Nutrition environments in corner stores in Philadelphia☆

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Objective: To examine the availability, quality, and price of key types of healthy and less-healthy foods found in corner stores in low-income urban neighborhoods and the associations between store characteristics and store food environments.

Method: A sample of 246 corner stores was selected from all corner stores participating in the Philadelphia Healthy Corner Store Initiative (HCSI). The Nutrition Environment Measures Survey for Corner Stores (NEMS-CS) was used to assess the availability, quality, and price of foods and beverages in 11 common categories between February and May, 2011.

Results: NEMS-CS measures were completed in 233 stores, 94.7% of the 246 stores approached. The healthier options were significantly less available in all food categories and often more expensive. Baked goods, bread, chips and cereals were sold at nearly all stores, with significantly fewer offering low-fat baked goods (5.7%, p < 0.0001), whole grain bread (56.2%, p < 0.0001), or baked chips (35.2%, p < 0.0001). Number of aisles was positively associated with availability score (p < 0.05).

Conclusion: Findings from this study point toward potential targets for intervention to improve the corner store food environment and dietary choices among low-income urban populations. Availability of certain healthier foods could be improved.

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Introduction

Recent estimates indicate that 23.5 million Americans live in low-income areas that are more than one mile from a supermarket (United States Department of Agriculture, 2009). Residents of these neighborhoods often rely on local convenience stores, which tend to have less variety, lower quality, and higher prices, particularly for healthier items (Gittelsohn et al., 2012; Gustafson et al., 2012; Krukowski et al., 2010). Convenience stores have lower availability of fruit, vegetables, and low fat milk than supermarkets and grocery stores (Leone et al., 2011).

Most reports of within-store food environments in the literature are limited by small sample sizes and include few neighborhoods (Bertoni et al., 2011; Krukowski et al., 2010; Leone et al., 2011; Martin et al., 2012; Thornton et al., 2010). This article describes the availability, quality, and price of key types of healthy and less-healthy foods found in more than 200 corner stores in Philadelphia and the associations between store characteristics and store food environments.

Methods

Sample and procedures

A random sample of 246 corner stores was selected from all corner stores enrolled in the Philadelphia Healthy Corner Store Initiative (HCSI) to be assessed prior to intervention. To date, 630 out of 1989 (31.7%) corner stores have enrolled in the program. The stores were concentrated in high poverty zip codes (areas where at least 20% of the population have incomes below 100% of the Federal Poverty Level to U.S. Census data) and were stratified by date of enrollment in the program, whether the store accepted Supplemental Nutrition Assistance Program (SNAP) and accepting EBT cards payments, and the Conversion Potential Rating (CPR). This rating, determined at the time of enrollment by intervention staff, estimates a store’s probability of progressing through the full initiative and is a proxy for the anticipated extent of intervention implementation. Data were collected between February and May of 2011 using handheld mobile devices.

Measurement tool

The Nutrition Environment Measures Survey for Stores (NEMS-S) was adapted for use in corner stores for this project (available on request).
NEMS-S is a validated observational measure of retail store nutrition environments (Glanz et al., 2007). It focuses on the availability of healthy food choices, quality of fresh produce, and price of healthy vs. comparable less-healthy options, in 11 common categories (Glanz et al., 2007). The NEMS for Corner Stores (NEMS-CS) expanded the NEMS-S to include additional measures for frozen and canned fruits and vegetables, and quantities of fresh produce. Inter-rater reliability and test-retest reliability were assessed to affirm the reliability of the adapted NEMS-CS and ensure the quality of data collected for the evaluation.

Store characteristic variables include square footage, number of aisles, acceptance of SNAP, and determination of the store’s CPR were collected by intervention staff at the time of HCSI enrollment.

**Statistical analysis**

Continuous variables (e.g. price) were summarized using means, standard deviations (SD), and ranges, and categorical variables (e.g. availability) were summarized with frequency counts and percentages. McNemar’s test for matched paired data was used to test for differences in the mean prices of healthy vs. less-healthy items. Analysis of variance (ANOVA) models were used to test for differences in the NEMS-CS summary scores by store characteristics. All analyses were performed using SAS version 9.2 (SAS Institute, Cary, NC).

**Results**

NEMS-CS measures were completed in 233 (94.7%) of the stores approached. Seven stores (2.9%) were excluded at the store owner’s request, and 6 (2.4%) stores were closed for business by the time of the observations.

Kappa’s for inter-rater reliability for availability and quality of fruits and vegetables ranged from 0.79 to 1.00 (with kappa=0.65 for one item, sweet peppers). Test-retest reliability ranged from Kappa’s of 0.37 to 1.00. Low values were due to skewed data and not discrepancies regarding the availability or quality of the products observed on two occasions.

Very few stores sold ground beef and only one-third sold frozen dinners, while 68.7% sold hot dogs (Table 1). The healthier alternatives of these products were rarely available.

**Discussion**

The findings from this study point toward potential targets for intervention to improve the corner store food environment and dietary choices among low-income urban populations. Availability of certain healthy foods could be improved, particularly meats; baked goods and snacks; and low-fat milk and zero/low calorie drinks. Prices for healthy baked goods and snacks should be more competitive. On the other hand, lower prices for low-fat milk and certain meat products, like hot dogs, could be emphasized.

There are several limitations to this study. Data collection occurred between 1 and 50 weeks after stores were enrolled in the healthy corner store intervention, due to the timing of funding for
this evaluation. However, sample selection ensured a distribution of time since enrollment and this factor was not associated with food environment findings (data not shown). Also, despite the large number of stores in the sample, findings may not be generalizable to other communities, particularly those that are not urban, population-dense, and high poverty. The cross-sectional data collection is a limitation since all assessed factors—availability, quality, quantity, variety, and price—may vary seasonally, and turnover of store ownership. Despite these limitations, this study makes significant contributions to the limited but growing literature on the nutrition environment within corner stores. Its strengths include: the use of a standardized, validated tool (NEMS-S) adopted and tested for corner stores; a large sample size; a focus on regular and healthier food items; and an assessment of environmental factors beyond availability. As corner store interventions expand, those responsible for implementation and evaluation will need to study the evidence base to ensure that public health goals are achieved and that outcomes are appropriately measured.

Conflict of Interest Statement
The authors declare that there are no conflicts of interest.

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References


Martin, K.S., Havens, E., Boyle, K.E., et al., 2012. If you stock it, will they buy it? Healthy food availability and customer purchasing behaviour within corner stores in Hartford, CT, USA. Public Health Nutr. 1–6.