Development and testing of the FRESH Foods Survey to assess food pantry clients' dietary behaviours and correlates

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Abstract

Objective: To use cognitive interviewing and pilot testing to develop a survey instrument feasible for administering in the food pantry setting to assess daily intake frequency from several major food groups and dietary correlates (e.g. fruit and vegetable barriers) – the FRESH Foods Survey.
Design: New and existing survey items were adapted and refined following cognitive interviews. After piloting the survey with food pantry users in the USA, preliminary psychometric and construct validity analyses were performed.
Setting: Three US food banks and accompanying food pantries in Atlanta, GA, San Diego, CA, and Buffalo, NY.
Participants: Food pantry clients (*n* 246), mostly female (68 %), mean age 54·5 (SD 14·7) years.
Results: Measures of dietary correlates performed well psychometrically: Cronbach's α range 0·71–0·90, slope (α) parameter range 1·26–6·36, and threshold parameters (β) indicated variability in the 'difficulty' of the items. Additionally, all scales had only one eigenvalue above 1·0 (range 2·07–4·71), indicating unidimensionality. Average (median, Q1–Q3) daily intakes (times/d) across six dietary groups were: fruits and vegetables (2·87, 1·87–4·58); junk foods (1·16, 0·58–2·16); fast foods and similar entrées (1·45, 0·58–2·03); whole-grain foods (0·87, 0·58–1·71); sugar-sweetened beverages (0·58, 0·29–1·29); milk and milk alternatives (0·71, 0·29–1·29). Significant correlations between dietary groups and dietary correlates were largely in the directions expected based on the literature, giving initial indication of convergent and discriminant validity.
Conclusions: The FRESH Foods Survey is efficient, tailored to food pantry populations, can be used to monitor dietary behaviours and may be useful to measure intervention impact.

In 2016, 12·3 % of US households experienced food insecurity, or the limited or inconsistent access to adequate food[1]. Food insecurity is associated with poor dietary quality and can contribute to and exacerbate chronic diseases among children and adults[2,3]. One aspect of the hunger safety net is emergency food assistance, where households in need can acquire supplemental food at food pantries. Food pantries are local client-facing locations (e.g. church, community centre, shelter, etc.) that provide food directly to people in need. Food pantries are typically supplied by food banks, which are regional hubs that collect donated and/or purchased food, store food, and distribute food to food pantries and similar client-facing meal programmes.

A recent systematic review indicated that food pantry clients' diets may be deficient in fruits, vegetables, whole grains, legumes and dairy[4]. However, the review also indicated the limited body of research on food pantry clients' diets, particularly in the USA. Only six US studies met inclusion criteria and were conducted between 1989 and 2015, representing a total of 670 participants[4]. In order to facilitate future research, and to design and evaluate dietary

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interventions, it is important to have appropriate measures of diet and dietary correlates for food pantry populations.

Conducting survey research among food pantry clients is challenging. Food pantry clients face many of the same barriers to eating healthfully that other very low-income populations face. These include lower average educational attainment/literacy and lack of access to healthful foods due to factors such as cost, lack of food preparation equipment and low access to transportation[5]. These factors need to be considered when designing appropriate and tailored surveys. Additionally, the context of the food pantry is important to consider[5]. When clients arrive at food pantries, they are in a state of desperation, as these locations are designed to address food emergencies for people in need. Therefore, 24 h recalls are not as useful for collecting dietary data on this population as their diets on the day of their visit are not likely to be typical of their usual diets due to fluctuating food resources[6]. Repeated contacts can also be challenging for food pantry clients who may lack reliable telephone access, may not utilize the food pantry on a regular basis and may have other barriers to longitudinal engagement[7]. Further, after signing in at the food pantry to receive food, clients typically wait a short time (e.g. 15–30 min) to be called to receive a food distribution or select their foods (depending on the type of food pantry), and then many (probably due to time constraints) do not utilize additional social services offered[8]. Thus, the duration of food pantry visits is typically relatively short.

