

# Measures of Retail Food Store Environments and Sales: Review and Implications for Healthy Eating Initiatives

Karen Glanz, PhD, MPH<sup>1,2</sup>; Lauren Johnson, BSN<sup>2</sup>; Amy L. Yaroch, PhD<sup>3</sup>;  
Matthew Phillips, MPH<sup>1</sup>; Guadalupe X. Ayala, PhD, MPH<sup>4,5</sup>; Erica L. Davis, BA<sup>1</sup>

## ABSTRACT

**Objective:** This review describes available measures of retail food store environments, including data collection methods, characteristics of measures, the dimensions most commonly captured across methods, and their strengths and limitations.

**Methods:** Articles were included if they were published between 1990 and 2015 in an English-language peer-reviewed journal and presented original research findings on the development and/or use of a measure or method to assess retail food store environments. Four sources were used, including literature databases, backward searching of identified articles, published reviews, and measurement registries.

**Results:** From 3,013 citations identified, 125 observational studies and 5 studies that used sales records were reviewed in-depth. Most studies were cross-sectional and based in the US. The most common tools used were the US Department of Agriculture's Thrifty Food Plan and the Nutrition Environment Measures Survey for Stores. The most common attribute captured was availability of healthful options, followed by price. Measurement quality indicators were minimal and focused mainly on assessments of reliability.

**Implications for Research and Practice:** Two widely used tools to measure retail food store environments are available and can be refined and adapted. Standardization of measurement across studies and reports of measurement quality (eg, reliability, validity) may better inform practice and policy changes.

**Key Words:** environment, measurement, Nutrition Environment Measures Survey for Stores, retail food store, Thrifty Food Plan (*J Nutr Educ Behav.* 2016;48:280-288.)

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## INTRODUCTION

Public health approaches to promoting healthy eating have increasingly focused on methods for improving retail food store environments.<sup>1,2</sup> Retail food store environments are an important venue from which Americans obtain food and beverage products and are receiving increas-

ing attention from public health experts.<sup>3,4</sup> Among children, they are a leading source of dietary calories, fat, and sugar.<sup>5</sup> Yet much remains unknown about how to quantify the healthfulness of these environments, and consequently how and where to intervene in food stores to promote more healthful food and beverage purchasing and subsequent healthy

eating.<sup>6</sup> This is essential to devise effective interventions and evaluate them successfully.

To identify contextually specific risk and protective factors associated with more healthful eating behaviors (eg, increased fruit and vegetable intake, decreased intake of energy-dense, nutrient-poor foods and beverages), efficient, reliable, and valid measures of the retail food environment are needed.<sup>1,7</sup> These measures are also needed to evaluate changes in retail food store environments, whether through policy, systems, and environment changes, communication efforts, and/or other program-related changes.<sup>8</sup> Understanding influential factors in retail food store environments and evaluating strategies that aim to improve these environments have the potential to promote consumption of more healthful foods and beverages,<sup>9</sup> and can be part of a comprehensive strategy to prevent and control obesity, diabetes, and other related health problems.<sup>2</sup>

<sup>1</sup>Department of Biostatistics and Epidemiology, Perelman School of Medicine, Philadelphia, PA

<sup>2</sup>School of Nursing, University of Pennsylvania, Philadelphia, PA

<sup>3</sup>Gretchen Swanson Center for Nutrition, Omaha, NE

<sup>4</sup>College of Health and Human Services, San Diego State University, San Diego, CA

<sup>5</sup>Institute for Behavioral and Community Health, San Diego, CA

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Address for correspondence: Karen Glanz, PhD, MPH, Department of Biostatistics and Epidemiology, Perelman School of Medicine and School of Nursing, University of Pennsylvania, 801 Blockley Hall, 423 Guardian Dr, Philadelphia, PA 19104; Phone: (215) 898-0613; Fax: (215) 573-5315; E-mail: [kglanz@upenn.edu](mailto:kglanz@upenn.edu)

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**Table 1.** Measures of Food Retail Store Environments That Are Most Often Used

