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ORIGINAL PAPER

Foods and Drinks Available from Urban Food Pantries: Nutritional Quality by Item Type, Sourcing, and Distribution Method

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Abstract

The overall nutritional quality of foods/drinks available at urban food pantries is not well established. In a study of 50 pantries listed as operating in the Bronx, NY, data on food/drink type (fresh, shelf-stable, refrigerated/frozen) came from direct observation. Data on food/drink sourcing (food bank or other) and distribution (prefilled bag vs. client choice for a given client's position in line) came from semi-structured interviews with pantry workers. Overall nutritional quality was determined using NuVal® scores (range 1–100; higher score indicates higher nutritional quality). Twenty-nine pantries offered zero nutrition at listed times (actually being closed or having no food/drinks in stock). Of the 21 pantries that were open as listed and had foods/drinks to offer, 12 distributed items in prefilled bags (traditional pantries), 9 allowed for client choice. Mean NuVal® scores were higher for foods/drinks available from client-choice pantries than traditional pantries (69.3 vs. 57.4), driven mostly by sourcing fresh items (at 28.3% of client-choice pantries vs. 4.8% of traditional pantries). For a hypothetical 'balanced basket' of one of each fruit, vegetable, grain, dairy and protein item, highest-NuVal® items had a mean score of 98.8 across client-choice pantries versus 96.6 across traditional pantries; lowest-NuVal® items had mean scores of 16.4 and 35.4 respectively. Pantry workers reported lower-scoring items (e.g., white rice) were more popular—appeared in early bags or were selected first—leaving higher-scoring items (e.g., brown rice) for clients later in line. Fewer than 50% of sampled pantries were open and had food/drink to offer at listed times. Nutritional quality varied by item type and sourcing and could also vary by distribution method and client position in line. Findings suggest opportunities for pantry operation, client and staff education, and additional research.

Keywords Food insecurity · Urban · Food pantry · Food bank · Food assistance · Nutrition

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Introduction

Food insecurity is widespread in the U.S., affecting up to 15.8 million U.S. households (12.7 percent) [1]. The term 'food insecurity' means lacking consistent access to adequate food as a result of monetary or other resource constraints [1]. Experiencing food insecurity has been linked to social and academic problems [2, 3], mental health issues [3–5], and diet-related chronic diseases [6–9]. Food insecurity has also been linked to poorer overall health [10–12].

For many who are food insecure, an important resource for obtaining food can be food pantries [13–15]. Food pantries are emergency food programs that distribute free foods and drinks to those struggling to achieve nutritional adequacy [16]. However, whether adequate nutrition can come from food pantries is not well-established.

Studies examining nutrition from food pantries have mostly considered only select nutrients. Such studies have, for example, demonstrated lacking levels of vitamins A and C [17–20], zinc [17, 20], and calcium [17–19] in pantry foods and drinks. Other research has documented deficits in the availability of dairy products, fruits, and vegetables from food pantries [17, 20–22]. Beyond considerations of food constituents and food groups though, studies have generally not considered broader nutritional quality, e.g. as with an overall nutritional index. Studies have also generally not considered potential differences in nutrition by item type (e.g., fresh, frozen, shelf stable) or by item sourcing.

Two studies from Minnesota did use an overall nutritional index, the Healthy Eating Index, to suggest that the items procured specifically from two food banks (non-profits supplying food pantries with shelf-stable items [16]) were of only 'mid-range' nutritional quality [23, 24]. However the nutritional quality of other types of food, procured from other suppliers, has not specifically been reported. Also not reported is whether nutritional quality relates to the methods pantries use to distribute food to clients; other authors have speculated that whether allowing clients to choose items for themselves or giving them handouts in a prefilled bag could be important [25].

In the current study, investigators sought to examine the overall nutritional quality of pantry foods and drinks. Specifically assessed were associations with item type, item sourcing, and distribution method.

Methods

This study began with early exploratory visits to a sample of food pantries. Exploratory visits informed later data collection about pantries and their offerings (e.g., regarding food/drink sourcing and pantry distribution methods) as described in another publication [26]. The study did not include human subjects and was considered exempt by the Albert Einstein College of Medicine Institutional Review Board.

Setting

The study took place in the Bronx, NY. The Bronx is both one of the five boroughs of New York City (NYC) and a county of New York State. The Bronx has the worst health outcomes of all 62 counties in New York State (e.g., higher rates of obesity, poor or fair health, and premature death) [27], and the southern half of the borough is home to the country's poorest congressional district (where more than 50% of census tracts have poverty rates exceeding 30% of individuals) [28].

Food insecurity is higher in the Bronx than in any other borough of NYC, with 31% of residents overall and 37% of children living in food-insecure homes [29]. In the context of food insecurity, residents of the southern Bronx report less-healthful dietary intake (i.e., lower consumption of fruits and vegetables, higher consumption sugar-sweetened beverages), higher rates of diet-related chronic diseases, and poorer overall health than the rest of the Bronx or rest of NYC [30] (Fig. 1).

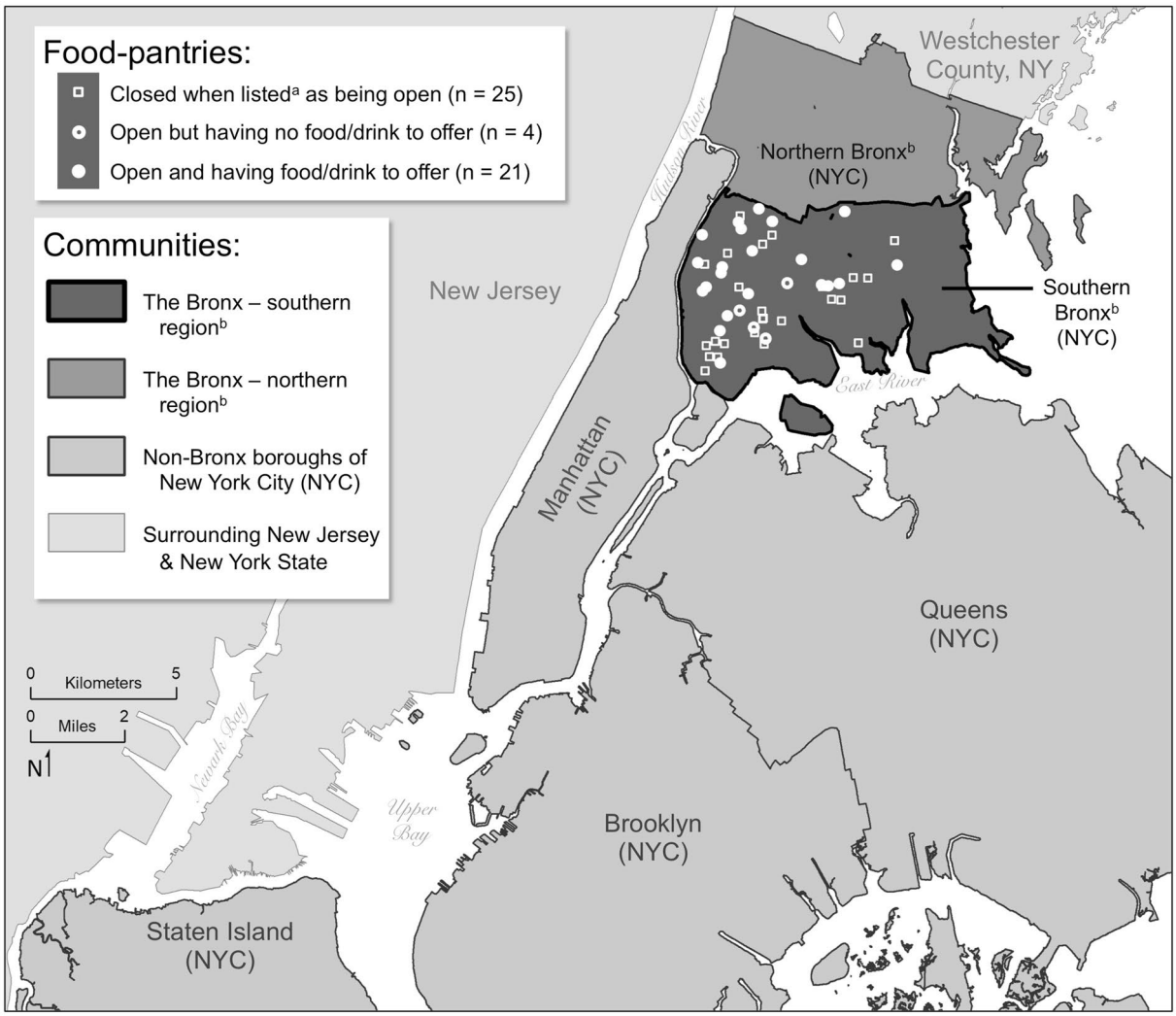
Sample

Investigators identified food pantries in the southern Bronx using an online listing from the city's largest hunger-relief organization, the Food Bank For NYC [31]. The listing included 88 pantry sites. Investigators aimed to include all of these sites in the study.

