice shopping model, where customers can peruse stocked shelves and make selections based on preferences, needs, appropriateness, and food-preparation knowledge (17). As a result, food pantry patrons' diet quality is determined by their selection of foods from the food pantry's available items, along with foods obtained through means outside of the food pantry (15). A systematic review conducted by Simmet et al. (18) concluded that the nutritional quality of the foods provided from the EFS does not support a healthful diet. A 2016 analysis of the food supply of food bank shelves determined that the average total Healthy Eating Index (HEI) score, a standardized method for identifying adherence to the Dietary Guidelines for Americans (DGA), was 62.7 out of 100 (19, 20).

The occurrence of the COVID-19 pandemic and associated regulatory measures applied potentially has vast implications for the nutritional quality of the foods available within the EFS. There is little known about how the changes implemented in EFS operations impact the nutrient quality of the food supply distributed to EFS clients. The purpose of this research is to identify and evaluate the consequences of the initial phase of the COVID-19 pandemic on food supply, nutrient quality, and distribution methods of 2 food pantries within southwestern Montana that offered a self-choice model of food distribution pre–COVID-19. This research aimed to determine how the food distribution system changed within these food pantries and applied findings to identify recommendations for building a healthy food supply within similar food pantries.

Methods

This research drew upon a case study approach to collect data beginning in April 2020, directly following the operational shifts made by food pantries as a result of COVID-19, and continued until August 2020.

Food pantry sites

Immediately prior to the COVID-19 pandemic, this research team conducted a study, called the UnProcessed Pantry Project, at 2 food pantries in Montana that evaluated the quality of the food supply over a 1-y period (14, 21). This research created a strong collaborative relationship between the food pantries and the research team, which allowed for continued data collection during the COVID-19 pandemic.

In Montana, stay-at-home orders were issued in mid-March and phased reopening began in late April (22). Due to stay-at-home orders that closed nonessential businesses, unemployment rates spiked, driving increased rates of food insecurity. As of August 2020, 28,922 total unemployment insurance claims were filed, nearly triple that of pre–COVID-19 rates (23). Along with the increase in unemployment, participation in the Supplemental Nutrition Assistance Program (SNAP) increased with growing population need (24). During 2018, approximately one-tenth of Montana residents received food through the Montana Food Bank Network (25). In response to the growing COVID-19–related food insecurity, the percentage of Montanans accessing the EFS through food banks increased at least 20% to 30% during 2020, after the onset of the COVID-19 pandemic (26).

As EFS use increased, systematic changes occurred to increase worker and client safety throughout food banks and food pantries nationwide (27). In Montana, 3 main shifts occurred across the EFS. First, food donations from the public were no longer accepted and instead money was requested to allow food pantries to purchase large quantities of food for food boxes. Second, food rescue operations from grocery stores were temporarily discontinued or significantly decreased (26). Third, many food pantry clients were no longer choosing their own food, and rather being provided a prepacked food box.

Located in non-metro southwestern Montana (28), both food pantry operations offered a self-choice shopping model prior to the COVID-19 pandemic. Both food pantries accepted donations of food and money to varying degrees. Food Pantry 1 also ran a food rescue program, collecting food from grocery stores (29, 30). Food Pantry 1, which also acts as a food bank, distributed 2,000,000 pounds of food to customers during the same time period (29, 30). Food Pantry 2 distributed over 200,000 pounds of food during the 2018–2019 fiscal year (29).

Food supply data and interpretation

Data were collected weekly at the 2 food pantry sites for 17 wk. For safety, food pantry clients were provided a prepacked food box, which was placed directly into their vehicle. All food boxes were packed with enough food for a household size of 4 to last approximately 1 wk, and families could return to the food pantry as frequently as needed.

Data were collected through photographs to follow COVID-19 protocols and social-distancing guidelines; the researchers could not directly visit the food pantry. Food pantry staff were directed to randomly select a food box after packaging for distribution and then photograph the food items prior to the client's food pick-up (**Figure 1**). Researchers drew upon food photography methods to assess the food boxes (31, 32). Each photograph depicted the entire contents of a single food box distributed so that labels were clearly identifiable. Staff captured these photos between 2 to 3 times per week initially and then transitioned to once per week as the variation in the distribution process stabilized on 3 occasions early in data collection; staff from 1 food pantry sent photographs of 2 different food boxes on a single day. In order to select a single food box for each day of data collection, the food boxes were numbered 1 or 2, and a random generator was used to select which box would be used for analysis.

Upon receiving the photographs from the food pantry staff, the lead researcher assessed and recorded each item in each food box according to the inventory protocol. Prepackaged items were counted and recorded individually. For every food item available, the name (e.g., low-sodium green beans), brand, number of units, servings per unit, total number of servings, and food group (e.g., dairy, vegetable, poultry) were recorded. Items with differing brands were entered separately, even if the item was the same type of food. Items with the same brand, but with differences in processing, were also recorded separately. As freshly packaged items, such as bakery breads or fresh fruits, often lack food labels with volume or weight listed, the researchers used USDA Food

FIGURE 1 Sample food pantry food box contents for understanding the influence of the COVID-19 pandemic on the food supply in the emergency food system. COVID-19, coronavirus disease 2019.

Data Central to approximate the weight of the item based on the calculated composite of the average serving size across all possibilities within each type of food (33). For food boxes with unclear photographs, both the lead researcher and a research assistant individually assessed the food boxes, compared results, reached a consensus, and recorded the items.

To determine the nutritional value of food items, the identified foods from the food pantry food boxes were compared across multiple databases. Each food item was matched with its corresponding description and food code from the Food and Nutrient Database for Dietary Studies (FNDDS) and Food Patterns Equivalent Database (FPED) (34, 35). The FNDDS provides nutrient values for items reported in the di-etary intake piece of the NHANES known as What We Eat in America. The FPED then uses the foods and beverages in the FNDDS to determine USDA food pattern equivalents (36). FNDDS and FPED values are reported per 100-g serving. Therefore, the total number of servings of each food pantry inventory item (as provided in the food pantry inventory dataset) and each food box inventory item (as provided in the food box inventory dataset) were multiplied by the item's average weight in grams per serving, listed in the FNDDS Portions and Weights dataset under "quantity not specified." These values were then divided by 100 to determine the number of standard 100-g servings per food pantry inventory item (21). The information provided from the FNDDS and the FPED is required to compute HEI-2015 scores.

TABLE 1 Semi-structured interview questions for understanding the influence of the COVID-19 pandemic on the food supply in the emergency food system[1]

	Interview guide
1	What changes occurred due to COVID-19 that caused the food bank or food pantry to become more efficient? Will any of the changes be continued?
2	What changes made due to COVID-19 caused the food pantry or food bank to become more inefficient? Will those changes be altered?
3	Do you think the changes made due to COVID-19 improved or did not improve the nutritional quality of the food provided to the customers of your food bank?
4	How has going from having volunteers to having no or few volunteers impacted the work you do?
5	Has not having volunteers impacted clients and their diets?
6	How has not accepting food donations and only accepting monetary donations changed the foods available for food pantry clients?
7	How has not accepting food donations changed the work you do?

