

# Fresh Fruit and Vegetable Purchases in an Urban Supermarket by Low-income Households

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## ABSTRACT

**Objective:** To investigate the predictors of fresh fruit and vegetable purchases in a low-income population and identify subgroups in which interventions to increase such purchases might prove useful.

**Methods:** Retrospective analysis of 209 shopping transactions from 30 households. Individual and household characteristics obtained from primary shopper. Data collected covered April 1–June 30, 2010. Primary outcome was number of servings of fresh produce purchased per week. Bivariate and multivariable analyses were conducted.

**Results:** Controlling for household size, the average number of servings of fresh produce per week was higher in families with more children ( $P = .008$ ) and in families with a wider age range of children ( $P = .04$ ).

**Conclusions and Implications:** Households with more children purchased more fresh produce. Purchase data combined with shopper household characteristics helped to distinguish relatively high from low purchasers of fresh produce among low-income families.

**Key Words:** low-income population, fruit, vegetables, supermarkets, urban setting, child (*J Nutr Educ Behav.* 2013;45:165–170.)

## INTRODUCTION

Fruit and vegetable consumption for both adults and children in the United States (US) is below recommended levels of intake.<sup>1</sup> Only an estimated 33% of adults in the US consume the recommended servings of fruit and 26% consume the suggested amount of vegetables.<sup>2</sup> A large proportion of children in the US also eat less than the recommended amounts of fruit and vegetables.<sup>3</sup> The consumption of fruit and vegetables is associated with the prevention and management of obesity, diabetes, and cardiovascular disease. Low-income populations are disproportionately affected by these health conditions.<sup>4–7</sup>

Identifying effective strategies to promote healthier eating in low-

income populations is both a challenge and a public health priority. Supermarkets are important venues for interventions aimed at changing the food purchasing practices of large numbers of individuals and households.<sup>8–14</sup> Close to 60% of US shoppers report spending the majority of their grocery budget at a full-service supermarket.<sup>15</sup>

The primary objectives of this study were to determine the quantity of fresh fruit and vegetables purchased in low-income households and to identify which individual and household characteristics predicted higher average weekly purchases. Increased purchasing of fresh fruit and vegetables was expected to be observed in households in which the primary shopper was female, older, and

more educated. The feasibility of using individual store shoppers' purchase data for research purposes was also investigated.

## METHODS

### Setting

The study was conducted with adult shoppers ( $n = 30$ ) at a supermarket located in a low-income, minority neighborhood in northwest Philadelphia, PA. The supermarket was supported, in part, by the Pennsylvania Fresh Food Financing Initiative, a unique statewide program that provides financial assistance and tax credits to encourage the development of new supermarkets in underserved neighborhoods. When it opened in 2009, the supermarket put an end to 1 of Philadelphia's largest food deserts, bringing the northwest Philadelphia area its first supermarket in over 40 years. The store averages 10,000 transactions weekly. In addition to offering the full range of usual grocery staples, the supermarket also has an extensive prepared food department that includes a range of food items, including a sushi bar, a brick oven pizza station, salad bar, and a hot-food section. The majority of the employees (70%)

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reside in the neighborhoods surrounding the store. Shoppers are also primarily residents of this community.

### Recruitment and Eligibility

To quantify purchases of fresh fruit and vegetables, supermarket purchases needed to be linked to consumers who had store “loyalty cards.” In many supermarkets in the US, consumers may register with a store and receive savings or rewards based on their purchases. Each time they shop, they “swipe” their card at a point-of-sale magnetic strip card reader and their purchases are recorded with their shopper identification number. Thus, having a loyalty card at the study supermarket was 1 of the requirements for inclusion.

Participants were recruited on-site in front of the supermarket by members of the research team in 2010, from May through the end of June. To be eligible, in addition to having the loyalty card, each participant needed to be an adult, self-identified as the primary shopper for their household, and have at least 1 child (under 18 years of age) living at home full-time. In addition, he or she needed to do the majority of their grocery shopping at the study supermarket (based on self-report) and be capable of providing informed consent.