Ultimately, the study only included 50 sites (Fig. 1 and Appendix Fig. 2). Other sites were not included for three related reasons: (1) pantries had limited hours of operation; generally being open fewer than 2 h/week [26] and having operating hours that often overlapped with those of other pantries in different, non-neighboring locations; (2) pantries were not reliably open as listed; the time spent making second or third visits to some pantries was time not making initial visits to others, (3) the availability of data collectors—and funding for data collection—was limited to an 8-week period; 50 pantry sites was the total number of pantries investigators were able to reach over 8 weeks.

Data Collection

As a starting point for data collection, investigators drafted a rough data-collection tool based on tools from prior food-environment research [32–37]. The tool was then refined



	NYC	Bronx	Southern Bronx
Total population - n[c]	8,298,233	1,414,485	867,210
People per sq. mile - n[c]	27,835	33,864	39,008
White non-Hispanic - %[c]	32.7	10.5	7.5
Hispanic - %[c]	28.8	54.5	61.0
Below poverty level - %[c]	20.7	30.5	34.9
5+ fruit and/or veg. - %[d]	10.1	7.1	6.2
Daily sugary drink(s) - %[d]	22.5	26.7	27.8
Poor diet - %[d]	28.0	32.4	36.3
Hypertension - %[d]	27.8	33.7	36.1
Diabetes - %[d]	10.7	14.0	14.3
Poor health - %[d]	22.2	26.4	29.6

Fig. 1 The southern Bronx, and its food pantries, in the context of New York City and surrounding areas. [a]According to 2014 online listing from the Food Bank for NYC: http://www.foodbanknyc.org/CD6F9867-926E-0C0F-558E6A7EC4762F9E?city=Bronx&CatCode=PANTRY&go.x=25&go.y=23&go=go. [b]Northern and Southern Bronx defined by aggregates of zip codes http://a816-dohbesp.nyc.gov/IndicatorPublic/EPHTPDF/uhf34.pdf. [c]Data from American Community Survey 5-Year Estimates, 2010–2014 https://doi.org/10.18128/D050.V12.0. [d]Data from NYC Health, Community Health Survey, 2014 (age-adjusted estimates) https://a816-healthpsi.nyc.gov/epiquery/CHS/CHSXIndex.html. '5+ fruit and/or veg.' = percent of adults reporting consumption of five of more servings of fruits and/or vegetables the preceding day. 'Daily sugary drink(s)' = percent of adults reporting consumption of one or more sugar-sweetened beverage per day on average. 'Poor diet' = percent of adults reporting having a fair/poor diet (in 2012, estimate not available for 2014). 'Hypertension' = percent of adults reporting ever having been told by a health professional that they have high blood pressure. 'Diabetes' = percent of adults reporting ever having been told by a health professional that they have diabetes. 'Poor health' = percent of adults reporting fair/poor overall health

based on early exploratory visits to a sample of three food pantries. At these visits, investigators made observations about pantry operations and had unstructured interviews with pantry workers. From these activities, investigators learned about several aspects of food-pantry operations that distinguished pantries from other previously studied local food sources: e.g., the possibility of pantries not being open as listed; the potential suppliers of pantry foods and drinks; the types of food and drink items that might be available at pantries; the methods pantries generally use to distribute items to clients; and that the popularity of specific items along with clients' positions in line might influence what items clients receive. All of these considerations were included in the final data-collection tool (Appendix Fig. 3 for items specific to food and drink offerings; Appendix of another publication for items specific to pantry facilities and operations [26]).

Guided by the data-collection tool, two investigators conducted assessments at food pantries June–August 2014. Assessments of all available food and drink items (everything in stock) occurred whenever visited pantries were open and had items to offer. Investigators used paper audit forms while onsite, and then entered structured data elements into REDCap (Research Electronic Data Capture), version 5.6.3 (Vanderbilt University, Nashville, TN) [38]. Structured data included detailed descriptions of fresh items, and detailed package information—including brand, size, and barcode UPC (universal product code)—for other items, in order to allow later determination of nutritional quality. Items that might be available to clients first in line versus clients last in line were determined based on reports of pantry staff (Appendix Fig. 3).

Nutritional Quality Determination

To determine nutritional quality of food and drink items, investigators used the Overall Nutritional Quality Index (ONQI). The ONQI summarizes overall nutrition for a food or drink item into a single score, NuVal®, by considering favorable and unfavorable nutrients and ingredients on a per unit basis. The score can range from 1 to 100, with higher value indicating higher nutritional quality. Details about the development, components, and performance of the ONQI algorithm and NuVal® scoring have been published elsewhere [39, 40]. A large longitudinal study demonstrated that consuming products with higher NuVal® scores is associated with lower body mass index, lower risk of chronic disease, and lower total mortality [41].

NuVal® scores are higher for whole foods (e.g., apples = 100) and have an inverse relationship with food processing, which may, for example, increase the concentration of sugars, the glycemic index, and/or the energy density (e.g., apple juice = 10) [39, 40]. Ultra processed products—particularly those low in vitamins, minerals, and fiber and/or high in added sugars, sodium, and/or trans fat—score particularly poorly (e.g., cinnamon buns = 2, soda = 1). Based on nutrient composition, NuVal® scores for similar products can differ substantially (e.g., yellow cling peaches in light syrup = 37, yellow cling peaches in pear juice = 73). Scores can also differ somewhat for different brands of the same product (e.g., canned chunk lite tuna in water can vary from 51 to 58 depending on brand, due to differences in ingredients like salt). Investigators obtained exact NuVal® scores for all the items pantries offered based on precise descriptions for fresh products (e.g., "French haricots verts green beans") and UPC or exact package details for other products.

Data Analysis

From early exploratory visits, it became clear that there were essentially two distinct methods for distributing foods and drinks at pantries: (1) prefilled bags, where pantry workers pack a set assortment of items to hand out to clients (with generally consistent offerings bag-to-bag and client-to-client as long as provisions last); and (2) client choice, a system more like grocery shopping, where clients choose a certain number of specific items from a set selection, often in item categories. Analyses separately considered pantries operating by a prefilled-bag model (traditional pantries) and those operating by client choice.

Analyses included frequency distributions, proportions, means, minima, and maxima, calculated using Stata version 12.1 (StataCorp, College Station, TX). Classifications for individual items included the following characteristics: food versus drink; item form (fresh, refrigerated/frozen, or shelf-stable); food-group category (fruit, vegetable, grain, dairy, protein—based on MyPlate.gov categorizations [42]—or 'other'); item source (food bank vs. others); and detailed item category (more-specific food and drink classifications).

Investigators calculated the absolute number of items offered at each pantry, the relative proportion of specific items, and corresponding NuVal® scores both by individual pantry and across all assessed pantries. Analyses considered items available overall, and then separately by prefilled-bag or client-choice models. Analyses also considered whether items were likely to be available to clients first in line or last in line (based on reports of pantry staff who packed bags or arranged items for client choice). Finally, analyses considered hypothetical best- and worst-case scenarios for nutritional quality

of pantry provisions using hypothetical collections—or 'balanced baskets' (one of each of fruit, vegetable, grain, dairy, and protein)—with the highest and lowest NuVal® scores.

Results

Of the 50 food pantries included in the study, 25 were not open (on at least two occasions when attempts to visit were made) and, thus, did not have any food or drink to assess. The reasons for pantries not being open—including temporary and permanent closures, with and without notification—are detailed elsewhere [26]. Of the 25 open pantries, four were completely out of food and drink; they had not received deliveries and thus had no items to offer clients to consume or investigators to assess. For the 21 pantries that did have foods and drinks to distribute (example images shown in Appendix Fig. 3), 12 operated by a traditional prefilled-bag model of distribution and nine operated by client choice.

Table 1 details the type, sources, and nutrition quality of specific foods and drinks available from the 12 traditional pantries that used prefilled bags. These pantries offered about a dozen items (11.8 on average) that had a mean NuVal® score of 57.4. Food items predominated over drink items and were mostly shelf-stable (94.3% on average), with a mostly even distribution across food-group categories (except for dairy, which was less common). Most foods (74.1% on average) came from the Food Bank For NYC (a non-profit with government contracts to distribute shelf-stable food). Processed produce—e.g., sauces, soups, canned fruits and vegetables—predominated (37.1% of all pantry items on average). Footnotes to Table 1 gives specific examples of the food and drink items that were available. Pantries using traditional prefilled-bags offered several items not carried by client-choice pantries: lower-NuVal® items like Vienna sausages, ham, BBQ sauce, sugary granola bars, and fruit punch.

Reported differences in pantry offerings for clients near the fronts of pantry lines (Appendix Table 4) versus near the backs of pantry lines (Appendix Table 5) were generally unremarkable at traditional pantries using prefilled bags. Exceptions were for the following two values: (1) the mean of all pantries' mean NuVal® scores and (2) the median NuVal® score across all pantries. These values were both higher for items reportedly available towards the back of lines (60.7 and 83 respectively; Appendix Table 5) than for items reportedly available towards the front of lines (58.5 and 77 respectively; Appendix Table 4). Contributing to these differences, lower-scoring refined-grain items were reportedly more available at the fronts of lines, whereas higher-scoring whole-grain items were reportedly available at both the fronts and backs of lines. Correspondingly, the mean of all traditional pantries' mean NuVal® scores for the food-group 'grain' was lower for items reportedly available near fronts of lines (65.3; Appendix Table 4) than near the backs of lines (73.8; Appendix Table 5). The suggestion is that refined-grain products were offered to clients preferentially up front, leaving whole-grain products for those arriving later.