[1]COVID-19, coronavirus disease 2019.

HEI-2015, NOVA food classification system, and the Unprocessed Pantry Project (UP3) Framework were used to assess the nutrient quality and contribution of UPFs to the food supply for a well-rounded understanding of the food supply.

The HEI is a metric that can be used to determine how well a diet pattern or food environment is in alignment with the DGA (21). The HEI is a scoring system with a scale ranging from 0 to 100, where a score of 100 represents a diet or food environment in alignment with the Dietary Guidelines (37). To calculate the HEI score, 13 nutritional components are assessed in terms of adequacy or moderation recommendations. The adequacy components are composed of foods that the DGA encourage Americans to consume. Comparatively, the moderation group is composed of foods that should be limited (37, 38).

NOVA (which is not an acronym, but rather means "new" in Portuguese) and the UP3 classification systems were applied to each food item (39). Classifications were made by reading each item's list of ingredients and Nutrition Facts panel, and then referring to both the UP3 and NOVA classification criteria to identify which category within both systems the item belonged (14, 39). The NOVA system classifies foods as either unprocessed or minimally processed (group 1), processed culinary ingredients (group 2), processed foods (group 3), and UPFs (group 4) (39, 40). Comparatively, the UP3 Framework expands upon the NOVA classification system by establishing 5 categories—namely, fresh foods, pantry staples, lightly prepared, heavily prepared, and UPFs (14).

Qualitative interviews with staff

Phone interviews with paid food pantry staff were conducted by the lead researcher to learn about staff perceptions regarding the shifts in operations as a result of COVID-19 (**Table 1**). Written consent was first obtained from staff to participate in the interview and demographic information was also collected. The semi-structured interviews lasted approximately 1 h and followed an interview guide. Ten open-ended questions were asked and prompts for each question were used to further probe for information. Thirteen staff members between the 2 food pantries were invited to participate and 8 staff members agreed to participate in the interview process.

Food pantry client surveys

Brief multiple-choice surveys (**Supplemental Table 1**) were conducted by food pantry staff over 1 mo at both locations in southwest Montana to assess if the food boxes were providing enough food and foods that the customers needed, wanted, and used. The surveys sought to determine if clients were receiving adequate food overall, and within specific food groups. Questions covered topics including if the amount of food provided met the customers' needs, the types of foods customers are getting too little and too much of, and the customers' preference about the food distribution model (shopping model vs. food box model). Deidentified responses to the multiple-choice customer survey questions were returned to the lead researcher by food pantry staff and entered into Excel (Microsoft Corporation). All entries were checked against the survey 3 times and a second researcher verified the data.

All human subjects research was approved by the Montana State University Institutional Review Board.

Statistical analysis

Descriptive statistics were used to summarize customer survey responses, count emerging themes regarding gained and lost efficiencies with food distribution as a result of COVID-19, and to assess each food pantry's food supply and food box composition individually and by month, to detect changes over time in the distribution of total calories, pounds, and servings of food in each UP3 and NOVA classification category (41). SAS macros (SAS Institute) provided by the National Cancer Institute were used to compute HEI-2015 scores for each month of data collection, using the Simple HEI Scoring Algorithm (42). Mean scores were assessed overall, by food pantry, distribution model, and month, and stratified by UP3 and NOVA classification. A 2-tailed *t* test was then used to assess the difference in means between Food Pantry 1 and Food Pantry 2, as well as between before and during COVID-19 modifications in food distribution. A general linear regression model was used to conduct a time trend analysis of HEI-2015 scores over the 5 mo of food box data collection. The most commonly available foods distributed with the food box drive-through distribution model were determined by first calculating the total number of servings of food distributed overall. The leading foods within each UP3 category were then determined by calculating the percentage of total servings distributed.

All qualitative responses were recorded and transcribed verbatim by the lead researcher. The content analysis method was used to analyze qualitative responses (43). A list of open codes was first created by 2 researchers independently reviewing the transcripts. The 2 researchers discussed the open codes and then merged them into a codebook. Next,

TABLE 2 HEI scores of food boxes overall and by food pantry for understanding the influence of the COVID-19 pandemic on the food supply in the emergency food system[1]

	Maximum value possible	Combined mean of Food Pantry 1 and Food Pantry 2 (*n* = 43)	Food Pantry 1 (*n* = 22)	Food Pantry 2 (*n* = 21)	*P*-Value[2] (differences between Food Pantry 1 and Food Pantry 2)
HEI-2015					
Total vegetables	5	5 ± 0	5 ± 0	5 ± 0	—
Greens and beans	5	5 ± 0	5 ± 0	5 ± 0	—
Total fruit	5	3.70 ± 1.30	3.33 ± 1.51	4.09 ± 0.91	0.053
Whole fruit	5	4.53 ± 1.18	4.27 ± 1.54	4.80 ± 0.50	0.139
Whole grains	10	7.31 ± 2.55	7.09 ± 2.66	7.54 ± 2.48	0.570
Total dairy	10	7.27 ± 2.43	8.14 ± 2.19	6.35 ± 2.37	0.014
Total protein	5	5 ± 0	5 ± 0	5 ± 0	—
Seafood and plant protein	5	5 ± 0	5 ± 0	5 ± 0	—
Fatty acids	10	4.86 ± 3.33	4.79 ± 3.31	4.92 ± 3.43	0.901
Sodium	10	3.66 ± 2.50	4.27 ± 2.47	3.02 ± 2.40	0.099
Refined grains	10	8.73 ± 2.11	7.98 ± 2.60	9.52 ± 1.00	0.014
Saturated fat	10	6.56 ± 3.33	6.73 ± 3.50	6.39 ± 3.21	0.739
Added sugar	10	9.79 ± 1.37	9.59 ± 1.92	10 ± 0	0.332
Total score	100	76.41 ± 7.37	76.19 ± 8.07	76.64 ± 6.75	0.844
Kcal	—	—	49005.4	26125.5	0.001

[1]Values are mean ± SD, unless indicated otherwise. COVID-19, coronavirus disease 2019; HEI, Healthy Eating Index.
[2]Significant differences observed between pantries at *P* < 0.05.

the interviews were split into individual quotes that contributed to the research question. Each individual quote ranged from short answers of about 10 words to longer responses of approximately 100 words. The codebook was then refined with definitions and applied to individual quotes independently by 2 researchers. Researchers discussed and resolved coding discrepancies. Coding frequency within 1 interview and across interviews was tabulated. From this process, the codes were organized into themes and subthemes regarding changes that occurred due to the COVID-19 pandemic.

Results

Food supply
In total, 43 food boxes were collected between the 2 food pantries. Of these, 22 food boxes were collected from Food Pantry 1 and 21 food boxes were collected from Food Pantry 2. Food boxes were packed with a standard set of dry-good items that contained beans, pasta, rice, cereal, canned soup, shelf-stable milk, peanut butter, canned fish, and canned vegetables. Variation in food boxes stemmed largely from either what was available to purchase or procure through food rescue. The food boxes had a mean (± SD) total HEI-2015 score of 76.41 ± 7.37 out of a possible score of 100 (**Table 2**). Overall, the highest scores were received in the categories of Total Vegetables, Greens and Beans, Total Protein, and Total Seafood and Plant Protein, which all received scores of 5 out of 5. Scores were lowest in the categories of sodium, with a mean score of 3.66 out of 10, and in fatty acids, with a mean score of 4.86 out of 10.