Measure	Description	Resources
Nutrition Environment Measures Survey for Stores (NEMS-S): n = 29 studies <sup>a</sup>	The NEMS tools are observational measures to assess community and consumer nutrition environments in food outlets. The NEMS-S tool is specifically designed to assess grocery stores and corner stores. The NEMS-S tool assesses the availability of healthful choices, prices, and quality of 11 measures of the store nutrition environment.	For the most updated version of NEMS-S and further information about NEMS tools: <a href="http://www.med.upenn.edu/nems/index.shtml">http://www.med.upenn.edu/nems/index.shtml</a>
United States Department of Agriculture Thrifty Food Plan (TFP): n = 11 studies <sup>a</sup>	The USDA TFP provides a representative healthful and minimal-cost meal plan that shows how a nutritious diet may be achieved with limited resources. The plan assumes that all purchased food is consumed at home.	For more information about TFP: <a href="http://www.cnpp.usda.gov/sites/default/files/usda_food_plans_cost_of_food/TFP2006Report.pdf">http://www.cnpp.usda.gov/sites/default/files/usda_food_plans_cost_of_food/TFP2006Report.pdf</a>

<sup>a</sup>Number of studies using each tool in current review from 1990 to 2015, including modifications of the tool.

Previous reviews related to this topic have provided a historical perspective to measuring the food environment,<sup>10</sup> critically discussed the state of the science on measuring the food environment,<sup>11</sup> examined the use of technology to measure the food environment,<sup>12</sup> and compiled lists of the most up-to-date tools to measure aspects of the food environment, including but not limited to the retail food store environment.<sup>13,14</sup> Recent reviews specific to the retail food store environment have addressed the complexity of measuring these environments in diverse contexts,<sup>15</sup> provided a synthesis on how aspects of the consumer retail food store environment are associated with various health outcomes, including dietary patterns and weight status,<sup>16</sup> and examined intervention effects in small food stores using a variety of metrics of the retail food environment.<sup>8</sup> However, over the past 5 years, the field has progressed rapidly. There is no up-to-date review that describes and summarizes how various aspects of retail food store environments have been measured, and how these tools can be used to move the field forward in the context of widespread healthy food access policies and initiatives.

This article reviews measures of the retail food store environment, including the types of methods used to collect these data and measure characteristics, including dimensions most commonly captured across methods, and their strengths and limitations. This research is guided by a conceptual model that considers sup-

ply and demand, focusing on both the consumer and the store.<sup>17</sup> Recommendations for researchers and practitioners interested in measuring the retail food store environment for policy and intervention development, implementation, and evaluation are provided, including a summary of the most often used measures (Table 1). This article also examines the implications of currently available measures for evaluating healthy food access initiatives.

## METHODS

### Data Retrieval Process

Using methods developed by Cooper<sup>18</sup> and employed by the authors previously,<sup>4,19,20</sup> articles for study inclusion were identified if they were published between 1990 and 2015 and met the inclusion criteria. To answer the research questions, articles were included in the review if they presented original research findings on the development and/or use of a measure and/or method to assess the retail food store environment. Consistent with the multiple operationalization approach recommended for literature review,<sup>18</sup> measures and methods considered for inclusion ranged from spatial and records assessments of the community food environment to observational and self-reported measures of the consumer food store environment and the use of sales and price data to reflect marketing and purchasing from both the store and

customer perspectives. In addition, although the initial emphasis of this review was on the retail food store environment most relevant to obesity prevention and control, articles with a focus on healthy eating, hunger, food security, and food deserts were included, because of their relevance to this topic. Finally, articles were included if they were published in a peer-reviewed journal and were excluded if they were published in a language other than English, and/or pertained to settings other than the retail food environment. Table 2 lists the databases used, and search terms.

Articles were identified in 4 ways: searching literature databases (CINAHL/EBSCO, Medline, and JSTOR), reviewing the references of articles meeting inclusion criteria (ie, backward searching), examining published reviews, and searching online sources and registries such as those through the National Cancer Institute,<sup>21</sup> the National Collaborative on Childhood Obesity Research,<sup>22</sup> the US Department of Agriculture (USDA) Food Environment Atlas,<sup>23</sup> and others.

Literature searches were downloaded into an Excel database (Microsoft, Bellevue, Washington) and screened to eliminate duplicates and facilitate the review process. To minimize the potential for bias or errors in the selection of articles, the first author periodically evaluated a random sample of articles and worked with 2 research assistants to ensure consistent application of these criteria. Review by the institutional review board was not required for this study because it is a systematic review.

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