Table 2 shows type, sources, and nutrition quality of offerings from the nine client-choice pantries. Compared to traditional pantries that distributed items using prefilled bags, the average number of available items at client-choice pantries was nearly three times higher (at 35.1), and the average NuVal® score was also higher (by > 20%, at 69.3). These differences reflected a greater availability of fresh items at client-choice pantries, especially fresh vegetables. Differences also reflected alternative sourcing: playing bigger roles at client-choice pantries were City Harvest (a non-profit, rescuing foods from restaurants, grocers, and manufacturers) and Local Produce Link (a non-profit connecting pantries directly with local farms). Client-choice pantries offered items that could not be found at pantries using traditional prefilled bags: higher-NuVal® items like fresh herbs, whole wheat bread, cottage cheese, chickpeas, and whole chickens.

At client-choice pantries, reported differences in availability for clients near the fronts of lines versus near the backs of lines could be substantial (Appendix Tables 6, 7). The mean number of items reportedly available for clients at the backs of lines was about 66% lower (11.0; vs. 34.6 reportedly available to clients at the fronts of lines). Yet the mean of all client-choice pantries' mean NuVal® scores and the median NuVal® score across client-choice pantries were both higher for items reportedly available near the backs of lines (80.7 and 91 respectively; Appendix Table 7) than near the fronts of lines (69.8 and 84 respectively; Appendix Table 6). These differences reflected greater proportions of offerings reportedly coming from fresh vegetables near the backs of lines. The implication is that clients who have other items to select do not select fresh vegetables as often.

Table 3 shows NuVal® scores of the items at pantries with the highest, median, and lowest nutritional quality. The table also shows the best and worst-case scenarios for nutrition in 'balanced baskets'—hypothetical collections of one of each fruit, vegetable, grain, dairy, and protein. Client-choice pantries had the highest-scoring NuVal® items in each MyPlate category, but also the lowest-scoring NuVal® items (with the exception of items in the protein category). If a client created a 'balanced basket' from the highest-scoring items across pantries, 'balanced baskets'

Table 1 Type, sources, and nutrition quality of foods and drinks from Bronx food pantries using traditional prefilled bags (n = 12 pantries)

Item characteristic	Number of items			Percentage of offerings			NuVal® scores by pantry			NuVal® across all pantries		
	Mean n across pantries	Min n at any pantry	Max n at any pantry	Mean % across pantries	Min % at any pantry	Max % at any pantry	Mean of all pantries' mean scores	Mean of all pantries' min score	Mean of all pantries' max score	Median score	Min score	Max score
Total items	11.8	2	26	100.0	100.0	100.0	57.4	7.0	93.0	70.5	1	100
Food or drink												
Food items	10.3	2	24	86.2	42.9	100.0	62.5	17.9	93.0	77	1	100
Drink items	1.5	0	4	13.8	0.0	57.1	41.9	17.4	70.0	10	2	89
Item form												
Fresh	0.7	0	4	4.8	0.0	21.1	100.0	100.0	100.0	100	100	100
Refrigerated or frozen	0.3	0	3	1.0	0.0	11.5	55.0	33.0	88.0	44	33	88
Shelf stable	10.8	2	23	94.3	78.9	100.0	55.3	7.0	91.7	65	1	100
Food-group category[a]												
Fruit	2.8	0	9	23.3	0.0	47.4	52.1	28.5	75.4	49.5	4	100
Vegetable	2.5	1	5	23.3	11.1	50.0	79.5	65.4	89.3	99	10	100
Grain	2.3	0	8	17.4	0.0	30.8	66.2	49.5	80.8	84	9	94
Dairy	0.5	0	1	4.1	0.0	11.1	89.0	89.0	89.0	89	89	89
Protein	2.7	1	10	23.2	6.3	50.0	52.4	36.5	68.3	51.5	20	100
Other	0.9	0	3	8.7	0.0	28.6	8.9	6.3	11.6	6.5	1	29
Item source												
Food bank	8.3	0	26	74.1	0.0	100.0	58.5	6.2	91.6	84	1	100
City Harvest	0.2	0	1	1.4	0.0	10.0	100.0	100.0	100.0	100	100	100
Corporations/businesses	1.6	0	9	13.4	0.0	90.0	57.0	40.3	76.3	30	1	100
Local Produce Link	–	–	–	–	–	–	–	–	–	–	–	–
Detailed item category[b]												
Fresh produce	0.7	0	4	4.8	0.0	21.1	100.0	100.0	100.0	100	100	100
Processed produce	4.1	1	7	37.1	23.1	70.0	64.9	33.6	88.3	83	4	100
Whole-grain products	0.8	0	3	5.8	0.0	20.0	93.1	93.0	93.3	93	93	94
Nuts	–	–	–	–	–	–	–	–	–	–	–	–
Cheese/yogurt	–	–	–	–	–	–	–	–	–	–	–	–
Red/processed meats	0.5	0	2	6.9	0.0	50.0	26.9	26.0	27.8	27.5	20	33
Fish	0.8	0	4	4.8	0.0	15.4	68.8	60.8	75.2	77	51	91
Poultry	0.6	0	1	4.6	0.0	11.1	30.1	30.1	30.1	25	20	44
Beans, lentils, legumes	0.9	0	3	7.6	0.0	20.0	75.0	65.0	84.2	84	29	100
Salty snacks	–	–	–	–	–	–	–	–	–	–	–	–
Sweet	0.5	0	2	4.3	0.0	12.5	8.1	8.0	8.2	7	1	24

Table 1 (continued)

Item characteristic	Number of items			Percentage of offerings			NuVal® scores by pantry			NuVal® across all pantries		
	Mean n across pantries	Min n at any pantry	Max n at any pantry	Mean % across pantries	Min % at any pantry	Max % at any pantry	Mean of all pantries' mean scores	Mean of all pantries' min score	Mean of all pantries' max score	Median score	Min score	Max score
Other refined-grain item	1.6	0	5	11.6	0.0	25.0	58.5	44.7	74.2	65	9	84
Milk	0.5	0	1	4.1	0.0	11.1	89.0	89.0	89.0	89	89	89
100% juice	0.6	0	2	4.8	0.0	14.3	11.8	11.7	12.0	10	6	24
Sugary drinks	0.3	0	2	3.7	0.0	28.6	4.0	2.0	6.0	2	2	10
Diet drinks	–	–	–	–	–	–	–	–	–	–	–	–
Water/carbonated water	–	–	–	–	–	–	–	–	–	–	–	–

– = none; there were no items sourced from Local Produce Link and there were no nuts, cheese/yogurt, salty snacks (like potato chips and pretzels), diet drinks, or bottled water/carbonated water available

[a]Example items by food-group category (**bold typeface** = items not offered through pantries operating by 'client choice'):

Fruit = fresh fruits, 100% juices, applesauce, dried fruits, and canned fruits in syrups

Vegetable = fresh vegetables, tomato-based pasta sauces, vegetable soups, and canned vegetables and corn

Grain = hot and cold cereals, rice, breads, and pasta/noodles including 'Mac and Cheese'

Dairy = shelf-stable 1% milk

Protein = included canned meats and fish, canned soups and casseroles with meat, canned and dried beans and lentils and chickpeas, peanut butter, **frozen tilapia**

Other = sweetened cereals, sugar-added juice cocktails, fruit jellies, cranberry sauce, **BBQ sauce**, sugary **granola bars**, condensed soups including cheese soup

[b]Example items by detailed item category (**bold typeface** = items not offered through pantries operating by 'client choice'):

Fresh produce = whole fresh fruits and vegetables

Processed produce = tomato-based pasta sauces, vegetable soups, canned vegetables canned corn, canned sweet fruits in syrups, applesauce, dried fruits

Whole gain = brown rice, oatmeal, whole-wheat pasta

Red and processed meats = **Vienna sausages**, beef ravioli, **pork**, and **ham**

Fish = canned salmon, tuna, mackerel, and sardines, and **frozen tilapia**

Poultry = canned chicken, canned chicken soups

Beans, lentils, legumes = dried and canned beans, lentils, peanut butter

Sweets = sweetened cereals, fruit jellies, cranberry sauce, **BBQ sauce**, sugary **granola bars**

Other refined grains = hot and cold refined cereals, white rice, white breads, corn flakes, and refined pasta/noodles, including 'Mac and Cheese'

Milk = shelf-stable 1% milk

Juice = 100% apple, grape, grapefruit, and **100% fruit punch**

Sugary drinks = sweetened teas, juice cocktails and concentrates

Table 2 Type, sources, and nutrition quality of foods and drinks from Bronx food pantries using 'client choice' (n = 9 pantries)