No significant trends were observed in total monthly HEI-2015 scores of food boxes distributed between April and August 2020. At Food Pantry 1, the highest mean (± SD) total HEI-2015 score of 82.86 ± 6.88 was recorded in June while the lowest mean total HEI-2015 score

of 70.57 ± 0.53 was recorded in August (*P*-trend = 0.34). Food Pantry 2 recorded its highest mean total HEI-2015 score of 79.19 ± 5.86 in May and lowest mean total HEI-2015 score of 72.76 ± 9.79 in June (*P*-trend = 0.69). The 2 food pantries' overall combined total HEI-2015 scores ranged from a mean high of 78.41 ± 8.40 in May to a low of 71.89 ± 2.74 in August (*P*-trend = 0.31) (**Table 3**).

Food Pantry 1 distributed food boxes with significantly more kilocalories per box than Food Pantry 2 (*P* < 0.01). Food Pantry 1 provided an average of 49,005 kcal per food box and Food Pantry 2 provided an average 26,126 kcal per food box. Despite this difference, no significant variation between food pantries in total HEI scores was found (*P* = 0.844), where Food Pantry 1 achieved a mean total HEI-2015 score of 76.19 and Food Pantry 2 received a score of 76.64. However, significant differences were found between pantries in the individual HEI component category scores of refined grains (*P* = 0.014) and dairy (*P* = 0.014). In the individual HEI component category of Total Dairy, Food Pantry 1 had a score (± SD) out of 10 of 7.27 ± 2.43, whereas Food Pantry 2 had a score of 8.14 ± 2.19 (Table 2). In the category of Refined Grains, Food Pantry 1 had a score out of 10 of 8.73 ± 2.11 and Food Pantry 2 had a score of 7.98 ± 2.60.

A relation was observed between total HEI scores and level of food processing, using both the NOVA and UP3 food classification systems. When stratified by NOVA classification, total HEI scores were highest in fresh, unprocessed foods, with a score of 78.47. Processed foods and UPFs received progressively lower scores of 69.73 and 47.92, respectively (**Table 4**).

Similarly, when stratified by UP3 classification, fresh foods received the highest total HEI-2015 score of 77.87. As food processing increased, the total HEI scores by category decreased. Lightly prepared foods received a total HEI score of 68.80, heavily prepared foods received a total HEI score of 59.19, and UPFs received a total HEI score of 47.92. By both NOVA and UP3 classifications, UPFs received the lowest HEI scores in

TABLE 3 Trend in total HEI scores of food pantry food boxes, April–August 2020 for understanding the influence of the COVID-19 pandemic on the food supply in the emergency food system[1]

	April	May	June	July	August	P-trend
Food Pantry 1	75.33 ± 2.66	77.82 ± 10.28	82.86 ± 6.88	72.52 ± 7.48	70.57 ± 0.53	0.34
Food Pantry 2	76.16 ± 5.53	79.19 ± 5.86	72.76 ± 9.79	78.44 ± 7.17	73.22 ± 3.89	0.69
Overall Combined	75.74 ± 4.04	78.41 ± 8.40	77.09 ± 9.64	75.48 ± 7.58	71.89 ± 2.74	0.31

[1]Values are means ± SD. COVID-19, coronavirus disease 2019; HEI, Healthy Eating Index.

greens and beans (0.88 out of 10), total fruit (0.33 out of 10), whole fruit (0.49 out of 10), saturated fat (2.66 out of 10), and sodium (2.03 out of 5).

The food boxes contained 14,581 servings of food in total, of which 50% was fresh, <0.1% was processed culinary ingredients, 26.3% was processed, and 23.4% was ultra-processed when classified according to NOVA. By the UP3 classification system, food boxes comprised 48.3% fresh food, 0.2% pantry staples, 17.2% lightly prepared food, 10.7% heavily prepared food, and 23.4% UPF servings (**Table 5**).

According to the UP3 classification system, the most frequent fresh foods by total number of servings provided in the food boxes were onions (8.6%), potatoes (7.2%), 2% milk (6.5%), eggs (5.3%), and pasta (4.8%) (**Table 6**). Butter was the only pantry staple provided within the food boxes with a total of 24 servings (100%) of the 14,581 total food servings in the data collected. The most frequent lightly prepared items by total number of servings distributed were salted pistachio nuts (7.63%), whole-wheat bread made from a home recipe or bakery (7.6%), dried plums (5.2%), multigrain bread (4.8%), and reduced-sodium canned chickpeas (4.0%). The most frequent heavily prepared items by total servings distributed were nuts and fruit trail mix (10.3%), canned salmon (9.4%), cheddar cheese (5.1.%), canned corn (4.9%), and Colby jack cheese (4.1%). The most frequent UPF items by number of servings were peanut butter (12.5%), dry mashed potato mix (8.2%), cheese with additives and colorings (6.1%), packaged bread (4.3%), and chocolate milk (6.6%) (Table 6).

Client surveys

The results from the 104 client surveys conducted are listed in Supplemental Table 1. Of the clients surveyed, 74.2% from Food Pantry 1 and 73.5% of respondents from Food Pantry 2 stated that they were receiving just the right amount of food to meet their family's needs. Of respondents from Food Pantry 1, 6.1% stated they were receiving slightly too much food and 12.1% stated they were receiving slightly too little food. Of respondents from Food Pantry 2, 11.8% stated they were receiving slightly too much food and 11.8% of respondents stated they were receiving slightly too little food.

When asked about specific food items at Food Pantry 1, 53% stated they were receiving too little meat (including chicken, turkey, beef, or venison), 37.9% of respondents stated they were receiving both too little vegetables (canned, fresh, or frozen) and too little fruit (canned, fresh, or frozen), and 10.6% of respondents said they were receiving too little dairy (including milk, yogurt, cottage cheese). At Food Pantry 2, 15.8% of respondents stated they were receiving too little ground beef, 26.3% stated they were receiving too little fresh fruit, 18.4% stated they were receiving too few eggs, and 15.8% stated they were receiving too little milk.

The survey conducted by Food Pantry 1 included a question that asked whether the client preferred the shopping distribution model or the food box distribution model. Of respondents, 40.9% stated that they preferred the shopping model, whereas 39.4% of respondents preferred the convenience of picking up the prepacked food boxes. No corresponding question was asked at Food Pantry 2.