Surveys that measure both diet and dietary correlates at food pantries need to be efficient to fit within the short time window, and must also consider the lower on average educational attainment and literacy of food pantry clients. Gold standard measures of diet, such as multiple 24 h dietary recalls, food records or general FFQ, which assess both frequency and portion size, may not be ideal for this setting. While comparatively accurate and comprehensive, they require repeated follow-up, considerable time to administer and/or can require high literacy or numeracy skills[9]. Compared with other options for assessing dietary behaviours, dietary screeners may be most appropriate for this setting. Dietary screeners are similar to short FFQ, but typically do not require participants to estimate the volume of foods consumed, only frequency of intake[9]. Therefore, numeracy requirements are comparatively low. Also, being relatively short, dietary screeners can be administered quickly and included as part of longer survey instruments that assess dietary correlates and other variables of interest. However, to date, no other survey instrument has been developed that includes sections to assess diet and dietary correlates that is tailored for the food pantry population. Such a tool would be beneficial in facilitating research and evaluation of nutrition interventions in this setting.

To address this gap, the objective of the present study was to use cognitive interviewing and pilot testing to develop a survey instrument that was feasible to administer (and ideally self-administer) in the food pantry setting to assess daily intake frequency from several major food groups, as well as items hypothesized to be correlated with dietary intake in this population (e.g. self-efficacy, dietary attitudes, barriers and availability). We modified and/or newly developed survey items to be more appropriate for assessment among US food pantry users. Then we refined survey items using cognitive interviews, pilot testing and psychometric assessment. The final survey instrument, described herein and referred to as the FRESH Foods Survey, includes two main dietary sections: (i) a dietary screener and (ii) questions and scales assessing dietary correlates.

Methods

Survey development overview

Development of the FRESH Foods Survey proceeded iteratively. First, a team of researchers and practitioners, including the authors and several collaborators mentioned in the acknowledgments, with experience in survey development and food pantry populations, conducted a landscape review of existing measures. A draft survey was developed by compiling existing items from the National Cancer Institute's Family, Life, Activity, Sun, Health, and Eating (FLASHE) Survey[10] (available at http://cancercontrol.cancer.gov/brp/hbrb/flashe.html) and the Food Attitudes and Behaviors (FAB) Survey[11] (available at https://cancercontrol.cancer.gov/brp/hbrb/fab/index.html) and, when necessary, modifying items for relevancy to food pantry settings. The FLASHE and FAB surveys were chosen because they have been used previously in nationally representative samples of adults and adolescents, are meant to be self-administered and have undergone cognitive testing. Both contain measures of dietary correlates and the FLASHE Survey contains a dietary screener. The FLASHE dietary screener is similar to the Dietary Screener Questionnaire (DSQ) used in the National Health and Nutrition Examination Survey[12], but contains additional items that assess convenience foods and less healthful entrées, and therefore might be more relevant to the diets of low-income populations.

The main sections of the draft FRESH Foods Survey included the modified dietary screener from the FLASHE study, as well as measures of dietary correlates in the form of seven scales and one single-item measure that were borrowed and modified from the FLASHE and FAB surveys. The draft FRESH Foods Survey then underwent cognitive testing and refinement, pilot testing, and preliminary psychometric and construct validity assessment. All research activities were conducted in accordance with prevailing ethical standards, including gaining informed consent from participants, and all study procedures were approved by the University of Nebraska Medical Center Institutional Review Board for Human Subjects Research.

Cognitive interviews

Cognitive interviews were conducted in Omaha, NE, USA, with adult food pantry clients (*n* 10) in three rounds with four, four and then two participants. Modifications were made after the first two rounds and no substantive changes were identified after the third round. Participants provided informed consent before participating. To be eligible, participants only needed to be a food pantry client, but efforts were made to recruit similar numbers of men and women. Clients present at the food pantry during the day scheduled for cognitive interviews were asked if they wanted to participate, and interviews were completed on a first-come-first-served basis until the time scheduled for interviews had passed. Interviews were conducted in a private space and lasted approximately 60 min each. Gift cards ($US 20) were provided to compensate interviewees for their time.