Item characteristic	Number of items			Percentage of offerings			NuVal® scores by pantry			NuVal® across all pantries		
	Mean n across pantries	Min n at any pantry	Max n at any pantry	Mean % across pantries	Min % at any pantry	Max % at any pantry	Mean of all pantries' mean scores	Mean of all pantries' min score	Mean of all pantries' max score	Median score	Min score	Max score
Total items	35.1	9	65	100.0	100.0	100.0	69.3	5.7	100.0	84	1	100
Food or drink												
Food items	31.6	8	60	90.1	84.6	96.7	72.3	6.8	100.0	87	1	100
Drink items	3.6	1	10	9.9	3.3	15.4	49.5	29.2	70.8	24	2	100
Item form												
Fresh	10.3	1	30	28.3	4.5	55.6	92.9	64.2	100.0	100	2	100
Refrigerated or frozen	0.6	0	2	1.3	0.0	6.5	39.3	24.3	54.3	36	7	99
Shelf stable	24.2	4	56	70.4	44.4	95.5	59.6	5.7	99.0	75	1	100
Food-group category[a]												
Fruit	7.2	2	17	21.8	9.2	36.4	53.5	6.6	99.7	37	1	100
Vegetable	12.2	3	28	35.9	13.6	66.7	91.4	58.8	100.0	100	20	100
Grain	6.4	0	22	17.0	0.0	33.8	56.6	21.5	85.0	65	8	94
Dairy	1.9	0	5	4.4	0.0	9.8	81.6	72.0	94.1	89	28	100
Protein	5.4	1	13	16.5	6.5	31.8	66.4	37.2	89.1	77	25	100
Other	1.9	0	5	4.4	0.0	7.7	11.8	7.4	16.7	10	1	28
Item source												
Food bank	12.7	0	53	37.3	0.0	86.4	67.3	21.5	96.5	83	1	100
City Harvest	6.1	0	27	13.0	0.0	52.9	76.3	19.2	99.8	100	2	100
Corporations/businesses	1.6	0	5	9.2	0.0	55.6	61.4	44.0	81.3	79.5	23	100
Local Produce Link	0.8	0	4	2.9	0.0	13.6	100.0	100.0	100.0	100	100	100
Detailed item category[b]												
Fresh produce	9.3	1	30	26.0	4.5	55.6	99.5	96.0	100.0	100	88	100
Processed produce	8.8	2	17	26.6	16.9	32.3	65.7	19.2	97.9	83	1	100
Whole-grain products	1.7	0	5	4.8	0.0	13.6	75.9	57.8	92.0	93	38	94
Nuts	–	–	–	–	–	–	–	–	–	–	–	–
Cheese/yogurt	0.7	0	3	1.5	0.0	6.5	50.6	33.0	70.5	38	28	99
Red/processed meats	0.4	0	1	2.4	0.0	11.1	28.0	28.0	28.0	28	25	31
Fish	1.4	0	2	4.7	0.0	9.5	71.9	62.7	81.0	77	51	91
Poultry	0.4	0	1	1.2	0.0	4.5	27.8	27.8	27.8	25	25	36
Beans, lentils, legumes	3.2	0	11	8.3	0.0	18.2	86.0	59.7	100.0	84	28	100
Salty snacks	–	–	–	–	–	–	–	–	–	–	–	–
Sweet	0.8	0	2	2.3	0.0	6.7	9.0	6.4	11.6	4	1	24

Table 2 (continued)

Item characteristic	Number of items			Percentage of offerings			NuVal® scores by pantry			NuVal® across all pantries		
	Mean n across pantries	Min n at any pantry	Max n at any pantry	Mean % across pantries	Min % at any pantry	Max % at any pantry	Mean of all pantries' mean scores	Mean of all pantries' min score	Mean of all pantries' max score	Median score	Min score	Max score
Other refined-grain item	4.8	0	17	12.2	0.0	26.2	49.0	21.5	77.8	51	8	93
Milk	1.2	0	3	2.9	0.0	4.8	90.0	87.8	93.3	89	82	100
100% juice	1.6	0	4	5.6	0.0	13.6	19.6	15.0	24.8	24	6	29
Sugary drinks	0.7	0	3	1.3	0.0	4.6	9.3	8.0	10.5	10	2	20
Diet drinks	0.1	0	1	0.2	0.0	1.5	–	–	–	–	–	–
Water/carbonated water	–	–	–	–	–	–	–	–	–	–	–	–

–=none; there were no nuts, salty snacks (like potato chips and pretzels), or bottled water/carbonated water available

[a]Example items by food-group category (**bold typeface**=items not offered through pantries operating by prefilled bags):

Fruit=fresh fruits, 100% juices, applesauce, dried fruits, and canned fruits in syrups

Vegetable=fresh vegetables, **fresh herbs**, tomato-based pasta sauces, vegetable soups, **instant potatoes**, and canned vegetables and canned corn

Grain=hot and cold cereals, rice, breads, and pasta/noodles including 'Mac and Cheese'

Dairy=**dried milk**, shelf-stable liquid milk, **cottage cheese**, and plain and flavored sweetened **yogurts**

Protein=canned meats and fish, canned soups and casseroles with meat, canned and dried beans and lentils and chickpeas, peanut butter

Other=sweetened cereals, sugar-added juice cocktails, fruit jellies and cranberry sauce, **grain-based desserts, pudding**, condensed soups including cheese soup, and **sweetened teas**

[b]Example items by detailed item category (**bold typeface**=items not offered through pantries operating by prefilled bags):

Fresh produce=whole fresh fruits and vegetables and **fresh herbs**

Processed produce=tomato-based pasta sauces, vegetable soups, **instant potatoes**, canned vegetables canned corn, canned sweet fruits in syrups, applesauce, dried fruits

Whole gain=brown rice, **cornmeal**, oats and oatmeal, **whole-wheat bread**, whole-wheat pasta

Cheese/yogurt=**cottage cheese**, plain and flavored sweetened **yogurts**

Red and processed meats=beef ravioli, **beef stew**

Fish=canned salmon, tuna, mackerel, and sardines

Poultry=canned chicken, canned chicken soups, and **whole refrigerated chickens**

Beans, lentils, legumes=dried and canned beans, lentils, and **chickpeas**, peanut butter

Sweets=sweetened cereals, **grain-based desserts**, fruit jellies, **puddings**

Other refined grains=hot and cold refined cereals, white rice, white breads, and refined pasta/noodles, corn flakes

Milk=instant **dried milk**, shelf-stable liquid milk (1% or nonfat except for one instance of whole milk)

Juice=100% apple, grape, grapefruit, or **orange juice**

Sugary drinks=sweetened teas, juice cocktails and concentrates

Diet drinks=pomegranate, berry, and guarana **low-calorie juice drink**

Table 3 Highest, median, and lowest-nutrition items, and best and worst-case nutritional quality for a 'balanced basket'[a] from Bronx food pantries (n = 13)[b]

Food-pantry items by MyPlate.gov food-group categories	NuVal® Score					
	Across all pantries	Across all prefilled-bag pantries	Across all 'client choice' pantries	Mean of all pantries' highest or lowest score	Mean of all prefilled-bag pantries' highest or lowest score	Mean of all 'client choice' pantries' highest or lowest score
Highest-NuVal® item[c]						
Fruit	100	100	100	85.6	69.3	99.6
Vegetable	100	100	100	98.3	96.3	100.0
Grain	94	94	94	83.7	74.0	92.0
Dairy	100	89	100	91.8	89.0	94.1
Protein	100	100	100	89.2	80.3	96.7
Basket of all 5 items (mean)	98.8	96.6	98.8	89.7	81.8	96.5
Median-NuVal® item						
Fruit	49.5	32.5	67.5	55.1	44.8	63.9
Vegetable	100	99	100	93.9	88.5	98.6
Grain	65	84	65	63.6	61.6	65.3
Dairy	89	89	89	83.3	89.0	78.4
Protein	77	52	77	65.2	52.3	76.2
Basket of all 5 items (mean)	76.1	71.3	79.7	72.2	67.3	76.5
Lowest-NuVal® item[d]						
Fruit	1	4	1	12.5	22.0	4.4
Vegetable	20	55	20	60.6	70.5	52.1
Grain	8	9	8	32.5	44.8	21.9
Dairy	28	89	28	79.8	89.0	72.0
Protein	20	20	25	34.7	27.7	40.7
Basket of all 5 items (mean)	15.4	35.4	16.4	44.0	50.8	38.2

[a]A 'balanced basket' is a hypothetical bundle of five items, one from each of the five MyPlate.gov food-group categories of fruit, vegetable, grain, dairy, and protein

[b]Analyses here restricted to the pantries that offered at least one item from each of the 5 MyPlate.gov food-group categories: 6 pantries operating by the traditional prefilled-bag model and 7 pantries operating by a client-choice model. For an imputed analysis, considering all pantries at which any foods or drinks were being offered (12 pantries operating by a prefilled-bag model and nine operating by a client-choice model) and setting missing items to a NuVal® score of zero, please see Appendix Table 8

[c]In the fruit and vegetables categories, fresh varieties—and canned varieties without added sodium—were among the items with NuVal® scores of 100 at pantries of both types. Brown rice was the whole-grain item with NuVal® score of 94 at both types of pantries. The dairy food with NuVal® of 89 at pantries using prefilled bags was 1% milk; fat-free milk (in either powdered or liquid form) was the dairy item with NuVal® score of 100 at client choice pantries. Scoring 100 in the protein category at pantries of both types were dried beans and lentils

[d]In the fruit category, sweetened dried cranberries had the NuVal® score of 4 and sweetened cranberry sauce had the NuVal® score of 1. For vegetables, diced, salted, canned tomatoes had the NuVal® score of 55, cut yams in light syrup had the NuVal® of 20. The grain item with NuVal® score of 9 was Mac and Cheese, the grain item with the NuVal® score of 8 was gluten-free tagliatelle. For dairy, 1% milk scored 89, and sweetened flavored yogurts scored the 28. The protein item having a NuVal® score of 20 was Vienna sausages, and the protein items having the NuVal® score of 25 were canned beef stew and canned chicken

would have near-perfect NuVal® scores both from client-choice and from traditional pantries (scores of 98.8 and 96.6, respectively). If a client created a 'balanced basket' from the lowest-scoring items across pantries, the result would be very poor nutrition from client-choice pantries (score of 16.4) and somewhat less-poor quality from pantries using prefilled bags (score of 35.4). Although not shown in the table, it is notable that 5.8% of all items at traditional pantries, and 6.3% of all items at client-choice pantries, had single-digit NuVal® scores (i.e., extremely poor nutritional quality).