TABLE 4 HEI scores of food boxes, stratified by NOVA and UP3 classifications for understanding the influence of the COVID-19 pandemic on the food supply in the emergency food system[1]

HEI component	NOVA classification				UP3 classification				
	1	2	3	4	1	2	3	4	5
Total vegetables	4.82	0.00	4.90	2.48	4.82	0.00	4.65	3.33	2.48
Greens and beans	3.94	0.00	4.77	0.88	3.94	0.00	4.53	1.05	0.88
Total fruit	4.14	0.00	3.35	0.33	4.17	0.00	2.79	2.65	0.33
Whole fruit	4.44	0.00	3.67	0.49	4.50	0.00	3.03	2.81	0.49
Whole grains	5.39	0.00	8.07	3.22	5.39	0.00	7.36	2.00	3.22
Dairy	8.59	0.00	3.04	6.79	8.67	0.00	1.37	3.57	6.79
Total protein	4.44	0.00	4.96	4.93	4.44	0.00	4.97	4.36	4.93
Seafood and plant protein	3.26	0.00	4.97	3.60	3.26	0.00	4.85	3.95	3.60
Fatty acid ratio	3.64	0.00	5.93	4.81	3.16	0.00	7.25	5.68	4.81
Sodium	8.73	10.00	1.00	2.03	8.44	10.00	2.06	2.48	2.03
Refined grains	8.71	10.00	7.74	6.80	8.71	10.00	7.58	9.00	6.80
Saturated fat	8.39	0.00	7.46	2.66	8.39	0.00	8.38	6.59	2.66
Added sugar	10.00	10.00	9.87	8.90	10.00	10.00	9.97	8.73	8.90
Total HEI score	78.47	30.00	69.73	47.92	77.87	30.00	69.80	56.19	47.91

[1]COVID-19, coronavirus disease 2019; HEI, Healthy Eating Index; UP3, Unprocessed Pantry Project.

TABLE 5   Total servings of food distributed in food boxes by NOVA and UP3 classification for understanding the influence of the COVID-19 pandemic on the food supply in the emergency food system[1]

Food pantry and unit	n	Total distribution by NOVA classification				Total distribution by UP3 classification				
		1	2	3	4	1	2	3	4	5
Total, overall										
Servings	14,581	7289	24	3833	3407	7049	24	2515	1559	3407
%	100	50	<0.1	26.3	23.4	48.3	0.2	17.2	10.7	23.4
Food Pantry 1										
Servings	9578	4881	24	2050	2601	4641	24	1484	807	2601
%	100	51	0.3	21.4	27.2	48.5	0.3	15.5	8.4	27.2
Food Pantry 2										
Servings	5002	2408	0	1783	806	2408	0	1031	752	806
%	100	48.1	0	35.6	16.1	48.1	0.0	20.6	15.0	16.1

[1]COVID-19, coronavirus disease 2019; UP3, Unprocessed Pantry Project.

Qualitative interviews with food pantry staff

Interviews were conducted with 8 staff members between 2 food pantries to better understand how the COVID-19 pandemic created challenges and opportunities within their work. In total, 3 operational themes and 9 subthemes emerged (**Figure 2**).

Operational themes

Staff responses to open-ended interview questions illuminated 3 themes that distinguished operations of the food pantries that were disrupted by COVID-19, including Food Procurement, Food Distribution Preparation, and Food Distribution.

Food Procurement is defined as the means taken by the food pantry to obtain food to provide to clients. These methods vary and include food rescue operations, food donations from the public, and food purchases from food distributors or grocery stores, and foods received from USDA programs such as The Emergency Food Assistance Program (TEFAP) or the Farmers to Families Program. Food Procurement was impacted by food shortages, changes in the supply chain, and a need to

TABLE 6   Most frequent food items distributed in food boxes, by serving and UP3 classification for understanding the influence of the COVID-19 pandemic on the food supply in the emergency food system[1]

UP3 classification	Servings	Percentage of servings
Group 1: Fresh, unprocessed foods	7049	100
Onions, raw	608	8.6
Potato, boiled, from fresh, peel eaten, no added fat	505	7.2
Milk, reduced fat (2%)	456	6.5
Egg, whole, raw	372	5.3
Pasta, cooked	336	4.8
Group 2: Pantry staples	24	100
Butter	24	100
Group 3: Lightly prepared foods	2515	100
Pistachio nuts, salted	192	7.63
Bread, whole wheat, made from home recipe or purchased at bakery	192	7.6
Dried plums	132	5.2
Bread, multigrain, toasted	120	4.8
Chickpeas, from canned, reduced sodium	101.5	4.0
Group 4: Heavily prepared foods	1559	100
Trail mix with nuts and fruit	160	10.3
Salmon, canned	147	9.4
Cheese, cheddar	80	5.1
Corn, canned, cooked, no added fat	77	4.9
Cheese, Colby Jack	64	4.1
Group 5: Ultra-processed foods	3407	100
Peanut butter	425	12.5
Mashed potato mix, dry	281	8.2
Cheese, with additives and colorings	208	6.1
Packaged bread	147	4.3
Chocolate milk	136	4.0

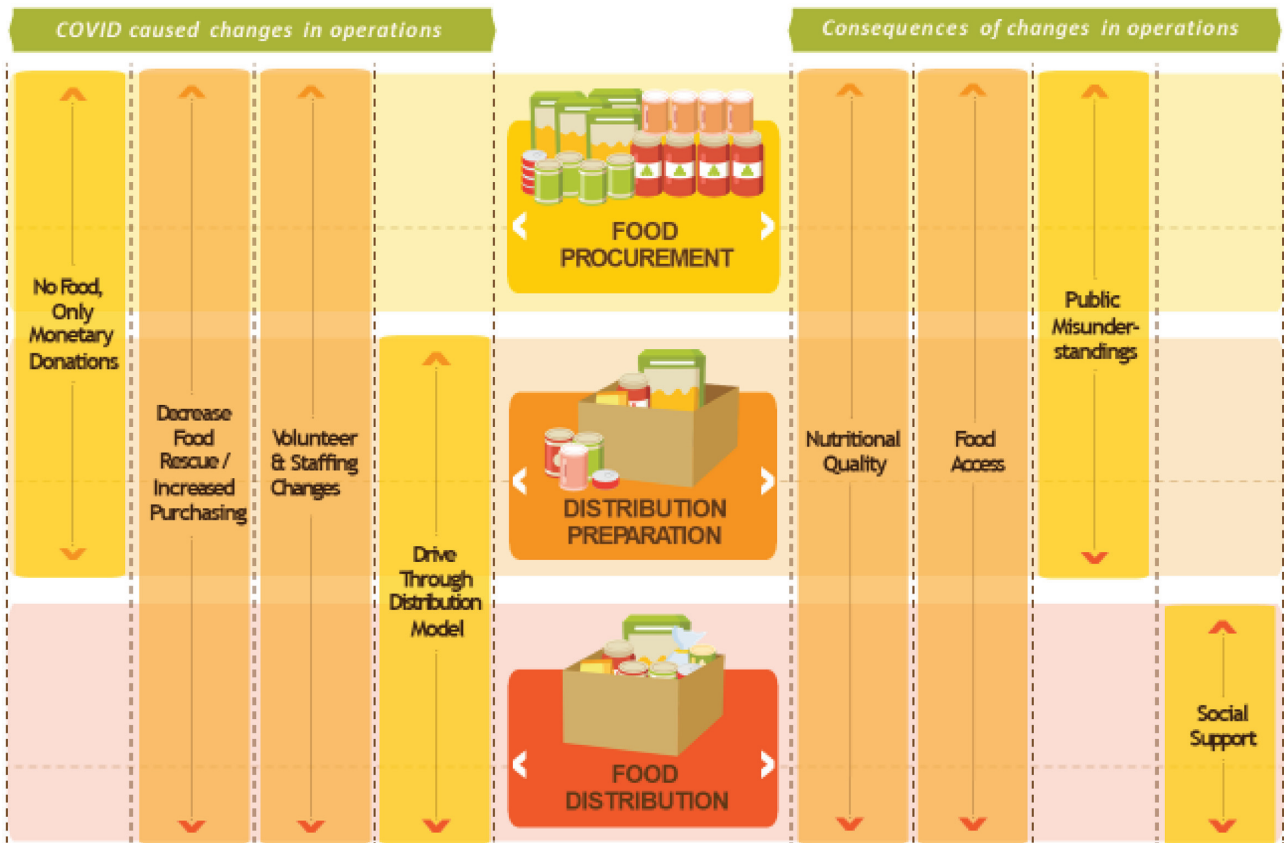[1]COVID-19, coronavirus disease 2019; UP3, Unprocessed Pantry Project.