Interviews employed a 'think aloud' technique in which participants explained their thought process while answering all questions in the draft FRESH Foods Survey[13]. Interviewers also probed participants about interpretations of questions, cognitive burden, and alternative wording or examples. Each participant completed the entire draft FRESH Foods Survey and field notes were recorded indicating potential changes identified during the interview. These were then discussed by the researchers and appropriate survey modifications were made.

FRESH Foods Survey sections and scoring

While the FRESH Foods Survey included non-dietary sections of questions, such as demographic characteristics, the main diet-related sections of the survey included a dietary screener, as well as scales and questions meant to assess dietary correlates (e.g. barriers, attitudes, availability and self-efficacy).

Dietary screener

One main section within the overall FRESH Foods Survey was the modified FLASHE dietary screener (Questions 32–59 in Appendix 8). Items in the FLASHE dietary screener included: fruit, 100 % fruit juice, green salad, non-fried potatoes, non-fried vegetables, cooked beans, cooked whole grains, whole-grain bread, non-sugary cereal, water, cow's milk, sweetened fruit drinks, regular soda, sports drinks, energy drinks, sugary cereal, candy/chocolate, cookies/cake, frozen desserts, fried chicken, fried potatoes, potato chips, processed meat, burgers, tacos/burritos, heat and serve (e.g. frozen dinners), and pizza. Also, following a request from food bank staff, a new item was created and tested (modelled after the other FLASHE items) to assess intake of milk alternatives (e.g. almond and soya milk), which are distributed in many food pantries. Participants reported intake frequency during the past 7 d: 'I did not consume in the past week', '1–3 times in the past week', '4–6 times in the past week', '1 time a day', '2 times a day' or '3 or more times a day'.

Items were grouped based upon healthfulness as evidenced by scientific reports[14-16] and internal consensus. The following independent groups were created: junk foods (candy/chocolate + cookies/cake + potato chips + frozen desserts + sugary cereal); sugar-sweetened beverages (soda + energy drinks + sweetened fruit drinks + sports drinks); fast foods and similar entrées (fried potatoes + fried chicken + pizza + tacos + processed meat + burgers + heat and serve); whole-grain foods (whole-grain bread + cooked whole grains + non-sugary cereal); fruits and vegetables (100 % fruit juice + fruit + green salad + other non-fried vegetables + cooked beans + other non-fried potatoes); and milk and milk alternatives (milk + milk alternatives).

For participants with completed data, weekly responses were converted to daily responses by dividing 0 days, 2 days or 5 days by 7 for the response options 'I did not consume in the past week', '1–3 times in the past week' or '4–6 times in the past week', respectively. Once items were converted to daily frequencies, they were summed to calculate a food group's daily intake frequency. This basic procedure is based on past research using similar types of dietary response options[17-19]. Scores greater than three interquartile ranges above the upper quartile, or below the bottom quartile, were considered outliers and removed[20]. This affected between 1·2 and 4·2 % of the sample.

Dietary correlates

In addition to a dietary screener, the FRESH Foods Survey also contained questions meant to assess dietary correlates. The survey sub-sections described below contained questions modified/modelled from FLASHE and/or FAB items. For all items below (unless stated otherwise), response options were scored on a five-point Likert scale ('strongly disagree' = 1 to 'strongly agree' = 5).

The barriers to fruit and vegetable (FV) consumption sub-section contained one eight-item scale (Questions 1–8 in Appendix 8) that addressed external, personal and/or knowledge/skill-based barriers (e.g. 'I don't eat fruits and vegetables as much as I like to because they take too much time to prepare').