Values across pantries give a sense of overall inventory. However, from a client perspective, it may be more meaningful to consider scores for 'balanced baskets' that could

come from single pantries (rather than from getting certain items from one pantry and other items from another). At a single pantry, items in the best possible 'balanced baskets' for prefilled bags would have a mean NuVal® score of 81.8, whereas items in the worst possible 'balanced baskets' would have a mean NuVal® score of only 50.8. At client-choice pantries, clients could select 'balanced baskets' scoring very high (mean NuVal® for the five basket items of 96.5), but could also select baskets scoring quite low (mean NuVal® of 38.2). Median values for five-item-mean scores were around 70 for both pantry types (slightly lower for traditional pantries and slightly higher for client-choice pantries).

The values in Table 3 are restricted to pantries that had items in all five of the MyPlate food-group categories (13 pantries; 8 pantries fewer than the 21 having any foods or drinks to offer at all). If all assessed pantries are considered (including those without items to offer in some MyPlate food-group categories), and a NuVal® score of zero is assigned in categories where items were not available (absent items provide zero nutrition), the results are shown in Appendix Table 8. While the results across all pantries are somewhat worse ('balanced baskets' having slightly lower nutritional quality), the results for a given traditional or client-choice pantry on average are not meaningfully different ('balanced baskets' having comparably high, median, and low mean NuVal® scores).

Discussion

This study examined the nutritional quality of food and drink offerings from a sample of urban food pantries. Findings revealed that when pantries were open and had food or drink items to offer (in fewer than 50% of cases listed online by the local food bank), there were differences in nutritional quality based on item type and sourcing, and likely by distribution method and client position in line.

Fully 58% of pantries (29 of 50) offered no foods or drinks at all—either because they were closed when they were listed as being open or because they simply had no items in stock. These pantries provided precisely zero nutrition at listed times.

Among pantries that did have food or drink, more than a third (8 of 21) did not have any items in at least one of the five MyPlate.gov food-group categories. The suggestion is that, when available, foods and drinks might be lacking in variety and balance. Prior studies of food pantries have also identified lack of balance, for example due to deficits in food-group categories like dairy products, fruits, and vegetables [17, 20–22].

Even when pantries had items representing all five food-group categories, products in some categories may not have been of high nutritional quality. For example, canned fruit cocktail in syrup could have counted as "fruit," and instant potatoes could have counted as "vegetable." Two prior studies showed that most "fruits and vegetables" at pantries were highly processed items like sauces and juices [22, 43].

In the current study, the type and quality of fruits and vegetables were related to both distribution method and item suppliers. Pantries offering client choice had more fresh items, especially vegetables, and sourced more items from organizations connecting pantries to local farms and other sources of fresh produce. In contrast, traditional pantries handing out prefilled bags depended much more heavily on shelf-stable items from food bank deliveries.

Another difference between traditional and client-choice pantries was the range of products offered. Client-choice pantries offered a greater number of items, having a wider range of nutritional quality. Across all client-choice pantries (that had food), one could have theoretically assembled a 'balanced basket' of fruit, vegetable, grain, dairy, and protein having near perfect nutritional quality (NuVal® score of 98.8). However, one could have also theoretically assembled a 'balanced basket' of items with a mean NuVal® score of only 16.4. Across traditional pantries using prefilled bags, the range was 35.4–96.6. In a study of six client-choice pantries in Connecticut, less than half of all available products were in the green (choose often) category (Cooksey-Stowers et al. 2017, unpublished data) using a stoplight nutritional grading system [44]. In the current study, 6% of items at pantries of either type (traditional or client choice) had NuVal® scores only in the single digits.

Inventories across pantries provide the total range of items available. A more applicable consideration for individual clients though is the inventory at a given pantry. At a given client-choice pantry (on average), the NuVal® score of 'balanced basket' could range from 38.2 (considering only the lowest-quality items) to 96.5 (considering only the highest-quality items). At a given traditional pantry using prefilled bags, the range was narrower and less extreme (50.8–81.8). While median NuVal® scores were around 70 for 'balanced baskets' from pantries of either type, where exactly in the range an actual client might land could depend on that client's position in line. Pantries operating by both client choice and prefilled bags reportedly offered lower-nutrition items to clients near the fronts of lines versus near the backs of lines. This difference was especially pronounced at client-choice pantries. The implication at client-choice pantries is that clients choose lower-NuVal® items preferentially; the implication at traditional pantries is that workers provide lower-NuVal® items preferentially. Perhaps explaining both practices is pantry

workers' reported impressions of clients' preferences; workers reported that clients preferred white rice and refined pasta, for example, over higher-nutrition alternatives like brown rice and whole-wheat pasta.

It is worth asking why individuals who are food-insecure would choose—or why pantry workers serving them would provide—less-nutritious items when there are healthier options available. One reason may be that nutrient density is not the most relevant concern for hungry people. Vegetables—as found at more client-choice pantries—often have perfect NuVal® scores, but may not be very filling. A study using focus group interviews showed that many pantry clients, especially those with children, seek more calorie-dense foods such as macaroni and cheese, peanut butter and jelly, sweet cereals, and white sandwich bread [45]. Unfortunately, some such items are unlikely to be more filling and may even promote hunger [46], revealing that nutritional knowledge and confusion about healthy eating may play a role in pantry food provision. Other obstacles to healthier provision at pantries may relate to practical considerations: e.g., an appreciation that clients may lack cooking equipment, lack food-preparation knowledge, or be challenged by carrying heavier produce items long distances [19, 47–51]. (Cooksey-Stowers et al. 2017, unpublished data) Ubiquitous advertising for unhealthful products likely also plays a role [52, 53]; such advertising extends even to mass transit stations in food-pantry communities [54]. Cultural traditions (e.g. beans and white rice as opposed to beans and brown rice) may be important too [26, 55]. In prior research, food-pantry clients cited cultural appropriateness as an important factor in food choice, and they reported difficulty obtaining culturally appropriate foods from food pantries [45]. From the perspective of pantry workers providing the food, concerns about scarcity or running out early—along with concerns for adverse reactions from clients who are towards the back of the line and forced to go without—might translate to setting limits up front and holding some provision of items until later in line [47, 51].

The current study had several strengths. First, investigators conducted exploratory visits to a sample of pantries before initiating data collection; in doing so, the team learned about key variables to include that were not considered in prior studies. Second, the study included a relatively large number of pantries and included findings about pantries not being open or not having food; these findings are important because foods and drinks offer precisely zero nutrition if they are absent. Third, the study assessed nutritional quality more comprehensively than in prior studies, using a validated nutritional scoring system that considers favorable and unfavorable components and that is supported by cohort-based morbidity and mortality data. Fourth, analyses included consideration of item type, sourcing, and distribution method, as well as clients' position in line. Analyses also considered best- and worst-case scenarios for nutrition based on hypothetical 'balanced baskets' of food provision.

A limitation of the current study was the final sampling, restricted by pantry hours and locations. Nonetheless, the online listing of all food pantries [31] reassured about comparable operating hours between included and excluded sites. Also, a map of all pantry locations (Appendix Fig. 2) reassured that included pantries reflected the full geographic distribution of pantries overall. The ultimate total of 50 included pantries might technically be described as a "convenience sample," but would be comparable to a patient sample from a randomized clinical trial where inclusion is based on willingness and availability of eligible individuals to participate.

Another limitation of the current study was the cross-sectional design. Nonetheless, at least two visits were made to all pantries that were closed so findings on closures (pantries not being open as listed online) were based not just on single time points. Moreover, investigators attempted to visit initially closed pantries at other times when alternative hours were listed by on-site signage [26]; pantries that were "closed" were closed on at least two occasions. When pantries were open, investigators asked workers not only about present conditions but also about *typical* conditions; workers reported that sourcing of fresh produce directly from local farms (e.g., through Local Produce Link) can vary seasonally but that other produce sourcing (as through City Harvest) is more stable. The end result might have been slightly less of a difference in fresh-produce availability between traditional pantries and client-choice pantries in the winter. From the standpoint of generalizability, pantries in other locations might have different sourcing and different offerings.