FIGURE 2 Operational themes and subthemes for the influence of the COVID-19 pandemic on the food supply in the emergency food system. COVID-19/COVID, coronavirus disease 2019.

decrease human interaction. At both sites, TEFAP foods doubled from approximately 10% to 20%. One staff member summarized these supply chain changes as follows: "There has been disruption in the supply chain because grocery stores have been without much inventory and have not been able in fact to fill orders that we have wanted to place with them and it's forced us to get creative and seek out other sources like using the TEFAP program more. But we've been picky on the foods that we get from them because we've got a written food nutrition distribution policy at our food pantry." Another staff member noted, "We've had to scale down [on food rescue] and that was a big way that we relied on getting fresh produce and so we've had to create new systems to get produce." Conversely, however, 1 staff member noted, "With the reduced food rescue, some of the donations that have fallen off are like just the flat-out junk food, like those packages of Hostess Ding Dongs and the little donuts, and we've talked as a staff for quite a while about minimizing sugar, sugar products and it would be lovely to not have to accept those kinds of things."

Distribution Preparation is the operational theme defined as all of the steps taken to ready food for food pantry clients. Prior to the COVID-19 pandemic, this theme involved sorting food items, repackaging bulk items, and stocking shelves. Food pantries shifted from a shopping model to a food box model, packing food boxes instead of stocking shelves. One staff member noted that "When it comes to stocking for food box distribution it's similar to stocking shelves." Dis-

tribution preparation did not have a significant impact on nutrition quality.

Food Distribution is defined as how clients received food from the food pantry. Food Distribution was impacted as food pantry clients no longer self-selected their own foods. One staff member emphasized that, with the food box distribution model, "The biggest thing we've lost is that our clients aren't choosing the food that they are receiving, which was a huge aspect of our food bank that we were proud of and that worked really well."

Causes and impacts of food pantry operational shifts during COVID-19

Staff responses indicated 9 subthemes that describe the causes and impacts of the operational changes, including No Food Donations, Only Monetary Donations; Decreased Food Rescue, Increased Purchasing; Volunteers Decrease; Staffing Changes; Shopping Model Eliminated, Drive-Through Distribution Only; Perceptions of Nutrition Quality; Food Access; Public Misunderstanding; and Social Support.

The first 5 subthemes describe causes of change in operational themes. The last 4 subthemes describe impacts that occurred as a result of these changes.

No Food Donations, Only Monetary Donations is defined as food pantries not accepting food donations from the general public and instead requesting only monetary donations be made. Staff mentioned

this subtheme 39 times during the interviews. Financial donations compared with prior to the COVID-19 pandemic increased (amounts are confidential), especially in light of decreased food donations due to policy changes to align with COVID-19 precautions. Staff noted that "[Food donations have] always been a really good source of food for us because, there is a lot of diversity…at the same time we can't control what we are getting and sometimes the quality is pretty bad." Similarly, another staff member noted, "We've purchased a lot more stuff which ties into the not accepting food donations, but just accepting money, so we've been able to purchase the things that we actually need."

Decrease Food Rescue, Increased Purchasing is defined as due to the need to limit opportunities for COVID-19 exposure, food pantries stopped operating food rescue routes. Prior to COVID-19, these routes involved staff and volunteers driving to grocery stores to collect foods that were no longer salable. Staff mentioned this subtheme 45 times during the interviews. Staff stated, "We've diminished or reduced the amount of businesses we are going to so…we are getting less food, so it's quicker for us to process it, to sort out what looks good and what is not… we are also reducing the variety of what we are giving away." Last, staff shared how the decrease in food rescues resulted in increased use of other food-sourcing methods and noted, "We've had to scale down [on food rescue] and that was a big way that we relied on getting fresh produce…we've purchased a bit more than I've seen us purchase. We've gotten a lot of assistance from federal and state programs to get produce, so it's all just been different."

Decreased Volunteers due to the number of volunteers allowed at the food pantries being cut dramatically was mentioned 56 times during interviews. Staff stated, "I think it goes against a lot of our grain here how we've transformed our system. Our motto was really like many hands make light work…now we transitioned to as few people as possible and that has been a really interesting perspective to see how we can run the food bank in this way with less labor."

Staffing Changes were made to prioritize health and safety during the COVID-19 pandemic. For example, Food Pantry 1 was split into 2 teams and Food Pantry 2 hired 2 new staff members to make up for lost volunteers. Staff mentioned staffing changes 42 times during interviews. Staff stated, "We mapped out the exact number of people we needed to staff our distribution and what those exact roles would be and figured out a way to control traffic and get people in and out of our parking lot as fast as possible."

Shopping Model Eliminated, Drive-Through Distribution Only is defined as food boxes prepared with food items, staff directly place the food box into client's vehicle, and the client drives off with food. Staff mentioned this theme 63 times during interviews. Staff noted, "We really homed in on a system to get people in and out as quickly as possible" and "We're working on recipes and meal kits and menu ideas for the week." Staff also mentioned that, for some, the drive-through distribution model might be preferred. One staff member stated, "Specifically, an example is with the senior commodities program, I think for that particular program we may just continue with the curbside pick option, so that these seniors don't have to park and get out and come in; instead they can just pull into line and we'll put the food into their car and off they go."

Perceptions of Nutrition Quality is defined as the anecdotal thoughts by staff of how healthy the foods in the food boxes being distributed were. Staff mentioned this subtheme 51 times. Sample quotes from staff

interviews on this theme include the following: "What we are putting in their box is the healthiest stuff that we have." Staff also noted, "The majority of the box is pretty unprocessed. It's mostly produce, dairy, bags of grains, real pasta, rice, dry beans, so the majority is pretty, pretty simple and healthy." Last, 1 staff member stated, "I believe for some customers it probably improved the quality because they were not able to choose."