The attitudes about FV from food pantry and grocery store sub-section contained two seven-item scales that addressed food pantry FV attitudes (Questions 9–13 in Appendix 8) and grocery store FV attitudes (Questions 14–18 in Appendix 8; e.g. 'I think fruits and vegetables from the (grocery store OR food pantry) taste good').

The availability of foods from home and food pantry sub-section contained four three-item scales, referred to as: healthy home food availability (Questions 19–21 in Appendix 8); unhealthy home food availability (Questions 22–24 in Appendix 8); healthy food pantry availability (Questions 25–27 in Appendix 8); and unhealthy food pantry availability (Questions 28–30 in Appendix 8). These questions assessed self-reported frequency (five-point Likert scale, from 'never' to 'always') of

home/place-of-residence and food pantry availability of 'healthful' foods (e.g. FV, lean meats and whole grains) and 'unhealthful' foods (e.g. sweets, sugary drinks and chips) during the past 3 months.

Self-efficacy for FV intake was measured with a single item. The survey question 'I feel confident in my ability to eat fruits and vegetables every day' was included to assess perceived self-efficacy for FV intake (Question 31 in Appendix 8).

Pilot-test sample and recruitment

Following cognitive interviews, three food banks from the Feeding America network (Atlanta Community Food Bank in Atlanta, GA; Feeding San Diego in San Diego, CA; Feeding Western New York in Buffalo, NY) and their accompanying food pantries were selected to pilot the survey. Study sites were chosen based on research capacity and demographic diversity of clients, as well as overall geographic diversity. From January to March 2017, trained food bank staff administered the FRESH Foods Survey via iPads at food pantries to clients aged ≥ 19 years who were waiting to receive food. Recruitment and data collection occurred initially in five food pantries across the three food banks' service areas. Three more sites were added during the data collection period to recruit on additional service days to increase the sample size. Therefore, recruitment occurred at two pantries in Atlanta, three pantries in Buffalo and three pantries in San Diego. Signs were posted at least one week in advance, notifying clients of the study and dates and times for data collection. All food pantry clients who arrived on data collection days were invited to complete a survey. Clients provided informed consent prior to participation. Surveys were largely self-administered, with participants assisted as needed with reading and/or comprehending survey questions, operating the technology, and by making available a magnifying glass and stylus (i.e. a small pen that, while not necessary, can be helpful to assist with indicating choices on a touchscreen device) if desired. Data collectors took notes on the types of assistance provided to the participants. All participants received a $US 10 gift card for participation.

Statistical analysis

The seven modified dietary correlates scales were analysed using item response theory employing graded response models (see Table 2). Graded response models were chosen due to the ordered response categories of the items and the belief that some items would be better indicators than others of the measured constructs. Item response theory assumes the scale items are measuring a single construct, representing the target trait. Hence, unidimensionality of the scales was examined by looking at the eigenvalues. When only one eigenvalue was greater than 1, unidimensionality was assumed. Both discrimination and difficulty, or threshold, parameters for every item of the scales were calculated

(see online supplementary material, Supplemental Tables 1–7). The discrimination parameter captures the relationship between the latent construct (e.g. perceived barriers to FV) and the probability of endorsing a particular response option for each item's response options. Edelen and Reeve provide a primer on the application of item response theory in survey development[21].

The dietary correlates scales, and self-efficacy single item, that were modified and included in the FRESH Foods Survey were largely borrowed from existing national surveys, and so the expected direction of effect with respect to dietary intake was known. Therefore, a preliminary assessment of convergent and discriminate validity was conducted by examining the statistical relationships between dietary intake frequency (assessed using the dietary screener) and dietary correlates scores. Spearman's correlations were used to assess linear relationships. Statistical significance was set at 0·05. All analyses were completed in April–May 2017 and conducted using the statistical software package SAS version 9.4.