An additional limitation relates to not having data on the items clients actually received—either through their own choice or through handouts in prefilled bags (and, moreover, no data on the items clients—or their families—actually consumed, or what other food sources contributed to their overall nutrition on pantries days, at other times during the week, over the month, etc.). Future client-focused ethnographic research would be valuable in these areas. In the interim, the analyses in the current study provide best- and worst-case scenarios to bound the possibilities of foods received from pantries.

A final limitation relates less to the study itself and more to the nuance of applying nutritional scoring to a full range of pantry offerings. For example, fresh vegetables usually have perfect NuVal® scores and yet are not, in and of themselves, nutritionally complete. A pantry

that provided only vegetables would score very near 100 for its inventory, but such a pantry would provide clients with a diet of inadequate balance. Thus, NuVal® scores across items should be interpreted cautiously. Our 'balanced basket' approach is one method to begin to address this limitation.

Conclusion

The current study showed substantial variation in the nutrition available from urban food pantries. In more than half of all cases, visited pantries were not open or had no items to distribute. When pantries did have foods and drinks, nutritional quality varied by item type and sourcing, and likely by distribution method and client position in line. Under worst-case scenarios, pantries could offer less-than-nutritious food and client preferences and worker practices could contribute to unhealthful food provision.

To help ensure better nutrition at more pantries at more times, increasing linkages to fresh produce—e.g. local farms or organizations that rescue fresh items from stores, restaurants, and manufacturers—could help. Manipulating displays to highlight nutritious items could support healthier selections when clients have a choice [44, 56–58]. Additionally, educational efforts may support client preferences for healthier items and workers' willingness to make them available. Education for clients might include information on nutrition, introductions to new foods through cooking demonstrations and tastings, and sessions to build food-preparation skills [55]. Facilities for food preparation may also be important.

Most important though will be efforts to ensure greater reliability in supply and provision. When it comes to nutrition, almost any food is better than no food, and adequacy is a chief concern. Future work should exam barriers to the regular provision and uptake of healthful items from pantries.

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Author Contributions SCL conceived the study, designed the data-collection tool and protocol, oversaw primary data collection, performed analyses, outlined introduction and discussion sections, and drafted methods and results sections, including tables and figures. ADB led the literature review and contributed to the writing of the introduction and discussion sections. ZAG and HJF conducted primary data collection. ARM created maps for figures and contributed to data capture for Fig. 1. CBS oversaw and assisted with data analysis. EBR contributed to data interpretation and writing. KCS provided guidance on study planning, and contributed to the literature review, data analysis, and writing. All authors helped revise the manuscript.

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Compliance with Ethical Standards

Conflict of interest None of the other authors have any disclosures.

Ethical Approval This study was considered exempt under federal regulations 45 CFR 46.101 (b) (2,4) and Einstein IRB policy.

Appendix

See Figs. 2, 3 and 4.

See Tables 4, 5, 6, 7 and 8.

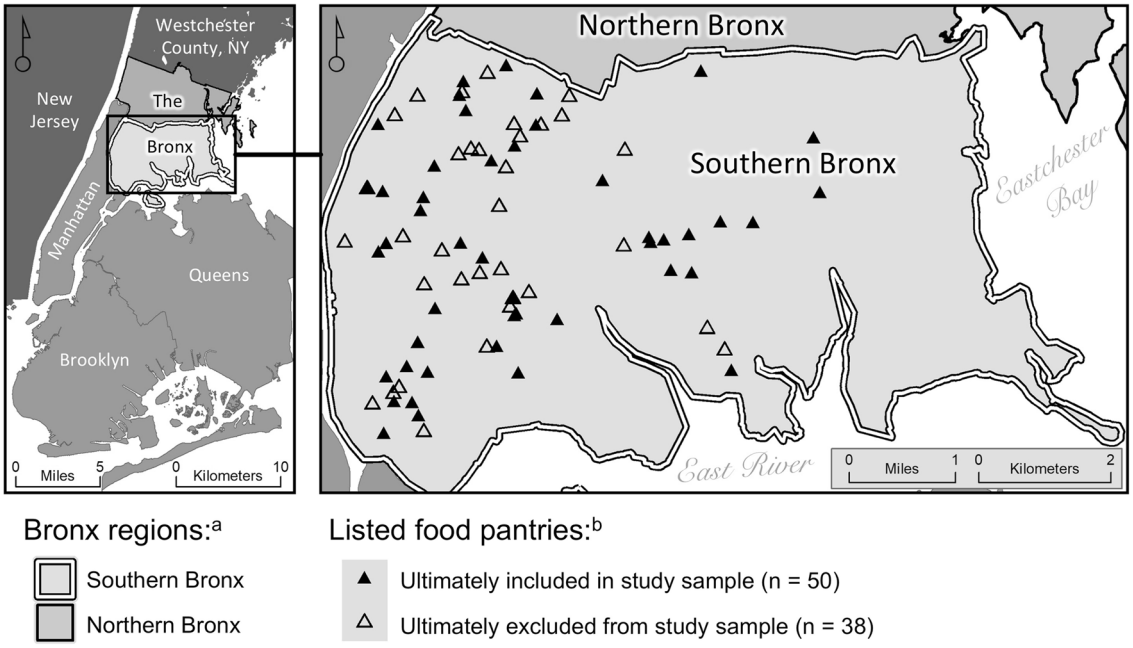

Fig. 2 Food pantries in the southern Bronx included in and excluded from the study sample. [a]Northern and Sothern Bronx defined by aggregates of zip codes http://a816-dohbesp.nyc.gov/IndicatorPublic/EPHTPDF/uhf34.pdf. [b]According to a 2014 online listing from the Food Bank for NYC: http://www.foodbanknyc.org/CD6F9867-926E-0C0F-558E6A7EC4762F9E?city=Bronx&CatCode=PANTRY&go.x=25&go.y=23&go=go

Specific item (detailed description—e.g., not "greens" but "green romaine lettuce") INCLUDE: 1. Brief Item description (e.g., Toasted whole grain oat cereal) 2. Brand (e.g., Cheerios) 3. Size (e.g., 18-oz 510 gm box)	Food or Drink	Fresh, Refrig-erated/ Frozen, Shelf stable	Cap (allowable number)	Item Category (fruit, vegetable, grain, dairy, protein, other)	Detailed Item Category (Fresh prod., Proc prod., Whole-grain, Nuts Cheese/yog., Red/proc meat, Fish, Poultry, Beans/lentils, Salty snack, Sweet, Other refined-grain, Milk, 100% juice, Sugar drink, Diet drink, Water	Item Source: (Food Bank, City Harvest, Local Produce Link, Corporate donation, Individ. Purchase/ donation, other)	Full 12-digit UPC Code or PLU code or "none"	In first bag of day or available to those first in line (Y/N)	In last bag of day or available to those last in line (Y/N)	Comments

Fig. 3 Data-collection tool for food and drink assessments at food pantries. Data-collection items specific to pantry facilities and operations (including whether pantries distributed foods and drinks using prefilled bags or client choice) appear in an Appendix to another paper [26]

Fig. 4 Montage of food and drink images from food pantries in the southern Bronx, 2014

Table 4 Type, sources, and nutrition quality of foods and drinks from Bronx food pantries using traditional prefilled bags (n = 12 pantries); foods reportedly available to clients near the front of the line

Item characteristic	Number of items			Percentage of offerings			NuVal® scores by pantry			NuVal® across all pantries		
	Mean n across pantries	Min n at any pantry	Max n at any pantry	Mean % across pantries	Min % at any pantry	Max % at any pantry	Mean of all pantries' mean scores	Mean of all pantries' min score	Mean of all pantries' max score	Median score	Min score	Max score
Total items	11.2	2	23	100.0	100.0	100.0	58.5	6.7	92.4	77	1	100
Food or drink												
Food items	10.0	2	21	88.7	66.7	100.0	62.5	17.4	92.4	77	1	100
Drink items	1.2	0	3	11.3	0.0	33.3	39.5	18.4	64.1	11	2	89
Item form												
Fresh	0.7	0	4	5.2	0.0	21.1	100.0	100.0	100.0	100	100	100
Refrigerated or frozen	–	–	–	–	–	–	–	–	–	–	–	–
Shelf stable	10.5	2	23	94.8	78.9	100.0	56.0	6.7	90.9	67.5	1	100
Food-group category												
Fruit	2.6	0	9	20.0	0.0	47.4	53.1	32.6	71.3	62	4	100
Vegetable	2.5	1	5	25.7	11.1	50.0	79.9	65.8	89.1	99	10	100
Grain	2.4	0	8	17.7	0.0	34.8	65.3	47.8	80.4	84	9	94
Dairy	0.5	0	1	3.7	0.0	11.1	89.0	89.0	89.0	89	89	89
Protein	2.4	1	7	23.8	6.3	50.0	52.5	37.5	65.4	54.5	20	100
Other	0.8	0	3	9.1	0.0	33.3	5.8	3.3	8.2	2.5	1	29
Item source												
Food bank	7.5	0	23	71.8	0.0	100.0	60.1	5.8	90.7	84	1	100
City Harvest	0.2	0	1	1.5	0.0	10.0	100.0	100.0	100.0	100	100	100
Corporations/businesses	1.7	0	9	14.6	0.0	90.0	57.0	40.3	76.3	30	1	100
Local Produce Link	–	–	–	–	–	–	–	–	–	–	–	–
Detailed item category												
Fresh produce	0.7	0	4	5.2	0.0	21.1	100.0	100.0	100.0	100	100	100
Processed produce	4.0	1	7	37.4	25.0	70.0	65.4	37.8	86.9	80	4	100
Whole-grain products	0.8	0	3	6.5	0.0	20.0	93.1	93.0	93.3	93	93	94
Nuts	–	–	–	–	–	–	–	–	–	–	–	–
Cheese/yogurt	–	–	–	–	–	–	–	–	–	–	–	–