Food Access is defined as the ability of food pantry clients to obtain food that is nutritionally adequate, socially appropriate, and culturally acceptable. Staff mentioned this subtheme 46 times during interviews. On this subtheme staff noted, "We're still here and able to give out food, and we still have plenty of food even if it's different than what we are used to having, so I think we've been able to adapt enough to be able to provide food still or enough food still."

Public Misunderstanding is defined as food pantry operations that the general population is not aware of or does not consider, such as the sorting of food that is required with food donations to check for safety and appropriateness. Staff mentioned this subtheme 23 times and sample quotes included the following: "I do think that COVID, the pandemic overall has provided us the opportunity to educate people more on just the manpower it requires to process and distribute food" and "My hope is that with all of this that there has been more of a broader awareness brought to the need for food security."

Social Support is defined as the aid provided to food pantry clients that is not tangible. Social Support includes resource referrals, well-being support, and nutrition education. Staff mentioned this subtheme during interviews 17 times. Sample quotes include the following: "We just get a lot of anecdotal feedback about what people like and how things are going when they come in and they are talking with the volunteer …if they don't know how to use something with recipes, or if they have a nutrition question, we can answer it, so that is a big difference."

Discussion

The goal of food pantries to support food security of local communities through providing nutrient-dense foods that promote high dietary quality and human health was challenged during the COVID-19 pandemic. Our study found that the COVID-19 pandemic caused operational changes within the 2 food pantries that presented both opportunities and challenges.

Both food pantries were able to quickly adapt to a food-distribution model that allowed for the efficient delivery of food with limited contact between staff and clients. In Montana, food insecurity in 2020 is estimated to have risen 5–8% (1). In some counties, more than 25% of the population is likely experiencing food insecurity (1). The shift in food distribution, from a shopping model to a drive-through distribution model, ensured that these food pantries were able to safely meet the rise in demand for emergency food assistance, and approximately 75% of all clients surveyed reported receiving the right amount of food.

Food pantry staff perceived that the food distributed either increased in quality or remained the same as prior to the COVID-19 pandemic. Our analysis showed that the food boxes distributed during COVID-19 between both food pantries had an overall total HEI-2015 score ($\pm$ SD) of 76.4 $\pm$ 7.4 out of a possible score of 100. In comparison, an analysis from the previous year within the same food pantries showed that the entire food supply had overall total HEI scores between 77.6 $\pm$ 6.6

and 79.5 ± 4.5 ([21](#)), indicating there may have been a minor decrease in the quality of the food available to clients. However, approximately 49% of the servings distributed in each food box during the COVID-19 pandemic were fresh or minimally processed food items by both the NOVA and UP3 classification systems. In contrast, in the previous year, fresh or minimally processed food items by NOVA and UP3 classification accounted for only 36% of total servings within the food supply of the 2 food pantries, indicating that the amount of processed or ultra-processed food items presented to food pantry clients decreased from the previous year.

No statistically significant changes over time were observed in the mean total HEI-2015 scores of food boxes distributed by the 2 food pantries. Moreover, the food pantries' highest and lowest mean total HEI-2015 scores did not occur during the same months. In fact, Food Pantry 1's highest score occurred during the month when Food Pantry 2 received its lowest total HEI-2015 score. Random influences in donations or food available to purchase throughout the months of data collection influenced, but only insignificantly, the quality of the food distributed. Seasonal influences, such as available produce, on the food distributed were not observed through changes in HEI-2015 scores over time.

The USDA Agricultural Marketing Service's Farmers to Families program ([44](#)) may have contributed to the food pantries' ability to maintain a relatively stable-quality food box according to the HEI compared with the previous year ([21](#)). The Farmers to Families program was initiated in April 2020 as part of the Coronavirus Food Assistance Program and enabled the USDA to begin the purchase of up to $4.5 billion of produce, processed dairy, and packaged meat from American food companies on 15 May 2020 to then distribute to organizations in need, such as food pantries, nonprofits, and faith-based organizations ([44](#)). Notably, the program ended 1 y later ([45](#)). The USDA packaged approximately 25 pounds' worth of food items into family-sized boxes ([44](#)). Both food pantries in this study participated; this participation may have mitigated food supply-chain challenges that arose during the COVID-19 pandemic and ensured that the food boxes distributed had a minimum quantity of meat, produce, and dairy, all measured by the HEI. Food Pantry 1 added the entire contents of a Farmers to Families box to the food box they were already distributing to clients, and Food Pantry 2 split the 25 pounds between food boxes for 2 families. These food boxes consistently provided plain Greek yogurt, raw spinach, apples, milk, carrots, processed meats, and cheddar cheese to the overall wholesome food boxes already being prepared by both food pantries. The fresh foods provided by the Farmers to Families program may have offset some of the increase in TEFAP foods distributed by both food pantries, as these foods are generally more processed and shelf stable.

Although attempts were made at both food pantries to pack food boxes that were diverse and healthful, inherent limitations exist with a prepacked food box system. In a prepacked food box system, clients cannot select the food items that are appropriate or preferred by them and their families ([46](#)), running counter to the core principles of both food pantries in this study that emphasize client empowerment ([47](#), [48](#)). Further research has demonstrated that client choice shopping models at food pantries allow clients to maintain some dignity through a situation as potentially difficult and humbling as asking for food assistance ([49](#)). The nearly even split results of client preference of distribution model from surveys conducted during this research indicate, however,

that the speed and convenience of the drive-through model for some families may outweigh other concerns regarding choice.

Research demonstrates that, if a client does not know how to use particular food items, they will not choose it in a food pantry setting where the self-choice distribution model is used ([46](#)). Concerns among staff arose during the staff interviews with providing clients with a food box filled with items that they may not know how to prepare or that they may not have been exposed to before. Moreover, foods offered changed from week to week and month to month, contributing to the dietary diversity of the contents of the box for clients. For example, vegetables offered over the 17 wk included carrots, cauliflower, broccoli, beets, peppers, lettuce, spinach, cabbage, brussels sprouts, potatoes, sweet potatoes, kale, eggplant, garlic, and green beans, among others. An opportunity exists to provide nutrition education resources to clients about different methods and techniques of cooking or recipes for the variety of foods distributed to address concerns about cooking knowledge.

Although the contents of a food pantry's food supply do not directly indicate what an individual's overall diet quality may be, Simmet et al. ([18](#)) suggested that the food available to food pantry clients does influence their dietary quality. A food box filled with a variety of healthful food items therefore may sway a client to try an item they otherwise may not try. Similarly, research demonstrates that nudges can be very successful in encouraging the consumption of a healthful diet ([50](#)). Nudges are defined as "environmental cues such as signage, colors, packaging and product placement, have been identified as factors that influence consumer choice" ([51](#)). Generally, nudges are techniques used in food environments such as self-choice groceries ([50](#)). However, the food boxes distributed at these 2 food pantries during the COVID-19 pandemic may have the ability to act as a nudge promoting the consumption of healthful food items by food pantry clients, since our analysis found the food boxes to be composed of foods having an overall total HEI score above that of the average American diet ([20](#)).