Results

Cognitive interview findings

For cognitive testing, four men and six women completed interviews. While demographic information was not collected beyond sex, the cognitive interview sample contained clients who appeared to be of African, European and/or Latino descent. Also, the interviewees appeared to be varied in their cognitive abilities and similar to food pantry clients who have participated in previous studies the authors have conducted. Many areas in need of modification were identified during the cognitive interviews, with most concentrating within the dietary screener subsection. For example, interviewers probed participants for how the term '100 % fruit juice' was understood and found participants' definitions were sometimes broader compared with the intended limited range of beverages. The interviews also revealed specific issues that hindered interpretability, such as clarity of wording and formatting. For instance, between the third and fourth response options in the 6-point response scale for the dietary screener, there was a transition from '. . . past 7 days' to '. . . per day'. Several interviewees did not notice the subtle change because the phrases were similar. Subsequent changes of the response options to '. . . past week' and '. . . a day,' respectively, improved interpretability. Additionally, it was found that for some items, alternative food and drink examples and clarifications were needed to make the questions more applicable to the population. For example: for the allowed water examples, some interviewees did not typically use the term 'sparkling water', they preferred 'carbonated water'; the non-fried vegetables question was interpreted by some interviewees as only referring to raw vegetables; and for questions referring to

Table 1 Sample characteristics of participants recruited from food pantries in Atlanta, GA, Buffalo, NY and San Diego, CA, USA, January–March 2017 (*n* 246)

Demographics		Socio-economic characteristics	
Sex (%)		Housing situation (%)	
Female	68·3	Homeless or non-stable housing†	35·4
Male	31·7	Renter	42·1
Race/ethnicity (%)		Homeowner	22·5
White, non-Hispanic	35·8	Marital status (%)	
Black, non-Hispanic	34·2	Married or living with partner	32·7
Hispanic/Latino(a)	15·0	Single or not living with partner	67·3
Asian, non-Hispanic	9·8	Educational attainment (%)	
Other/multi-racial/ethnic	5·3	Less than high school	22·0
Age (%)		High school or equivalent	30·1
21–35 years	14·2	Some college	18·7
36–45 years	11·7	2-year or 4-year degree, or higher	29·3
46–55 years	21·3	Employment (%)	
56–65 years	30·4	Unemployed	36·7
≥66 years	22·5	Not employed due to circumstances‡	45·7
People in household (%)		Temporary or part-time	9·8
1	40·8	Full-time	7·8
2–4	33·1	Annual household income (%)	
≥5	26·1	$US 0–5000	33·3
Children in household (%)		$US 5001–25 000	54·9
0	68·3	≥$US 25 001	11·8
1	8·9	SNAP§ participant (%)	51·6
≥2	22·8	WIC‖ participant (%)	6·9

†Homeless, no regular housing/shelter, hotel/motel, group home/transitional housing, friend's or family's place, or subsidized housing.
‡Retired, disabled, a full-time homemaker/stay-at-home parent, or a full-time student.
§Supplemental Nutrition Assistance Program, formerly known as the Food Stamp Program.
‖Special Supplemental Nutrition Program for Women, Infants, and Children.

common fast-food entrées such as burgers and fried chicken, it was not clear to several respondents that they should also count these foods if homemade or if from a sit-down restaurant. Modifications were made to survey wording and example items in response to cognitive interviews prior to pilot testing.

Pilot sample characteristics

The analytic sample for the pilot included 246 food pantry clients, approximately evenly split between the food bank service areas in Atlanta (*n* 81), Buffalo (*n* 86) and San Diego (*n* 79). Across the eight food pantries, there was a median of 33·5 participants, ranging from ten to forty-nine per site. Participants were mostly female (68 %), mean age 54·5 (SD 14·7) years, and racially and ethnically diverse. Nearly one-third (32 %) of clients reported using food pantries infrequently (once to a few times in the last 12 months); 54 % used food pantries every other month to about every other week; and 14 % used food pantries once per week or more. Mean household size was 3·2 (SD 2·7) total people and 0·8 (SD 1·4) children. Additional participant characteristics are shown in Table 1.

