

Nutrition and Very-Perishable Food Rescue

A study on the contributions of fresh produce to one relief agency in Boulder, Colorado

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Abstract

The purpose of this report is to examine the effect that recovery of culled produce from grocery stores has on the quantity of fresh fruits and vegetables available in meals served by one relief agency in Boulder, Colorado. Boulder Food Rescue uses a just-in-time model to recover fragile, highly perishable produce that is frequently not collected by traditional food rescue and relief organizations and delivers it directly to recipients. One of those recipients, Bridge House, is a day shelter that serves approximately 1,000 meals a week to homeless and working poor individuals. These two organizations recorded the ingredients and the donor of those ingredients in each Bridge House meal served for eight weeks (February and March, 2012). Boulder Food Rescue contributed 600 lbs of produce a week, representing 66% of the fresh fruits and vegetables served, equivalent to between two and three servings of fruits and vegetables per meal, and was the only food-rescue source for many of these items. Results show that the just-in-time food rescue model can supplement traditional food relief organizations by supplying fresh fruit and vegetables in the winter months when it would have been otherwise cost prohibitive.

Limitations of the current study

The current research occurred during the winter months over an eight-week period. During other months of the year, fresh produce is more readily available to traditional rescue organizations, such as food banks, when food is grown in closer proximity. Food banks purchase and distribute thousands of pounds more produce during the summer than the winter. Therefore, a summer survey would likely show a greater contribution from food bank sources. Yet, many relief organizations are constrained by small amounts of storage space and limited access to commercial kitchens, which constrains what they can pick up on a trip to the food bank. With better storage, relief agencies would likely utilize more fresh produce both from food banks and other rescue organizations. BFR's multi-day delivery schedule of manageable amounts of produce contributes to an agency's ability to utilize more fruits and vegetables within a day or two throughout the week. Additional research is needed to examine the effects of frequent, smaller deliveries on agencies

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throughout the year.

Introduction

Boulder Food Rescue (BFR) is a food recovery organization that collects produce from grocery stores that would otherwise be composted due to imperfections or nearness to expiry, and delivers it directly to relief agencies. Although many grocers contribute perishable items to food banks (see, e.g., (Feeding America, 2012)), BFR specifically recovers food that is considered too fragile for these traditional food rescue systems. Culled food, mainly nutritious shelf-stable produce from large displays in grocery stores (Gunders, 2012), is effectively recovered from the waste stream with minimal handling and is then redistributed to agencies in manageable quantities that can be used in one to two days. At certain times of the year, this food represents the majority of the produce available to these organizations.

The aim of this work is to measure the effect of a just-in-time fresh-food rescue model on one organization to evaluate the potential of this food recovery model for other relief agencies. One of BFR's main recipients is Bridge House, the day shelter in Boulder, CO that provides services for homeless and working poor individuals. Through February and March, 2012, BFR and Bridge House conducted a study to determine how BFR donations affected the quantity of fresh produce included in Bridge House meals. For eight weeks, Bridge House and BFR recorded the pounds of produce that BFR delivered to Bridge House each week and the individual ingredients included in all meals prepared at the Bridge House. The donating source for each ingredient was also recorded.

The dynamic environment in which the meals are prepared and the limited resources available to conduct this study presented measurement challenges. This document describes the parameters of the study and its outcomes, including the methodology used to collect data in a fast-paced, food-production environment. The results presented here include the amount of produce that BFR delivered to Bridge House each week as well as how this food was used in individual meals. The source of other ingredients (dairy, grains, and protein) in Bridge House meals was also evaluated to show all contributors to the nutritional quality of the meals.

Methods

Boulder Food Rescue

Boulder Food Rescue (BFR) is a non-profit food recovery organization in Boulder, Colorado that was founded in August 2011 to fill gaps in the food-recovery process. BFR rescues and redistributes perishable food "waste" to nonprofit organizations that serve the homeless, hungry, at-risk, and low-income populations in Boulder. BFR is frequently the only source of these fresh and healthful foods for recipients due to the cost of purchasing and transporting these items in the winter and the difficulty of rescuing these foods using a traditional food bank model. BFR also sets itself apart from other food rescue organizations by transporting the food with bicycles and trailers whenever possible.

In the first year of its existence, BFR ballooned from a small organization with a few dedicated volunteers to more than 100 active volunteers. The organization rescued over 170,000 lbs of food from 16 donors, including grocery stores, bakeries, and restaurants, and distributed it to over 40 different recipients at a rate of 50 to 1,000 lbs of food per week, per recipient. Recipients include homeless shelters, soup kitchens, low-income elderly homes, and low-income schools. Currently, approximately 25,000 lbs of food are rescued per month.