Table 4 (continued)

Item characteristic	Number of items			Percentage of offerings			NuVal® scores by pantry			NuVal® across all pantries		
	Mean n across pantries	Min n at any pantry	Max n at any pantry	Mean % across pantries	Min % at any pantry	Max % at any pantry	Mean of all pantries' mean scores	Mean of all pantries' min score	Mean of all pantries' max score	Median score	Min score	Max score
Red/processed meats	0.5	0	1	7.2	0.0	50.0	26.0	26.0	26.0	24	20	31
Fish	0.7	0	3	5.1	0.0	13.0	68.2	60.8	75.2	71.5	51	91
Poultry	0.5	0	1	3.8	0.0	11.1	28.4	28.4	28.4	25	20	43
Beans, lentils, legumes	0.8	0	3	8.5	0.0	33.3	75.2	68.4	81.0	84	29	100
Salty snacks	–	–	–	–	–	–	–	–	–	–	–	–
Sweet	0.5	0	2	3.8	0.0	12.5	4.1	4.0	4.3	3	1	12
Other refined-grain item	1.5	0	5	11.2	0.0	25.0	56.5	42.1	73.0	65	9	84
Milk	0.5	0	1	3.7	0.0	11.1	89.0	89.0	89.0	89	89	89
100% juice	0.5	0	2	3.1	0.0	11.1	9.3	9.0	9.5	10	6	12
Sugary drinks	0.3	0	1	4.5	0.0	33.3	2.0	2.0	2.0	2	2	2
Diet drinks	–	–	–	–	–	–	–	–	–	–	–	–
Water/carbonated water	–	–	–	–	–	–	–	–	–	–	–	–

Pre-filled bags could reportedly vary in terms of size and content based on a client's position in line; the values in this table are based on items pantry workers reported as among those that would be available to clients in the first bags of the day

Table 5 Type, sources, and nutrition quality of foods and drinks from Bronx food pantries using traditional prefilled bags (n = 12 pantries); foods reportedly available to clients near the back of the line

Item characteristic	Number of items			Percentage of offerings			NuVal® scores by pantry			NuVal® across all pantries		
	Mean n across pantries	Min n at any pantry	Max n at any pantry	Mean % across pantries	Min % at any pantry	Max % at any pantry	Mean of all pantries' mean scores	Mean of all pantries' min score	Mean of all pantries' max score	Median score	Min score	Max score
Total items	9.0	1	23	100.0	100.0	100.0	60.7	13.8	89.8	83	1	100
Food or drink												
Food items	7.9	1	21	85.3	50.0	100.0	66.4	28.5	89.8	84	1	100
Drink items	1.1	0	2	14.7	0.0	50.0	37.6	17.6	57.6	11	2	89
Item form												
Fresh	0.3	0	1	9.7	0.0	100.0	100.0	100.0	100.0	100	100	100
Refrigerated or frozen	–	–	–	–	–	–	–	–	–	–	–	–
Shelf stable	8.8	0	23	90.3	0.0	100.0	56.7	6.0	88.9	77	1	100
Food-group category												
Fruit	1.8	0	4	22.6	0.0	100.0	55.1	31.3	75.0	62	4	99
Vegetable	2.0	0	5	29.2	0.0	100.0	78.9	66.5	88.3	95	10	100
Grain	2.1	0	8	15.6	0.0	34.8	73.8	56.3	88.6	84	9	94
Dairy	0.4	0	1	3.7	0.0	11.1	89.0	89.0	89.0	89	89	89
Protein	1.8	0	7	19.9	0.0	50.0	54.4	39.8	67.1	62	24	100
Other	0.8	0	3	9.1	0.0	33.3	8.4	6.3	10.4	3	1	29
Item source												
Food bank	7.8	0	23	74.1	0.0	100.0	60.4	6.2	91.6	84	1	100
City Harvest	0.2	0	1	1.4	0.0	10.0	100.0	100.0	100.0	100	100	100
Corporations/businesses	0.5	0	6	4.2	0.0	50.0	18.7	1.0	29.0	21.5	1	29
Local Produce Link	–	–	–	–	–	–	–	–	–	–	–	–
Detailed item category												
Fresh produce	0.3	0	1	9.7	0.0	100.0	100.0	100.0	100.0	100	100	100
Processed produce	3.2	0	7	35.2	0.0	70.0	69.7	44.8	85.5	88	4	100
Whole-grain products	0.8	0	3	6.0	0.0	20.0	93.1	93.0	93.3	93	93	94
Nuts	–	–	–	–	–	–	–	–	–	–	–	–

Table 5 (continued)

Item characteristic	Number of items			Percentage of offerings			NuVal® scores by pantry			NuVal® across all pantries		
	Mean n across pantries	Min n at any pantry	Max n at any pantry	Mean % across pantries	Min % at any pantry	Max % at any pantry	Mean of all pantries' mean scores	Mean of all pantries' min score	Mean of all pantries' max score	Median score	Min score	Max score
Cheese/yogurt	–	–	–	–	–	–	–	–	–	–	–	–
Red/processed meats	0.3	0	1	5.4	0.0	50.0	26.3	26.3	26.3	24	24	31
Fish	0.4	0	3	2.9	0.0	13.0	72.8	67.0	78.0	77	58	91
Poultry	0.4	0	1	3.8	0.0	11.1	29.4	29.4	29.4	25	25	43
Beans, lentils, legumes	0.8	0	3	8.4	0.0	33.3	78.6	66.6	89.6	92	29	100
Salty snacks	–	–	–	–	–	–	–	–	–	–	–	–
Sweet	0.5	0	2	4.3	0.0	12.5	8.1	8.0	8.2	7	1	24
Other refined-grain item	1.3	0	5	9.7	0.0	25.0	64.9	51.0	81.3	65	9	84
Milk	0.4	0	1	3.7	0.0	11.1	89.0	89.0	89.0	89	89	89
100% juice	0.4	0	1	6.9	0.0	50.0	9.6	9.6	9.6	10	6	12
Sugary drinks	0.3	0	1	4.1	0.0	33.3	2.0	2.0	2.0	2	2	2
Diet drinks	–	–	–	–	–	–	–	–	–	–	–	–
Water/carbonated water	–	–	–	–	–	–	–	–	–	–	–	–

Pre-filled bags could reportedly vary in terms of size and content based on a client's position in line; the values in this table are based on items pantry workers reported as among those that would be available to clients in the last bags of the day

Table 6 Type, sources, and nutrition quality of foods and drinks from Bronx food pantries for using 'client choice' (n=9 pantries); foods reportedly available to clients near the front of the line

Item characteristic	Number of items			Percentage of offerings			NuVal® scores by pantry			NuVal® across all pantries		
	Mean n across pantries	Min n at any pantry	Max n at any pantry	Mean % across pantries	Min % at any pantry	Max % at any pantry	Mean of all pantries' mean scores	Mean of all pantries' min score	Mean of all pantries' max score	Median score	Min score	Max score
Total items	34.6	9	65	100.0	100.0	100.0	69.8	5.7	100.0	84	1	100
Food or drink												
Food items	31.0	8	60	89.9	84.6	96.7	72.9	6.8	100.0	88	1	100
Drink items	3.6	1	10	10.1	3.3	15.4	49.5	29.2	70.8	24	2	100
Item form												
Fresh	10.1	1	30	28.3	4.5	55.6	93.4	64.4	100.0	100	2	100
Refrigerated or frozen	0.4	0	2	1.1	0.0	6.5	45.0	22.5	67.5	37	7	99
Shelf stable	24.0	4	56	70.6	44.4	95.5	59.8	5.7	99.0	76	1	100
Food-group category												
Fruit	7.2	2	17	22.1	9.2	36.4	53.5	6.6	99.7	37	1	100
Vegetable	12.0	3	28	35.7	13.6	66.7	92.5	61.0	100.0	100	20	100
Grain	6.4	0	22	17.3	0.0	33.8	56.6	21.5	85.0	65	8	94
Dairy	1.6	0	4	3.8	0.0	6.5	86.9	80.7	94.1	89	38	100
Protein	5.4	1	13	16.6	6.5	31.8	66.4	37.2	89.1	77	25	100
Other	1.9	0	5	4.4	0.0	7.7	11.8	7.4	16.7	10	1	28
Item source												
Food bank	12.6	0	53	37.2	0.0	85.7	67.5	21.5	96.5	83.5	1	100
City Harvest	5.8	0	24	12.8	0.0	51.1	77.7	19.2	99.8	100	2	100
Corporations/businesses	1.6	0	5	9.2	0.0	55.6	61.4	44.0	81.3	79.5	23	100
Local Produce Link	0.8	0	4	3.0	0.0	14.3	100.0	100.0	100.0	100	100	100
Detailed item category												
Fresh produce	9.3	1	30	26.5	4.5	55.6	99.5	96.0	100.0	100	88	100
Processed produce	8.6	2	17	26.2	16.9	32.3	66.2	19.2	97.9	83	1	100
Whole-grain products	1.7	0	5	4.9	0.0	14.3	75.9	57.8	92.0	93	38	94
Nuts	–	–	–	–	–	–	–	–	–	–	–	–
Cheese/yogurt	0.3	0	2	0.9	0.0	6.5	68.5	38.0	99.0	68.5	38	99