Assistance needed during pilot testing

A little more than 60 % of participants needed no help operating the iPad and about 15 % needed 'extensive' help, with the remaining needing 'a little' help. For comprehending survey questions, 77 % needed no help and 5 % needed 'extensive' help, with the remaining needing 'a little' help reading or explaining questions. Over 35 % utilized the provided stylus to assist with making selections on the iPad's touchscreen; very few (1 %) utilized the available magnifying glass.

Assessment of modified dietary correlates scales

Following psychometric assessment, two items each were removed from the attitudes on grocery store FV scale and the attitudes on food pantry FV scale. Removing these items was based on low slope/discrimination parameters, relatively low threshold ('difficulty') parameter spreads and smaller areas under their item information curves than the other items. Unidimensionality for both scales improved substantially following removal of these items. The other scales did not require modification (see online supplementary material, Supplemental Tables 1–7).

Table 2 shows the results from psychometric assessment of the final versions of the modified dietary correlates scales and questions. Modified measures for dietary correlates performed well psychometrically: Cronbach's α ranged from 0·71 to 0·90; slope (α) parameters ranged from 1·26 to 6·36 (i.e. the items were useful in assessing participants for the construct); and threshold parameters (β) indicated that there was variability in the 'difficulty' of the items. Additionally, all scales had only one eigenvalue above 1·0 (ranging from 2·07 to 4·71), indicating unidimensionality. Scales explained between 58 and 87 % of the variation in the latent trait (data not shown). Finally, the single item for FV self-efficacy (data not shown) had a mean of 4·16

Table 2 Description of final scales in the FRESH Foods Survey following psychometric assessment and refinement (n 246)

Scales	Item count	Mean	SD	Score range	Highest eigenvalue	Discrimination (α) range	Difficulty (β) range	Cronbach's α
Fruit and vegetable barriers	8	2·3	0·9	1–5	4·71	1·26–3·02	−1·44–5·94	0·88
Attitudes on food pantry fruits and vegetables	5	3·9	0·7	1–5	3·67	1·59–5·81	−14·64–5·81	0·88
Attitudes on grocery store fruits and vegetables	5	3·8	0·8	1–5	3·47	1·59–4·16	−8·57–4·16	0·83
Healthy home food availability	3	2·8	0·9	0–4	2·07	1·46–4·26	−10·23–1·23	0·71
Unhealthy home food availability	3	1·8	1·0	0–4	2·20	1·80–3·28	−3·29–4·39	0·78
Healthy food pantry availability	3	2·9	0·9	0–4	2·29	2·31–2·83	−6·72–1·08	0·77
Unhealthy food pantry availability	3	1·9	1·2	0–4	2·61	3·05–6·36	−5·6–4·06	0·90

Table 3 Spearman's correlation matrix showing the linear relationships between survey scales or items in the FRESH Foods Survey and daily intake frequency of six food or beverage groups among participants recruited from food pantries in Atlanta, GA, Buffalo, NY and San Diego, CA, USA, January–March 2017 (n 246)