Bridge House

One of BFR's biggest recipients is Bridge House, a non-profit organization in Boulder, Colorado that provides assistance to homeless and working poor individuals. Bridge House provides services that address immediate survival needs, such as food and shelter, and Ready to Work, a job readiness and training program, as well as other resources that lead to employment, housing, personal stability, and healing. In 2011, Bridge House recorded 38,000 visits from individuals seeking employment services, medical services, mental health support, and substance abuse counseling. Bridge House is the sole relief agency in Boulder County providing breakfast, lunch, and dinner 52 weeks a year for single adults. The Bridge House's strategic plan for 2013 includes a shift in its food program from a traditional soup kitchen model to a social enterprise, including a food service and training and employment program, and in-house and outside catering.

In 2011, Bridge House served 58,250 meals (1,120 meals a week), including breakfast and lunch on five days a week, and dinner on four days a week and every other Friday. The primary contributors of food for these meals are Community Food Share (the food bank for Boulder and Broomfield Counties), Boulder Food Rescue, and Olive Garden through its national program initiative to feed the hungry and reduce waste. Additional donations also come from local businesses. At the beginning of each week, the Nutrition Director together with approximately 15 community volunteers and 5 Bridge House Ready to Work trainees prepare the meals for the week using a menu built from the ingredients available at hand. However, the menu and the exact ingredients in each dish are subject to change to accommodate additional ingredients.

Data collection

In designing the data collection methods for this study, several methods for measuring the contents of the meals were considered. Calculating the nutritional value of a meal requires knowing the amount of each ingredient included and the nutrient content of the ingredient (Tse, 2008). Unfortunately, neither the Bridge House nor BFR had the personnel resources for this approach. Interrupting the meal preparation to weigh each ingredient would have caused significant delays in the process. Additionally, the exact amount of each ingredient could change from one serving to the next as the availability of ingredients varied, requiring that multiple servings of the same dish would need to be measured.

The data collection method used for this study was to record the individual ingredients included in each meal, but not their amounts. This methodology is similar to those of the ANDI and NuVal/ONQI scores used to rate foods in some grocery stores (NuVal, 2012; Katz, 2007; Nutrient Density, 2012). These scoring systems assign a value to foods using the ratio of nutrients in the food that are known to have positive health effects to those that have negative health effects. Foods that are high in positive nutrients, such as iron, fiber, and calcium, for example, have a higher score than foods that are high in negative nutrients, such as salt, fat, and sugar. The quantity of the food does not affect its score, or the score of the meal in which it is included, e.g. a meal either has broccoli or it does not. Using this approach, we can accurately record the ingredients in the meal and provide a coarse evaluation for the nutritional value of the meal.

The scoring methods used here rate food differently. For the ANDI scale, scores range from 1 – 1000, with foods such as kale receiving a 1000 and milk receiving a 28. This score range highlights one of the problems with the ANDI score: foods that are high in some good nutrients can still have very low ANDI scores². For the NuVal scale, scores range from 1 – 100. Fruits and vegetables have scores typically between 90 and 100. Milk has a score between 55 and 91 depending on fat content, cooked chicken has a score of 39, and processed snack foods have a score less than 10. NuVal is a measure of individual foods, but not necessarily whether that food is part of a balanced diet. For example, a diet consisting only of kale would have a perfect NuVal score, but would be less healthy than one that included a variety of foods from all food groups.

In addition to the ANDI and NuVal scales, we have also included a very different metric derived from work by researchers at the Harvard Business School (HBS) to model nutrition experts' opinions on the health value of various foods (Martin, 2008). In that work, researchers surveyed 57 nutrition experts as to their opinion on 205 sample foods/beverages, and performed a least squares fit to the responses. The resulting metric ranges from approximately -5 (very unhealthy) to 5 (very healthy), and each value corresponds to the average predicted rating of foods using per-ingredient fitted parameters.

In the current study, meals served by Bridge House typically feature two options for a main dish (one vegetarian), two side dishes, such as hard boiled eggs, salad, and canned vegetables, a beverage (coffee, tea, and milk), and a dessert. To record the ingredients in the main dishes, Bridge House and BFR developed a data sheet that listed the commonly used ingredients in Bridge House meals (included as Appendix 1). The ingredients were divided into five categories – grains, protein, dairy, vegetables, and fruit. For each meal served between February 5, 2012 and March 27, 2012, the ingredients in the main dishes, the source of the ingredients,

² As compared to NuVAL/ONQI and HBS scores, ANDI scores do not appear to have been rigorously evaluated by nutrition experts. We have included them here for comparison due to their popularity with grocers (e.g., Whole Foods Market).

and an estimate of the amount of the ingredient as a percentage of the meal were recorded. There were six primary sources for the food: BFR, Community Food Share (the local food bank), Olive Garden, Rudi's Organic Bakery, store purchased, and other local restaurants.