Table 6 (continued)

Item characteristic	Number of items			Percentage of offerings			NuVal® scores by pantry			NuVal® across all pantries		
	Mean n across pantries	Min n at any pantry	Max n at any pantry	Mean % across pantries	Min % at any pantry	Max % at any pantry	Mean of all pantries' mean scores	Mean of all pantries' min score	Mean of all pantries' max score	Median score	Min score	Max score
Red/processed meats	0.4	0	1	2.4	0.0	11.1	28.0	28.0	28.0	28	25	31
Fish	1.4	0	2	4.8	0.0	9.5	71.9	62.7	81.0	77	51	91
Poultry	0.4	0	1	1.2	0.0	4.5	27.8	27.8	27.8	25	25	36
Beans, lentils, legumes	3.2	0	11	8.4	0.0	18.2	86.0	59.7	100.0	84	28	100
Salty snacks	–	–	–	–	–	–	–	–	–	–	–	–
Sweet	0.8	0	2	2.3	0.0	6.7	9.0	6.4	11.6	4	1	24
Other refined-grain item	4.8	0	17	12.4	0.0	26.2	49.0	21.5	77.8	51	8	93
Milk	1.2	0	3	2.9	0.0	4.8	90.0	87.8	93.3	89	82	100
100% juice	1.6	0	4	5.7	0.0	13.6	19.6	15.0	24.8	24	6	29
Sugary drinks	0.7	0	3	1.3	0.0	4.6	9.3	8.0	10.5	10	2	20
Diet drinks	0.1	0	1	0.2	0.0	1.5	–	–	–	–	–	–
Water/carbonated water	–	–	–	–	–	–	–	–	–	–	–	–

Options available for selection in a 'client choice' model often reportedly depended on a client's position in line; the values in this table are based on items pantry workers reported as among those that would be available to clients at the start of a pantry session

Table 7 Type, sources, and nutrition quality of foods and drinks from Bronx food pantries for using 'client choice' (n=9 pantries); foods reportedly available to clients near the back of the line

Item characteristic	Number of items			Percentage of offerings			NuVal® scores by pantry			NuVal® across all pantries		
	Mean n across pantries	Min n at any pantry	Max n at any pantry	Mean % across pantries	Min % at any pantry	Max % at any pantry	Mean of all pantries' mean scores	Mean of all pantries' min score	Mean of all pantries' max score	Median score	Min score	Max score
Total items	11.0	2	20	100.0	100.0	100.0	80.7	34.2	100.0	91	1	100
Food or drink												
Food items	10.0	2	18	92.1	84.6	100.0	80.4	34.2	100.0	93	1	100
Drink items	1.0	0	2	7.9	0.0	15.4	75.8	65.0	86.7	85.5	24	89
Item form												
Fresh	3.0	1	5	39.7	14.3	100.0	99.9	99.6	100.0	100	99	100
Refrigerated or frozen	–	–	–	–	–	–	–	–	–	–	–	–
Shelf stable	8.0	0	17	60.3	0.0	85.7	67.9	17.8	98.5	84	1	100
Food-group category												
Fruit	1.8	0	4	11.7	0.0	23.1	70.4	42.3	99.7	62.5	4	100
Vegetable	4.2	1	7	47.3	14.3	100.0	93.5	71.6	100.0	100	40	100
Grain	2.4	0	5	21.0	0.0	57.1	69.7	24.0	93.3	88.5	15	94
Dairy	0.6	0	1	5.4	0.0	14.3	86.7	86.7	86.7	89	82	89
Protein	1.8	0	3	13.5	0.0	23.1	58.4	52.3	64.8	77	28	100
Other	0.2	0	1	1.0	0.0	5.0	1.0	1.0	1.0	1	1	1
Item source												
Food bank	6.0	0	17	44.9	0.0	85.7	70.0	17.3	98.0	86	1	100
City Harvest	1.2	0	3	27.5	0.0	100.0	100.0	100.0	100.0	100	100	100
Corporations/businesses	0.4	0	2	3.1	0.0	15.4	79.5	75.0	84.0	79.5	75	84
Local Produce Link	0.6	0	3	3.0	0.0	15.0	100.0	100.0	100.0	100	100	100
Detailed item category												
Fresh produce	3.0	1	5	39.7	14.3	100.0	99.9	99.6	100.0	100	99	100
Processed produce	2.6	0	6	16.8	0.0	38.5	69.8	32.0	97.0	69	4	100
Whole-grain products	1.4	0	4	15.0	0.0	57.1	88.5	74.7	93.3	93	38	94
Nuts	–	–	–	–	–	–	–	–	–	–	–	–
Cheese/yogurt	–	–	–	–	–	–	–	–	–	–	–	–

Table 7 (continued)

Item characteristic	Number of items			Percentage of offerings			NuVal® scores by pantry			NuVal® across all pantries		
	Mean n across pantries	Min n at any pantry	Max n at any pantry	Mean % across pantries	Min % at any pantry	Max % at any pantry	Mean of all pantries' mean scores	Mean of all pantries' min score	Mean of all pantries' max score	Median score	Min score	Max score
Red/processed meats	0.2	0	1	1.5	0.0	7.7	31.0	31.0	31.0	31	31	31
Fish	0.4	0	2	2.0	0.0	10.0	84.0	77.0	91.0	84	77	91
Poultry	–	–	–	–	–	–	–	–	–	–	–	–
Beans, lentils, legumes	1.2	0	3	10.0	0.0	23.1	60.8	58.0	64.3	79.5	28	100
Salty snacks	–	–	–	–	–	–	–	–	–	–	–	–
Sweet	0.2	0	1	1.0	0.0	5.0	1.0	1.0	1.0	1	1	1
Other refined-grain item	1.0	0	3	6.1	0.0	15.4	48.3	17.0	84.0	36	15	84
Milk	0.6	0	1	5.4	0.0	14.3	86.7	86.7	86.7	89	82	89
100% juice	0.4	0	1	2.5	0.0	7.7	24.0	24.0	24.0	24	24	24
Sugary drinks	–	–	–	–	–	–	–	–	–	–	–	–
Diet drinks	–	–	–	–	–	–	–	–	–	–	–	–
Water/carbonated water	–	–	–	–	–	–	–	–	–	–	–	–

Options available for selection in a 'client choice' model often reportedly depended on a client's position in line; the values in this table are based on items pantry workers reported as among those that would be available to clients at the end of a pantry session

Table 8 Highest, median, and lowest-nutrition items, and best and worst-case nutritional quality for a 'balanced basket'[a] from Bronx food pantries (n = 21)[b]

Food-pantry items by MyPlate.gov food-group categories	NuVal® score					
	Across all pantries	Across all prefilled-bag pantries	Across all 'client choice' pantries	Mean of all pantries' highest or lowest score	Mean of all prefilled-bag pantries' highest or lowest score	Mean of all 'client choice' pantries' highest or lowest score
Highest-NuVal® item						
Fruit	100	100	100	82.2	69.1	99.7
Vegetable	100	100	100	93.9	89.3	100.0
Grain	94	94	94	78.3	73.5	75.6
Dairy	100	89	100	85.2	76.3	82.4
Protein	100	100	100	77.2	68.3	89.1
Basket of all 5 items (mean)	98.8	96.6	98.8	83.4	75.3	89.3
Median-NuVal® item						
Fruit	37	37	37	52.7	47.9	37
Vegetable	100	99	100	89.1	82.1	100
Grain	65	84	65	60.5	60.8	65
Dairy	89	44.5	89	77.3	76.3	89
Protein	75	51.5	77	59.8	52.6	75
Basket of all 5 items (mean)	73.2	63.2	73.6	67.9	63.9	73.2
Lowest-NuVal® item						
Fruit	0	0	1	17.7	26.1	6.6
Vegetable	10	10	20	62.6	65.4	58.8
Grain	0	0	0	35.1	45.0	19.1
Dairy	0	0	0	74.1	76.3	63.0
Protein	20	20	25	36.8	36.5	37.2
Basket of all 5 items (mean)	6.0	6.0	9.2	45.3	49.9	36.9

[a]A 'balanced basket' is a hypothetical bundle of five items, one from each of the five MyPlate.gov food-group categories of fruit, vegetable, grain, dairy, and protein

[b]Analyses here were imputed for pantries not offering at least one of item from each of the 5 MyPlate.gov food-group categories: six pantries operating by a prefilled-bag model and two pantries operating by a client-choice model. For imputation, NuVal® scores were set to zero for missing items

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