Survey scale/item	Fruits and vegetables	Junk foods	Fast foods and similar entrées	Wholegrain foods	Sugar-sweetened beverages	Milk and milk alternatives
Fruit and vegetable barriers	−0·055	0·301	0·420	−0·026	0·369	0·094
P value	0·452	<0·001*	<0·001*	0·719	<0·001*	0·201
Attitudes on food pantry fruits and vegetables	0·203	−0·044	0·012	0·040	0·067	0·031
P value	0·004*	0·539	0·864	0·574	0·356	0·661
Attitudes on grocery store fruits and vegetables	0·102	−0·032	−0·045	−0·023	−0·065	−0·013
P value	0·119	0·634	0·506	0·729	0·330	0·843
Healthy home food availability	0·189	−0·043	−0·183	0·218	−0·211	0·033
P value	0·004*	0·523	0·006*	0·001*	0·002*	0·619
Unhealthy home food availability	−0·078	0·486	0·419	−0·078	0·416	−0·009
P value	0·239	<0·001*	<0·001*	0·244	<0·001*	0·888
Healthy food pantry availability	0·140	0·002	0·041	−0·022	0·002	0·103
P value	0·046*	0·977	0·569	0·759	0·974	0·150
Unhealthy food pantry availability	0·145	0·193	0·155	−0·069	0·120	0·033
P value	0·041*	0·008*	0·034*	0·336	0·101	0·651
Fruit and vegetable self-efficacy	0·168	−0·050	−0·044	0·073	−0·144	0·092
P value	0·011*	0·460	0·513	0·273	0·033*	0·169

*Statistically significant at the <0·05 level.

(SD 1·32; range 1–5), meaning participants were highly confident in their ability to eat FV every day.

Dietary intake frequency and preliminary indications of construct validity

Average (mean, SD; median, Q1–Q3) daily intakes (times/d) across the six dietary groups were: fruits and vegetables (3·60, 2·44; 2·87, 1·87–4·58); junk foods (1·66, 1·53; 1·16, 0·58–2·16); fast foods and similar entrées (1·60, 1·37; 1·45, 0·58–2·03); whole-grain foods (1·27, 1·12; 0·87, 0·58–1·71); sugar-sweetened beverages (1·07, 1·25; 0·58, 0·29–1·29); milk and milk alternatives (0·89, 0·89; 0·71, 0·29–1·29).

There were several statistically significant associations between survey scales/items and dietary variables, as shown in Table 3. Significant associations were largely in directions expected based on previous research. Higher scores on four of the scales (i.e. attitudes about food pantry FV, healthy home food availability, healthy food pantry food availability and unhealthy food pantry availability scales) and higher scores on the FV self-efficacy single item were each associated with more frequent intake of FV. Higher scores on three of the scales (i.e. FV barriers, unhealthy home food availability and unhealthy food pantry food availability) were generally associated with more frequent intake of less healthful foods and beverages (e.g. junk foods, fast foods and similar entrées, sugar-sweetened beverages). Higher scores on the healthy home food availability scale were also associated with more frequent intake of whole grains and less frequent intake of fast foods and sugar-sweetened beverages. Additionally, higher scores for the FV self-efficacy single item were associated with less frequent intake of sugar-sweetened beverages. No significant associations were seen for the grocery store FV attitudes scale, or for the milk and milk alternatives food group.

Discussion

The purpose of the present study was to develop a survey tool to assess dietary behaviours and related correlates

among US food pantry clients. The FRESH Foods Survey was developed, modified using cognitive interviews, pilot-tested, and then examined for its psychometric characteristics and convergent and discriminant validity. The survey performed well psychometrically and the scales were shown to be associated, largely in directions expected, with dietary behaviour.

There are several methodologies used in research for assessing diet, each with their own strengths and limitations. Dietary records and 24 h dietary recalls are comprehensive but are also costly and time-consuming to administer, particularly if multiple assessments are needed[9,22–24]. The dietary screener is useful in situations where measurement of total diet is not necessary and minimizing participant burden is important[9,22–24]. While dietary screeners have inherent limitations compared with more robust and costly measures of diet, screeners are efficient and versatile, measure overall dietary behaviours over a longer time period than single-day intake (e.g. a week to a month) and are generally easy to administer. The dietary screener modified for the FRESH Foods Survey contained twenty-eight items tailored to the food pantry population and can be used to efficiently assess dietary intake frequency for several major healthful and unhealthful food and beverage groups.