A second data sheet was used to collect information about the other food served with the meal, including side dishes, beverage, and dessert (included in Appendix 2). In cases where a side dish had multiple ingredients, such as a fruit salad, all unique ingredients and the source of those ingredients were recorded.

Results and discussion

During the study period, BFR delivered an average of 600 lbs of food a week to Bridge House, consisting primarily of produce. Upon delivery, the produce was hand sorted by Bridge House and approximately 90% was retained for use, with damaged items being composted. These deliveries contributed an average of 0.54 lbs of produce to each meal as ingredients used in main dishes and fruit provided as a side dish to the main meal. To put this in the perspective of the number of servings, 0.54 lbs is the equivalent of just under three, three-ounce servings: an additional two to three servings of produce were added to each meal divided between the two main dishes and the side dishes.

The produce from BFR was a considerable portion of the total produce received from all donors. Table 1 shows the five categories of food included in the main dishes and the sources for the food. The numbers in the table are the percentage of food over the study period that came from BFR and all other sources. These data show that 66.4% of the fruit and 66.7% of the vegetables in the Bridge House main dishes were provided by BFR. Also evident in these data is a complimentary relationship between BFR and the other donors. While BFR provided produce, CFS provided dairy (68.9%), grains (56.5%), and protein (61.4%). The BFR model does not include storing and delivering the dairy and protein needed for a balanced meal.

The seasonality of this study is again important to note. In the summer months, when produce is cheaper, CFS is able to purchase these items and make them available to organizations like the Bridge House. However, in the winter months when this study was conducted, CFS does not purchase produce other than potatoes, carrots, and other root vegetables due to the high cost. The produce that BFR provided was the primary food-rescue source available for Bridge House.

A similar pattern existed when the entire meal, including side dishes and beverages, were included in the results, as shown in Table 2. CFS contributed canned fruits and vegetables as side dishes to the meals, increasing their contribution percentage of these items. The fruit contribution from BFR also increased as a result of the fruit available with the meals as a side dish. The Dairy contribution from CFS increased as a result of the milk available at each meal donated by a local dairy (Horizon Organic).

Table 1. Percentage of each food category contributed by BFR and all other sources. The sources in the all other category are Community Food Share, Olive Garden, Rudi's Organic Bakery, and store purchased.

	Veggies	Fruit	Dairy	Grains	Protein
BFR	66.4	66.7	4.4	13.0	2.9
All other sources	33.6	33.3	95.6	87.0	97.1

Table 2. Percentage of each food category contributed by BFR and all other sources to the entire meal, including the main dishes and side dishes. The sources in the all other category are Community Food Share, Olive Garden, Rudi's Organic Bakery, and store purchased.

	Veggies	Fruit	Dairy	Grains	Protein
BFR	54.6	68.9	3.8	15.1	4.2
All other sources	45.4	31.1	96.2	84.9	95.8

Table 3 shows the number of ingredients contributed by each source and the mean and total ANDI, NuVal, and HBS scores of those ingredients per source. The ingredients here include both those in the main dishes and the side dishes. In these data, an ingredient is counted each time it is used in a meal, e.g. if tomatoes are used in five meals, then they are listed here as five ingredients. These data do not include the amount of each ingredient.

Table 3. The number of ingredients included in all meal items and their values from ANDI, NuVal, and HBS scoring metrics provided by all food sources. The sources here are Community Food Share (CFS), Boulder Food Rescue (BFR), Olive Garden (OG), and store purchased (SP).

	Number of ingredients	Mean/sum ANDI score	Mean/sum NuVal score	Mean/sum HBS score
BFR	150	165 / 22,639	87 / 12,244	1.74 / 251
All other sources	366	59 / 14,347	54 / 14,633	0.73 / 249

BFR contributed 150 ingredients and 366 ingredients came from all other sources. When the three scoring metrics are used, the BFR ingredients had a higher value for all metrics due to the high value assigned to fruits and vegetables in all three systems. For example, the mean NuVal scores were 87 for BFR and 54 for all other sources. This does not imply that the BFR contributions were better than those from other donors, only that they fulfill a different need. In the NuVal system, fruits and vegetables receive a higher score than protein, dairy, and grains. However, a balanced diet requires all of these things: a diet consisting of only fruits and vegetables may not provide a sufficient level of energy, particularly given the greater nutritional requirements of typical homeless individuals as compared to the

general population (Tse, 2008).