This research is not without limitations. While the purpose of this study is to gain a better understanding of how the food box distribution method has impacted the quality of the food provided to customers during COVID-19, a convenience sample of food items was recorded and analyzed. The results regarding the food supply within food pantries may not be generalizable to all geographies. However, strengths of this study include its case study design and the use of triangulation where findings from 1 data source were used to strengthen our understanding of the findings from another ([52](#)). Moreover, several metrics were applied to analyze the quality of the food boxes distributed, which provides a comprehensive understanding of food quality. Last, the timing and length of food supply data collection, over 17 wk, is a strength as it allowed for accurate and detailed illumination of the food distributed during the height of the COVID-19 pandemic, which was only possible due to already existing projects with the food pantries included in this study.

In conclusion, this study determined that a food box distribution model can provide healthful food to individuals and families in need during emergency circumstances, as the food pantry operational changes implemented by these 2 food pantries during the COVID-19 pandemic have demonstrated. Although the food quality distributed to food pantry clients decreased slightly according to the HEI, the proportion of food that was ultra-processed within the food boxes compared with the food supply from the previous year decreased, indicating that

the HEI score does not show the entire picture of food quality. Importantly, both food pantries in this study will return to a shopping distribution model once they can do so safely, since this method supports client autonomy (53). However, as was highlighted by the client surveys and staff interviews, the changes that occurred because of the COVID-19 pandemic demonstrated that, for some food pantry clients, such as the elderly, drive-through food box distribution is an efficient and less burdensome pathway toward receiving healthy food. Last, the operational changes that occurred as a result of the COVID-19 pandemic allowed food pantries to reassess their methods of obtaining food to focus on healthful food options. Although nutrition policies were not studied in this research, the opportunity exists for food pantries to build upon changes implemented during the COVID-19 pandemic and designate what types of food items the food pantry will accept.

The translational goal of this research was to create recommendations for supporting a healthy food supply within food pantries, and ultimately support the healthful food intake of food pantry clients. Recommendations to elevate include the following:

1) Food pantries should focus on requesting monetary donations from the public but should maintain an outlet for food donations to ensure diverse public involvement.

2) Food pantries should consider implementing nutrition policies that emphasize fresh or lightly prepared foods for the food donations they do accept.

3) Food pantries should provide nutrition education resources to promote the use of a diversity of foods.

4) Food pantries should consider the needs of their clients or groups of their clients with food-distribution models. For example, elderly clients may prefer the convenience of a drive-through distribution model over the option to select their foods.

Acknowledgments

References

1. Freeman A. The impact of the coronavirus on food insecurity [Internet]. Feeding America Action; 2020. [cited 2020 Sep 10]. Available from: https://www.feedingamericaaction.org/the-impact-of-coronavirus-on-food-insecurity/.

2. Morales ME, Berkowitz SA. The relationship between food insecurity, dietary patterns, and obesity. Curr Nutr Rep 2016;5(1):54–60.

3. Kaur J, Lamb MM, Ogden CL. The association between food insecurity and obesity in children—The National Health and Nutrition Examination Survey. J Acad Nutr Diet 2015;115(5):751–8.

4. Pan L, Sherry B, Njai R, Blanck HM. Food insecurity is associated with obesity among US adults in 12 states. J Acad Nutr Diet 2012;112(9):1403–9.

5. Seligman HK, Laraia BA, Kushel MB. Food insecurity is associated with chronic disease among low-income NHANES participants. J Nutr 2010;140(2):304–10.

6. Wolfson JA, Leung CW. Food insecurity and COVID-19: disparities in early effects for US adults. Nutrients 2020;12(6):1648.

7. Food and Agriculture Organization. Hunger [Internet]. United Nations; 2020. [cited 2020 Sep 10]. Available from: http://www.fao.org/hunger/en/.

8. USDA ERS. Definitions of food security [Internet]. USDA ERS; 2020. [cited 2020 Sep 2020]. Available from: https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/definitions-of-food-security.aspx.

9. Hanson KL, Connor LM. Food insecurity and dietary quality in US adults and children: a systematic review. Am J Clin Nutr 2014;100(2):684–92.

10. Leung CW, Epel ES, Ritchie LD, Crawford PB, Laraia BA. Food insecurity is inversely associated with diet quality of lower-income adults. J Acad Nutr Diet 2014;114(12):1943–1953.e2.

11. Baraldi LG, Canella DS, Monteiro CA. Consumption of ultra-processed foods and associated sociodemographic factors in the USA between 2007 and 2012: evidence from a nationally representative cross-sectional study. BMJ Open 2018;8(3):e020574.

12. Jetter KM, Cassady DL. The availability and cost of healthier food alternatives. Am J Prev Med 2006;30(1):38–44.

13. Rico-Campà A, Martínez-González MA, Alvarez-Alvarez I, Mendonça R, de la Fuente-Arrillaga C, Gómez-Donoso C, Bes-Rastrollo M. Association between consumption of ultra-processed foods and all-cause mortality: SUN prospective cohort study. BMJ 2019;365:l1949.

14. Byker Shanks C, Weinmann E, Holder J, McCormick M, Parks CA, Vanderwood K, Coburn C, Johnson N, Yaroch AL. The Unprocessed Pantry Project Framework to address nutrition in the emergency food system. Am J Public Health 2019;109(10):1368–70.

15. Byker Shanks C. Promoting food pantry environments that encourage nutritious eating behaviors. J Acad Nutr Diet 2017;117(4):523–5.

16. Feeding America. 2017 Map the meal gap executive summary [Internet]. Feeding America; 2019. [cited 2020 Apr 21]. Available from: https://www.feedingamerica.org/sites/default/files/2019-05/2017-map-the-meal-gap-executive-summary_0.pdf.

17. Remley DT, Kaiser ML, Osso T. A case study of promoting nutrition and long-term food security through choice pantry development. J Hunger Environ Nutr 2013;8(3):324–36.

18. Simmet A, Depa J, Tinnemann P, Stroebele-Benschop N. The nutritional quality of food provided from food pantries: a systematic review of existing literature. J Acad Nutr Diet 2017;117(4):577–88.

19. Nanney MS, Grannon KY, Cureton C, Hoolihan C, Janowiec M, Wang Q, Warren C, King RP. Application of the Healthy Eating Index-2010 to the hunger relief system. Public Health Nutr 2016;19(16):2906–14.

20. USDA FNS. Healthy Eating Index [Internet]. USDA FNS; 2020. [cited 2020 Sep 10]. Available from: https://www.fns.usda.gov/resource/healthy-eating-index-hei.

21. Byker Shanks C, Webber E, Larison L, Wytcherley B. The translational implications of applying multiple measures to evaluate the nutrient quality of the food supply: a case study of two food pantries in Montana. Transl Behavl Med 2020;10(6):1367–81.

22. Montana Department of Public Health and Human Services. Plan to begin phased reopening [Internet]. Montana Department of Public Health and Human Services; 2020. [cited 2021 Apr 28]. Available from: https://dphhs.mt.gov/News/2020/04/PlantoBeginPhasedReopening.