In addition to measuring dietary intake frequency, the FRESH Foods survey examines correlates of dietary behaviour and intermediate outcomes associated with improved behaviour. Predecessors to the dietary correlates scales used in the present study, although not previously examined among food pantry client populations, performed similarly from a psychometric perspective[10,11]. These previous studies also demonstrated similar associations found in the current study between dietary intake and psychosocial constructs[11,25–28], dietary barriers[11,27,28] and home food availability[28–30]. These findings give a preliminary indication of construct validity, as food groups were associated with dietary correlates largely in the directions expected.

While the majority of findings were consistent with what we would expect from the literature, some findings were counterintuitive. For example, it would have been expected that participants who scored higher on the FV barriers scale would have less frequent intake of FV, but this was not the case. It may be that barriers not included in the present study, such as social norms, peer influences, motivation and food access, may be more impactful factors compared with factors such as knowledge/skills, perceptions and cost that were included in the current study[11,28,30,31]. However, higher scores on the FV barriers scale in the current study were strongly associated with increased intakes from the less-healthful food and beverage groups. Therefore, rather than relating to FV intake specifically, the barriers assessed by the scale may actually be barriers to substituting healthful purchases in place of less healthful ones. Also surprising was the positive association

between higher score for the unhealthy food pantry availability scale and more frequent intake of FV. As expected, this scale was also positively associated with higher intakes of unhealthful food groups, so the unexpected positive association with FV intake might be explained by the fact that pantries that are better stocked with junk foods may also be better stocked overall, including with FV. This counterintuitive finding may also reflect the possibility that more frequent consumers of FV are more likely to perceive the food available at their food pantry as less healthy. More research is needed to further investigate these findings.

The current study has several limitations and strengths. Despite efforts to ensure a diversity of days, times and locations for study recruitment, the sample is not a random sample of food pantry clients. However, the sample was very similar to demographic estimates of the population of food pantry clients served by Feeding America food banks[5]. The study was cross-sectional, and therefore study findings cannot be used to identify causal relationships between dietary correlates and dietary intake. The dietary screener used in the study does not comprehensively capture participants' diets and therefore cannot fully assess certain food groups (e.g. lean meats, complete dairy group, non-whole grains, etc.) or energy intake. All pilot testing and assessment of the survey was conducted in English and while a Spanish version was created based on the final English version (see online supplementary material for the final survey in English), it is unknown if the Spanish version would perform similarly. The dietary correlates scales focused heavily on FV, which likely contributed to null findings seen for associations with the milk and milk alternatives group. The study's strengths included a relatively large and diverse sample (e.g. by age, race/ethnicity, geography, etc.), inclusion of an understudied population (e.g. food pantry clients), reliance on previously used and/or validated survey items, cognitive interviewing to refine questions where needed and psychometrics to assess scale performance.

The present study is among the first to develop and test a survey to efficiently measure dietary intake frequency and dietary correlates among food pantry clients. Like all people, food pantry clients face multilevel factors influencing their ability to eat healthfully. Focusing on food available from the food pantry is critical insofar as food pantries are potential settings for influencing dietary intake. Implementing interventions, such as policy and behavioural approaches, in a food pantry setting offers an opportunity to reach a vulnerable population and address health disparities. With adequate data, such interventions could be implemented through wide-reaching organizations such as Feeding America (a network of the majority of food banks in the USA and the nation's largest anti-hunger non-profit) and the Emergency Food Assistance Program (a federally run programme that provides food banks food to allocate to partner agencies). These organizations, and others, have a broad reach into food-insecure populations

and large impact on the food supply that reaches food pantries. Conducting research and evaluation in the food pantry setting requires a tool that is efficient, easily understood and tailored to this population. The FRESH Foods Survey fills this role, can be used whole or as separate modules to monitor food pantry clients' diets and may be useful to measure intervention impact. Next steps for the FRESH Foods Survey are to assess sensitivity to change and to make the survey available for use by food banks, food pantries and those who work with similar populations in other settings.

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Supplementary material

To view supplementary material for this article, please visit https://doi.org/10.1017/S1368980019000697

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