Eligible individuals provided consent for participation and for release of data on their previous shopping transactions. Individual and household sociodemographic characteristics were obtained in a brief interview conducted at the store following consent. Participants received a stipend of \$20. All study methods were approved by the Institutional Review Board of Einstein Healthcare Network.

To simplify the extraction of household shopping history data by supermarket personnel, all records were retrieved back to a fixed date (April 1, 2010). Thus, shopping transactions of all consenting participants covered a period from April 1, 2010 through their enrollment dates.

### Study Outcomes

The primary outcome was the number of servings of fresh fruit and vegetables purchased per week. In this report, servings refer to adult-size

servings of fresh fruit and vegetables. Servings were calculated based on the US Department of Agriculture Food Buying Guide for Child Nutrition Programs,<sup>16</sup> which provides the number of child servings of fruit and vegetables;<sup>16</sup> child serving sizes are different from serving sizes for adults.<sup>17,18</sup> To derive the number of adult servings, the number of US Department of Agriculture (child) servings was divided by 4 or 2, depending on the specific produce item. For example, the child serving size for apples is 1/4 cup, and it is 1 cup for adults. To obtain the number of adult servings of apples, the number of child servings was divided by 4. In another example, the serving size for nectarines is 1/2 cup for children and 1 cup for adults. Thus, the number of child servings was divided by 2. Similar conversions were made for other types of produce.

The secondary outcome was the total expenditure per week for fresh fruit and vegetables. The total expenditure was the full cost of the produce paid with cash or cash equivalents, consistent with how the US Bureau of Labor Statistics Consumer Expenditure Surveys and others report household expenditures on fruit and vegetables.<sup>19,20</sup>

### Statistical Analyses

Because household shopping history data for participants with different dates of study entry were retrieved back to a fixed date (April 1, 2010), statistical methods were used that accommodated households' different study times. Bivariate and multivariable Poisson regressions with a log link and robust standard errors were used to investigate which household composition and resource characteristics were associated with the study outcomes.

Robust standard errors adjusted for both the clustering of data for different transactions from the same household and for the overdispersion of the outcomes (variance greater than the mean).<sup>21</sup> Variables either with  $P < .05$  in bivariate analyses or necessary for control of potential confounding were included in the multivariable models. All multivariable results were expressed as incidence rate ratios (IRRs),<sup>22</sup> 95% confidence intervals (95% CI), and  $P$  values. In this study, (incidence) rate ratios are ratios of the

rates of fresh produce bought per week in the different households being compared. Using those multivariable models, separate post hoc statistical tests assessed whether the study outcomes were greater in households with more children after controlling for household size. A value of .05 was used as the criterion for statistical significance. Because of the exploratory nature of the data analyses, they were not corrected for multiple comparisons. Improper (ie, over-) adjustment for multiple comparisons can lead to type 2 errors. To reduce the likelihood of type 1 errors, robust standard errors were used in the multivariable models; this step generally increases  $P$  values and widens confidence intervals. Nevertheless, results that are statistically significant should be viewed as preliminary and await replication. Statistical analyses were performed using Stata (version 11.0, College Station, TX, 2009), SAS (version 8.2, SAS Institute, Inc, Cary, NC, 2001), and PASW (version 17.0, SPSS Inc., Chicago, IL, 2010).

## RESULTS

### Study Group Characteristics

The mean household size was  $4.4 \pm 1.4$  persons, and the mean number of children in the household was  $2.3 \pm 1.1$  (Table 1). The average age range of children in the household was 5.3 years  $\pm$  5.0 years. Seventy percent of the sample reported household incomes of \$25,000 or less. Forty-seven percent were enrolled in the Supplemental Nutrition Assistance Program (SNAP) at the time, and 30% were enrolled in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). Shoppers were mostly female (90%) and African American (87%).

### Fresh Fruit and Vegetable Purchases

Two hundred nine store transactions were extracted from the study market's point-of-sale system using the participants' loyalty card numbers as unique identifiers. Three of the 30 households (10%, 95% CI 2%-27%) bought no fresh fruit or vegetables during the entire study period. Servings of fresh fruit and vegetables purchased per week ranged from 0-21.2, with a mean of

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