23. Montana Department of Labor and Industry. Job tracking [Internet]. Montana Department of Labor and Industry; 2020. [cited 2020 Sep 4]. Available from: http://lmi.mt.gov/home/job-tracking.

24. Hake M, Dewey A, Engelhard E, Gallagher A, Summerfelt T, Malone-Smolla C, Maebry T. The impact of the corona virus on local food security [Internet]. Feeding America; 2020. [cited 2020 Sep 5]. Available from: https://www.feedingamerica.org/about-us/press-room/feeding-america-study-projects-local-food-insecurity-rates-amid-pandemic-could.

25. Montana Food Bank Network. Hunger in Montana [Internet]. Montana Food Bank Network; 2019. [cited 2020 Sep 4]. Available from: https://mfbn.org/hunger-in-montana.

26. Montana Food Bank Network. Coronavirus (COVID-19) updates and resources [Internet]. Montana Food Bank Network; 2019. [cited 2020 Feb 23]. Available from: https://mfbn.org/8199-2/.

27. Feeding America. The impact of coronavirus on food insecurity [Internet]. Feeding America; 2021. [cited 2021 Feb 27]. Available from: https://www.feedingamerica.org/research/coronavirus-hunger-research.

28. USDA ERS. Rural-urban continuum codes [Internet]. USDA ERS; 2013. [cited 2020 Sep 17]. Available from: https://ers.usda.gov/data-products/rural-urban-continuum-codes.aspx.

29. Livingston Food Resource Center. 2018-2019 Annual report [Internet]. Livingston Food Resource Center; 2020. [cited 2020 Sep 5]. Available from: https://livingstonfrc.org/about-lfrc/about.html.

30. Gallatin Valley Food Bank. Annual reports [Internet]. Gallatin Valley Food Bank; 2020. [cited 2020 May 3]. Available from: https://gallatinvalleyfoodbank.org/about-us/annual-reports/.

31. Sharp DB, Allman-Farinelli M. Feasibility and validity of mobile phones to assess dietary intake. Nutrition 2014;30(11-12):1257–66.

32. Naaman R, Parrett A, Bashawri D, Campo I, Fleming K, Nichols B, Burleigh E, Murtagh J, Reid J, Gerasimidis K. Assessment of dietary intake using food photography and video recording in free-living young adults: a comparative study. J Acad Nutr Diet 2021;121(4):749–61, e1.

33. USDA ARS. Food Data Central [Internet]. USDA ARS; 2020. [cited 2020 Dec 27]. Available from: https://fdc.nal.usda.gov.

34. USDA ARS. FNDDS overview [Internet]. USDA ARS; 2020. [cited 2020 Sep 4]. Available from: https://www.ars.usda.gov/northeast-area/beltsville-md-bhnrc/beltsville-human-nutrition-research-center/food-surveys-research-group/docs/fndds/.

35. USDA ARS. FPED overview [Internet]. USDA ARS; 2020. [cited 2020 Sep 4]. Available from: https://www.ars.usda.gov/northeast-area/beltsville-md-bhnrc/beltsville-human-nutrition-research-center/food-surveys-research-group/docs/fped-overview/.

36. Bowman S, Clemens J, Shimizu M, Friday J, Alanna J, Moshfegh A. Food Patterns Equivalents Database 2015–2016: methodology and user guide [Internet]. USDA ARS; 2018. [cited 2021 Apr 10]. Available from: https://www.ars.usda.gov/ARSUserFiles/80400530/pdf/fped/FPED_1516.pdf.

37. USDA FNS. How the HEI is scored [Internet]. USDA FNS; 2018. [cited 2020 Sep 10]. Available from: https://www.fns.usda.gov/how-hei-scored.

38. Guenther PM, Casavale KO, Reedy J, Kirkpatrick SI, Hiza HAB, Kuczynski KJ, Kahle LL, Krebs-Smith SM. Update of the Healthy Eating Index: HEI-2010. J Acad Nutr Diet 2013;113(4):569–80.

39. Monteiro CA, Cannon G, Levy R, Moubarac JC, Jaime P, Martins AP, Canella D, Louzada M, Parra D. NOVA. The star shines bright. World Nutr J 2016;7(1–3):28–38.

40. Monteiro CA, Cannon G, Moubarac JC, Levy RB, Louzada MLC, Jaime PC. The UN decade of nutrition, the NOVA food classification and the trouble with ultra-processing. Public Health Nutr 2018;21(1):5–17.

41. Guest G, MacQueen K, Namey E. Applied thematic analysis. Thousand Oaks (CA): Sage Publications; 2012.

42. National Cancer Institute. The Healthy Eating Index- SAS Code [Internet]. NCI; 2020. [cited 2021 Apr 10]. Available from: https://epi.grants.cancer.gov/hei/sas-code.html#f1.

43. Schreier M. Qualitative content analysis in practice. Thousand Oaks (CA): Sage Publications; 2012.

44. USDA AMS. USDA Farmers to Families food box [Internet]. USDA AMS; 2020. [cited 2020 Dec 27]. Available from: https://www.ams.usda.gov/selling-food-to-usda/farmers-to-families-food-box.

45. USDA AMS. Farmers to Families Food box [Internet]. USDA AMS; 2020. [cited 2021 Apr 28]. Available from: https://www.ams.usda.gov/selling-food-to-usda/farmers-to-families-food-box-letter.

46. Walch AK, Burke TK, Holland K, Byam B. The nutrient quality of foods provided to clients at the largest food pantry in Alaska. J Hunger Environ Nutr 2020;16(3):336–55.

47. Gallatin Valley Food Bank. About us: Gallatin Valley Food Bank [Internet]. Gallatin Valley Food Bank; 2016. [cited 2021 Feb 12]. Available from: https://gallatinvalleyfoodbank.org/about-us/.

48. Livingston Food Resource Center. LFRC home [Internet]. Livingston Food Resource Center; 2020. [cited 2021 Feb 21]. Available from: https://livingstonfrc.org/.

49. Vissing Y, Gu J, Jones A, Gabriel S. Preserving dignity in the face of hunger: a study of food pantry utilization. Humanity Soc 2017;41(4):461–81.

50. Wilson N. When the cupboards are bare: nudging food pantry clients to healthier foods. J Assoc Consum Res 2016;1(1):125–33.

51. Feeding America. The power of nudges: making the healthy choice the easy choice in food pantries [Internet]. Feeding America; 2016. [cited 2020 Dec 23]. Available from: https://hungerandhealth.feedingamerica.org/resource/the-power-of-nudges-making-the-healthy-choice-the-easy-choice-in-food-pantries/.

52. Turner SF, Cardinal LB, Burton RM. Research design for mixed methods: a triangulation-based framework and roadmap. Organ Res Methods 2017;20(2):243–67.

53. Remley DT, Zubieta AC, Lambea MC, Quinonez HM, Taylor C. Spanish-and English-speaking client perceptions of choice food pantries. J Hunger Environ Nutr 2010;5(1):120–8.