



## Factors associated with the healthfulness of food shelf orders



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### ABSTRACT

Food shelves are placing increased emphasis on the healthfulness of the food they offer to clients. This paper presents an analysis of foods ordered from food banks by 110 food shelves in Minnesota and western Wisconsin in 2013. We examine whether and how food shelves' Healthy Eating Index scores for ordered food are associated with food shelf size and sourcing patterns, food bank providers, food shelf policies, food shelf manager characteristics, client characteristics and community-level demographics. We find a significant positive relationship between annual order quantity and the HEI-2010 score for ordered food. We also find strong associations between characteristics of the person placing food bank orders and the healthfulness of food ordered, which suggest that training programs designed to improve these individuals' skills and motivation for ordering a healthy assortment of foods may have an important impact. Finally, while the age structure of clients served does have a significant relationship with HEI-2010 scores, it is noteworthy that the ethnic profile of clients served by a food shelf does not have a strong relationship with the healthfulness of food ordered. This suggests that food shelves can respond successfully to wide variations in culturally based food preferences.

### 1. Introduction

Food shelves play an important role in meeting the nutrition needs of many food insecure households. The network of more than 39,000 food shelves affiliated with Feeding America, the largest anti-hunger organization in the country, served roughly 46 million people in 2014. Seventy-two percent of households served by food shelves in 2014 were below the federal poverty line and 85 percent were food insecure. Twenty-nine percent of individuals served were children under age 18, and 11 percent were seniors over age 65. Food shelves also serve a disproportionate number of African-American (26 percent of adults served) and Hispanic people (20 percent of adults served) relative to the general population. Finally, the self-reported health in the client population is poor. More than half (59 percent) of food shelf client households in 2014 have at least one person with high blood pressure, one in three clients (34 percent) report that someone in their household has been diagnosed with diabetes, and one in four clients (28 percent) report that they or another household member lacks any type of health insurance (Weinfield et al., 2014).

Over the last decade, hunger relief agencies have shifted their focus

from providing emergency food to households in times of crisis to being a regular source of food that supplements food purchases and food distributed through other feeding programs. As a result, food shelves are placing increased emphasis on the healthfulness of the food they offer to clients (Campbell et al., 2015). At the same time, because both food shelf offerings and client demand ultimately affect the healthfulness of food distributed, researchers have been working to identify food shelf operating policies regarding food procurement and the level of client choice as well as merchandising strategies that will encourage clients to make healthy food choices (Rochester et al., 2011; Handforth et al., 2013; Wilson, 2016; Wilson et al., 2016).

The nutritional quality of food in food shelves is often described as poor. For example, a survey of food pantry donations in 2008 showed donation boxes to be low in protein, vitamins, and whole grains and high in sugar, carbohydrates, and sodium (Companion, 2010). Several other studies report similar findings on the poor nutritional quality of food shelf offerings (Akobundu et al., 2004; Duffy et al., 2009).

Nanney et al. (2016) calculated Healthy Eating Index (HEI-2010) scores for food ordered by 269 food shelves from two major food banks based in Minnesota during 2013. Developed by the USDA Center for

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Nutrition Policy and Promotion (CNPP), the HEI-2010's scoring standards are derived from USDA's Food Patterns, a resource that translates key recommendations of the Dietary Guidelines for all Americans into specific types and quantities of food to consume. The 2010 version of the HEI generates 12 separate component scores, which aggregate to an overall HEI-2010 score on a 0–100 point scale. The closer the HEI-2010 score is to 100, the more balanced and healthful is the diet (Guenther et al., 2013). Food assortments are normalized by calories – i.e., nutrient levels and food pattern equivalents are assessed on a “per 1000 kcal” basis. As a result, the HEI-2010 can be applied in a wide variety of settings ranging from the assessment of food intake by an individual to the assessment of food offerings in a “food environment” (Guenther et al., 2014; Reedy et al., 2010). HEI scores have been shown to have a strong positive correlation with diet quality and associated health outcomes (Weinstein et al., 2004; Guo et al., 2004).

Nanney et al. (2016, p. 7) report an average overall HEI-2010 score of 62.7 for the food shelves in their study, with a range of scores from 28 to 82. Eighty-nine percent of food shelves had HEI-2010 scores in the “needs improvement” range of 51–79. Only two percent had scores in the “good” range (80 or greater) and nine percent had scores in the “needs substantial improvement” range (less than 51).<sup>3</sup> In this study we use a subset of the data collected by Nanney et al. (2016) to identify factors associated with the wide observed variations in HEI-2010 scores for food ordered from food banks.

This paper presents an analysis of foods ordered from food banks by food shelves in Minnesota and western Wisconsin in 2013. We examine whether and how food shelves' annual HEI-2010 scores for ordered food are associated with food shelf size and sourcing patterns, food bank providers, food shelf policies, food shelf manager characteristics, client characteristics and community-level demographics. In the sections that follow, we first introduce the study setting and describe general data collection procedures. Next, we present the conceptual framework for our analysis, provide details on variable definitions and data sources, and report descriptive statistics. We then specify the econometric model for our analysis, describe estimation procedures, and present results. We conclude with a discussion of implications of our findings.

## 2. Study setting and data collection

This paper reports results for a baseline analysis conducted at the outset of a randomized controlled trial (RCT) study designed to examine whether providing feedback on the nutritional quality of food in recent food bank orders to those responsible for food shelf ordering decisions would improve the nutritional quality of food in subsequent orders. Throughout this paper, we use the term *food shelf* to refer to an agency that distributes groceries directly to client families. While this term is commonly used in the Upper Midwest, these agencies are also referred to as *food pantries* or *food cupboards*. We use the term *food bank* to refer to a distribution center that distributes food to other hunger relief agencies but does not distribute food directly to client families.

Project partners included the University of Minnesota, Second Harvest Heartland (SHH), The Food Group (TFG), the United Way, and ICA Foodshelf. SHH and TFG are the two largest food banks in the State of Minnesota. Both United Way and ICA Foodshelf were previously University partners in a pilot study examining the healthfulness of food in food shelves. The University of Minnesota research team included principal investigators in Departments of Family Medicine and Applied Economics, a study coordinator, an information and programming specialist, two research assistants, and a biostatistician.

In late 2013, records provided by SHH and TFG listed a total of 395 food shelves in Minnesota and western Wisconsin that were served by one or both of the food banks in 2012. The contact lists also included

data on pounds of food distributed and the age structure of clients served. These food shelves distributed a total of 73.4 million pounds, averaging 185,928 lb per site. The 1,214,686 households they served were made up of 1,820,858 adults, 1,331,949 children, and 294,344 seniors – i.e., children and seniors, respectively, made up 38.6 and 8.5 percent of the population served.

In January and February 2014 these food shelves, which are considered to be the relevant population for this study, were surveyed using a two-stage, online procedure. The first-stage questionnaire was sent to 411 individuals identified as contacts for the 395 food shelves. This questionnaire asked the respondent to confirm the name and contact information of the person responsible for food shelf ordering and to express interest in participating in the study. Some errors and duplications in the original list of contacts were identified during this stage, and we received a total of 230 responses representing 193 food shelves.

In the second stage of the survey, we distributed a larger questionnaire designed to gather information about food shelf policies and characteristics of the person responsible for making food shelf ordering decisions to all sites that responded to the pre-survey. Of these 193 sites, 150 (77.7%) responded to the full survey. While the survey was distributed using 2012 food bank lists, the analysis was to be conducted using 2013 data. Therefore, eight food shelves were removed from the sample because they did not order food that could be scored from at least one food bank in 2013. Two additional sites were dropped because they had ceased operations by the beginning of 2014. Subsequently, several duplicate sites were identified and four sites asked to withdraw from the study. Finally, one food shelf that met all criteria for the study but did not have 2013 data on food distributed and the age structure of their population served was excluded from the sample. Therefore, the final sample for this analysis is 130 food shelves that ordered food in 2013, responded to the second stage questionnaire, and agreed to be part of the study.<sup>4</sup>

The food shelves in this study population place food bank orders electronically, selecting both free and for-purchase items from available food bank inventories. The frequency of orders and subsequent deliveries varies from weekly, to monthly, to once every several months. At the outset of the study, both SHH and TFG provided electronic copies of all invoices from all food shelves during the baseline year – January through December 2013. Subsequently, SHH and TFG provided electronic copies of invoices on a monthly basis through March 2015.

The University of Minnesota study team developed procedures and software tools for using the invoice data to calculate HEI-2010 scores. These procedures are more fully described in Nanney et al. (2016). Briefly, however, the process involved the following steps:

1. A registered dietitian mapped all the items in each food bank's inventory to food codes listed in the USDA Food and Nutrient Database for Dietary Studies (FNDDS-5.0) and Food Patterns Equivalent Database (FPED 2009-10) and converted quantity measures used on food bank invoices to the standard measures used in the FNDDS and FPED databases. These mappings were stored in an electronic file to be accessed during calculation of the HEI-2010. New inventory items were added monthly, and 10 percent of all coding entries were checked for accuracy by a second registered dietitian.
2. A JavaFX application developed for the study was used to parse the electronic invoices to extract food items and quantities and, using the FNDDS/FPED mapping, convert data on the food assortment into the nutrient component density data required for the HEI-2010 calculations.
3. The nutrient component density data were processed using modified

<sup>3</sup> These interpretive ranges are specified by Guenther et al. (2007, p. 1).

<sup>4</sup> The first and second stage survey instruments are available in a [supplementary online appendix](#).

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