Although we did not measure the servings of ingredients in each meal, there are still several things that can be said about the nutritional value of the food. For instance, we know that an 8-oz glass of milk is offered with every meal – one serving. Therefore, the dairy available at each meal is at least one, which is already greater than the 0.45 servings observed in the studies in (Tse, 2008). It also appears that fresh food rescue greatly increases the variety and availability of vegetables in some dishes. For instance, “Veggie Pasta” is a dish regularly paired that supplements white and whole wheat pasta (from CFS) and a soup base (from Olive Garden) with fresh vegetables provided by BFR. On February 6th, for instance, this dish included brussel sprouts, carrots, eggplant, garlic, peppers, tomatoes, and zucchini. These vegetables are an important supplement given the specific nutritional demands of the population served by the Bridge House and serves to address the USDA recommendation that all Americans should increase their intake of fresh fruits and vegetables (USDA, 2010).

Conclusion

In this study, we found a complimentary relationship between two food recovery agencies – Boulder Food Rescue that uses a just-in-time model to recover fresh fruits and vegetables, and the local Feeding America food bank, Community Food Share, that purchases and collects food at a central warehouse and then redistributes it.

This work is a first step in the direction of quantifying the nutritional impact of direct “just in time” food rescue, and how this model can help supplement the food provided by traditional food relief organizations. Although Boulder Food Rescue is not the only just-in-time food rescue organization³, it is one of a very few that exist nationally, where many urban areas are served by a single large food bank using a traditional recovery and storage model. We believe that there is great opportunity for reducing food system waste through food rescue and redistribution, and that the greatest rewards, particularly with fresh healthful and often soon to expire food, will be attained through careful minimization of transportation and storage time during food recovery along with frequent, flexible delivery times with manageable quantities (Phillips, 2011). We believe this work also helps to demonstrate that efficient solutions to the complex time-sensitive problem of food recovery and redistribution likely require the cooperation of multiple organizations operating at different scales using different mechanisms for rescue and distribution. In future work we hope to expand what we have done to include additional food recipients in our study, including food pantries and low-income housing organizations, as well as refine our measurement methodology for the logistical challenges presented by these new areas.

³ City Harvest, of New York City, is the largest direct food recovery and redistribution program nationally.

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Appendix 1

BOULDER FOOD RESCUE – FOOD CHECKSHEET

Name of Dish (e.g. Mac n' Cheese): _____

Size (e.g. ½ large tray): _____ Date: ____/____/____

Est. %	Item	Source
	GRAINS	
	Bread/rolls/bagels – white flour	
	Bread/rolls/bagels – other than white flour	
	Cereal	
	Cornmeal	
	Crackers	
	Flour, white	
	Flour, whole wheat	
	Pasta, white	
	Pasta, whole wheat	
	Rice, brown	
	Rice, white	
	Seeds (sesame, quinoa, flax)	
	Tortillas, corn	
	Tortillas, flour	
	Other: _____	
	PROTEIN	
	Beans (pinto, fava, soy/edamame)	
	Beef	
	Cold cuts/cured meat (salami, pastrami)	
	Chicken	
	Eggs	
	Fish	
	Lamb	
	Peanuts	
	Tree nuts (almonds, cashews)	
	Pork/Ham	
	Tofu/Tempeh	
	Turkey	
	Veal	
	Other: _____	
	DAIRY	
	Butter	
	Cheese – soft (cottage, ricotta, queso fresco, cream cheese)	
	Cheese – hard (jack, cheddar, provolone)	
	Cheese – processed (american, velveta)	
	Milk	
	Milk	
	Milk - soy	
	Sour cream	
	Other: _____	

Est. %	Item	Source
	VEGGIES	
	Asparagus	
	Broccoli	
	Brussell sprouts	
	Cabbage	
	Carrots	
	Cauliflower	
	Celery	
	Corn	
	Cucumbers	
	Garlic	
	Greens (kale, chard)	
	Lettuce	
	Mushrooms	
	Okra	
	Onions	
	Peas	
	Peppers	
	Potatoes – white	
	Potatoes – sweet or yam	
	Root vegetables (turnips, rutabaga, parsnips, beets)	
	Spinach	
	Squash (winter, butternut, acorn)	
	String beans	
	Tomatoes	
	Other: _____	
	FRUIT	
	Apples	
	Bananas	
	Berries (strawberries, blueberries, raspberries)	
	Citrus (oranges, lemons, grapefruit, limes)	
	Grapes	
	Mangos	
	Melons (watermelon, cantalope)	
	Papayas	
	Pears	
	Pineapple	
	Pomegranates	
	Stone fruit (peaches, apricots, plums, cherries)	
	Other: _____	

Appendix 2

Community Table Meal Sheet

Date: ____ / ____ / ____

Meal: B / L / D

Main Dishes:

Sides: (List item and its main contents)

Beverages:
