Prioritizing Food Retailer Perspectives for Environmental Change in Food Stores to Encourage Healthy Dietary Purchases Among Low-Income Consumers in the United States

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ABSTRACT

Supplemental Nutrition Assistance Program (SNAP)-authorized store environments could be improved to favor consumer purchase of healthy products. Engaging with the key intermediaries who can use marketing-mix and choice-architecture (MMCA) strategies to encourage low-income consumers to purchase healthy products aligned with the Dietary Guidelines for Americans (DGA), 2015-2020 is essential. This PhD research describes five investigations that explored the perspectives of food store owners, managers, and corporate or independent businesses (e.g., retailers) to inform healthy food retail approaches: (1) a systematic review of the literature (1980-2017) identified social-ecological influencers of food store retailers' decision-making and ability to use MMCA strategies to encourage healthy dietary purchases in the United States (US); (2) SNAP-authorized retailers' perceived feasibility and costs to implement healthy MMCA strategies in rural stores were assessed (n=29); (3) SNAP-authorized retailers' healthy food and beverage perceptions and DGA-aligned product offerings were documented; (4) prevalent SNAP-authorized food store retailers in the US and between two states were identified to inform settings where healthy food retail approaches could reach numerous SNAP consumers; (5) and the availability of corporate social responsibility commitments to use MMCA strategies to improve consumers' diet quality among prevalent SNAP-authorized food store chains was explored. The collective findings from the review and four studies were that multiple social-ecological factors (e.g., skills/knowledge, consumers, suppliers) influenced US retailers' decision-making and ability to use MMCA strategies that favor healthy products. Rural retailers perceived prompting and proximity (e.g., labeling and location) strategies as feasible and less costly compared to other MMCA strategies. Some misalignments of healthy food perceptions and food store availability were identified and indicated a need for trainings to enhance the success of healthy food retail programs. To reach numerous SNAP consumers, healthy food retail programs should target nontraditional (e.g., non-grocery) food stores with varied approaches by state. However, few prevalent SNAP-authorized retailers have made public, voluntary commitments to reduce obesity and may reflect a low readiness to engage in partnerships to establish healthy food retail environments. Future research should document approach to and the impact of using MMCA strategies to encourage healthier consumer purchases on business outcomes among diverse store contexts.

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PUBLIC ABSTRACT

Supplemental Nutrition Assistance Program (SNAP) consumers are low-income Americans who could benefit from exposure to store cues or marketing-mix and choice-architecture (MMCA) strategies that 'make the healthy choice the easy choice'. However, food store owners, managers, and businesses (e.g. retailers) ultimately decide if they will initiate and continue MMCA changes. This research prioritized the retailer perspective to inform healthy food retail approaches. A systematic review of literature (1980-2017) explored multifaceted influencers of food store retailers' decision-making and ability or willingness to use MMCA strategies to encourage healthier dietary purchases in the United States (US). Additionally, four original research investigations were conducted: (1) a mixed-methods and cross-sectional investigation in rural, central Virginia assessed SNAP-authorized retailers' perceived feasibility and costs to implement MMCA strategies that encourage healthy consumer purchases in stores; (2) an investigation of SNAP-authorized retailers' healthy food and beverage perceptions and healthy food store offerings informed healthy food retail approaches in this setting; (3) an examination of prevalent SNAP-authorized food store retailers in the US and between two US states informed targeted healthy food retail approaches that could benefit numerous SNAP consumers; and (4) the availability of corporate social responsibility commitments to use MMCA strategies to promote consumer health among prevalent SNAP-authorized food store chains was explored. Main findings of these investigations indicated that there are multiple factors (e.g., skills/knowledge, consumers, suppliers) that influence US retailers' decision-making. Also, rural retailers perceived prompting and proximity (e.g., healthy food labeling and moving healthy foods to an ideal location) strategies as feasible and low cost. There were some misalignments of healthy food perceptions and food store availability, indicating a need for trainings to enhance the likelihood for healthy food retail programs to succeed. In approaching SNAP-authorized retailers for partnership opportunities, targeting nontraditional (e.g., non-grocery) settings may reach more consumers and varied approaches by state are warranted. However, many of these prevalent SNAP retailers lack publicly available commitments to reduce obesity which may hinder partnership approaches. Future work should document approach to and the impact of using MMCA strategies to encourage healthier consumer purchases on diet quality and business outcomes among diverse store contexts.

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List of Acronyms and Abbreviations

CA	California
CASP	Critical Appraisal Skills Programme
CSR	Corporate Social Responsibility
DGA	Dietary Guidelines for Americans, 2015-2020
FNV	Fruits & Veggies Campaign
MBAT	Market Basket Assessment Tool
MMCA	Marketing Mix and Choice Architecture
N/A	Not Applicable
PHA	Partnership for a Healthier America
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analysis
RDN	Registered Dietitian Nutritionist
RUCC	Rural-Urban Continuum Code
SNAP	Supplemental Nutrition Assistance Program
SNAP-Ed	Supplemental Nutrition Assistance Program-Education
US	United States
USDA	United States Department of Agriculture
VA	Virginia
WIC	Special Supplemental Nutrition Assistance Program for Women, Infants, and Children

Chapter 1

INTRODUCTION

I. Research Background

Obesity is a complex, global issue that affected more than 700 million people in 2015.[1] Poor dietary behaviors such as low fruit, vegetable, and whole grain consumption contribute to the development of obesity and noncommunicable diseases (e.g., heart disease, stroke, type 2 diabetes, and certain cancers).[2] Globally, dietary choices that are energy dense and nutrient poor have been associated with more quality life years lost than risky behaviors such as smoking, unsafe sex practices, and/or drug and alcohol use.[2] In the United States (US), about 39.8% of adults and 18.5% of youth populations were classified as obese in 2015-2016.[3]

Most Americans could benefit from improved dietary behaviors.[4] For the greatest impact, strategies that align dietary patterns with the Dietary Guidelines for Americans, 2015-2020 (DGA)[5] should focus on factors beyond individual education and improve environments, systems, and policies.[5, 6] As such, food environment approaches that promote reduced consumption of foods and beverages high in calories, saturated fats, added sugars, and sodium are warranted.[5, 7] The food environment is defined in two broad ways: (1) the geographic availability of retail outlets, including food stores and restaurants, where consumers can purchase foods and beverages; and (2) consumer variables (e.g., availability, affordability, convenience, and desirability of healthy dietary products)[8] that impact food and beverage purchasing within settings.[9] For example, healthy food store environments have a variety of foods and beverages aligned with the DGA available, that are also affordable, convenient, and desirable to consumers.[8]

In the US, food stores have been targeted for healthy food retail interventions due to environmental characteristics that influence consumers' to purchase energy-dense and nutrient-poor products that contribute to high rates of obesity.[7, 10-14] Marketing-mix and choice-architecture (MMCA)[15] strategies could be implemented in food stores to increase the likelihood for consumers to choose DGA-aligned alternatives.[15, 16] These types of interventions, which have been shown to be effective,[17-21] use behavioral economic principles to create environments that prompt the purchase of healthy products (e.g., fruits, vegetables, whole grains, lean and plant-based proteins, and low-fat dairy).[5] From a public health perspective, using subtle environmental strategies helps to create a 'culture of health'[22] within food retail spaces without restricting consumers' freedom of choice.[16] However, food environment research approaches have largely excluded the perspective of a key intermediary population for change in the food store setting: food store owners, managers, and buisinesses.[21, 23-30]

II. Rationale for this PhD Research

Food store owners, managers, and businesses (e.g., retailers) are intermediary stakeholders that have a large degree of control with regard to whether public health nutrition strategies are implemented and sustained in retail settings.[31, 32] However, retailers' perspectives, goals, and store business models may not align with public health ideals.[33-37] Low perceived consumer demand for DGA-aligned products and a high perceived cost and/or perishability of fresh food and beverage products may deter food store retailers from incorporating these items into their inventory.[33-37] Therefore, a pragmatic approach[38] to public health interventions in food stores may enhance their success initially and over time.

Retail interventions have the potential to help minimize access gaps and diet-related health disparities among vulnerable US populations.[39-41] Low income consumers may be more susceptible to marketing cues for unhealthy foods and beverages[42] and less likely than high income consumers to deny child requests for these products.[43] Additionally, rural US residents may face heighted barriers to accessing affordable and healthy food options.[39, 44, 45] These factors contribute to the higher obesity rates experienced among rural and low income US populations when compared to urban and higher income groups.[46, 47]

Targeting federal nutrition assistance program-affiliated food store environments may be an optimal mechanism to reach vulnerable US consumers.[48-52] The US Department of Agriculture's Special Supplemental Nutrition Assistance Program for Women, Infants, and Children (WIC) and Supplemental Nutrition Assistance Program (SNAP) are the two largest nutrition assistance programs in the US and help pregnant and breastfeeding women and children (aged 1-5) and income-eligible households to acquire foods and beverages.[49, 50] Both WIC and SNAP require stocking standards.[51, 52] However, SNAP participants' allowable purchases are not as restrictive as they are for WIC participants.[49, 50] As a result, DGA-aligned food and beverage access may not be as pronounced in SNAP-authorized food stores in comparison to WIC-authorized locations.[53]

Healthy food retail approaches in authorized food store settings that encourage SNAP participants to choose DGA-aligned foods and beverages are warranted.[54] However, little is known regarding food store retailers' perceptions of using MMCA strategies to promote healthy product purchases in this setting.[33-37] Filling this research gap is necessary to identify healthy food retail strategies that support business and public health outcomes as a mechanism to improve dietary behaviors among SNAP populations.[33]

III. Research Approach and Contribution

This dissertation research aims to investigate opportunities for food store environment change from the food store retailer perspective by answering the following, overarching research question: *What are US food store business perspectives regarding healthy food retail strategies that could be used to encourage low income consumers to purchase foods and beverages aligned with the Dietary Guidelines for Americans, 2015-2020?*

To address this research question, a systematic review of peer-reviewed literature and four research studies were completed:

- Chapter 2: Systematic review of literature.
    - This review analyzed peer-reviewed research published after the year 1980 in order to extract and interpret food store owner and/or manager perspectives regarding MMCA strategies that are used to improve the dietary quality of consumers' purchases and to understand factors that impact decision making.
    - **Research Question**: *What are the influential factors that affect US food store owner and manager decision making and ability or willingness to apply marketing-mix and choice-architecture strategies to encourage healthy consumer food and beverage purchases among consumers?*
- Chapters 3 and 4: Original research investigations.
    - These studies were conducted in two rural Virginia counties using a cross-sectional and mixed-methods design. Data was collected from SNAP-authorized store owners and managers to understand their perceptions of using MMCA strategies to promote DGA-aligned product purchases and to understand what products they considered healthy.

- **Research Questions**: (1) *What is the perceived feasibility and cost of SNAP-authorized food store owners and managers to implement a variety of marketing-mix and choice-architecture strategies to encourage healthier consumer food and beverage purchases?*; (2) *What are SNAP-authorized food store owners' and managers' healthy food perceptions and how does their healthy food inventory align with these perceptions?*

- Chapter 5: Secondary data analysis.
  - An analysis of SNAP-authorized store information was conducted in order to identify targeted approaches for SNAP-Education (SNAP-Ed) food store interventions that engage with prevalent food store retailers to reach numerous SNAP consumers.
  - **Research Questions**: (1) *What SNAP-authorized food store retailers and formats are most prevalent (by number of stores) in the US?;* (2) *Do prevalent SNAP-authorized stores differ between two states and between the state's urban and rural areas?*
- Chapter 6: Secondary data analysis of publicly available information.
  - In this final investigation, prevalent SNAP-authorized retailer information was reviewed in order to identify aligned areas of corporate social responsibility (CSR) commitments with public health nutrition strategies in food stores.
  - **Research Question**: *What is the availability of prevalent SNAP-authorized food store retailers' public, voluntary commitments to use marketing-mix and choice-architecture strategies in stores to encourage consumer food and beverage purchases aligned with the DGA?*

These research investigations have the potential to inform future, targeted approaches to enhance food store environments to promote healthy consumer food and beverage purchases, using food store retailers as the mechanism for meaningful change.

IV. Dissertation Structure

The literature review and chapters of this dissertation have been published, submitted, or prepared for peer-reviewed publication. Author contributions and co-authors are detailed below.

Literature Review. Published (2019) as a systematic literature review in the *International Journal of Behavioral Nutrition and Physical Therapy*

A Systematic Review of Factors that Influence Food Store Owner and Manager Decision Making and Ability or Willingness to Use Choice Architecture and Marketing Mix Strategies to Encourage Healthy Consumer Purchases in the United States, 2005-2017

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Study 1. Under review as an original research article in *Translational Behavioral Medicine*

Rural SNAP-Authorized Food Store Owners' and Managers' Perceived Feasibility to Implement Marketing-Mix and Choice-Architecture Strategies to Encourage Healthy Product Purchasing by SNAP Consumers

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Study 2. Under review as an original research article in *Journal of Nutrition Education and Behavior*

Rural SNAP-Authorized Food Store Product Availability and Owners' and Managers' Healthy Food and Beverage Perceptions Inform the Need for Retailer-Targeted Nutrition Education and Training

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Study 3. Original research article in preparation for *Journal of Community Health*

An Examination of Prevalent Supplemental Nutrition Assistance Program (SNAP)-Authorized Chain Retailers in the United States, California, and Virginia to Inform Large-Scale Healthy Food Retail Initiatives

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Study 4. Short Commentary in preparation for *Public Health Nutrition*

An Analysis of Voluntary Commitments of Prevalent Supplemental Nutrition Assistance Program (SNAP)-Authorized Food Retailers to Use Marketing-Mix and Choice-Architecture Strategies to Influence the Healthfulness of Consumers' Dietary Purchases

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Chapter 2

Literature Review: A Systematic Review of Factors that Influence Food Store Owner and Manager Decision Making and Ability or Willingness to Use Choice Architecture and Marketing Mix Strategies to Encourage Healthy Consumer Purchases in the United States, 2005-2017

ABSTRACT

Background: Altering food store environments is a promising approach to encourage healthy product purchases by consumers to improve their diet quality and health. Food store owners and managers are intermediaries to ensure that environmental changes are enacted. Despite their role as gatekeepers to implement and sustain healthy food environment changes, no systematic review has been published that examines food store owner and manager (retailer) data. The purpose of this research was to conduct a review of retailer information available within the expansive United States (US) food environment literature.

Methods: The PRISMA protocol was used. A search strategy, including published articles from years 1980-2017, was applied to six databases to locate relevant articles that addressed the perspective of food store retailers in the US. Data were extracted, organized, and agreed upon between two authors based on pre-designed constructs: (1) a social-ecological model to capture factors that influence retailer decision making; and (2) a marketing-mix and choice-architecture framework to examine perspectives of applied (or the prospective application of) strategies at the store-level. Study quality was assessed using quality criteria checklists for qualitative and quantitative research.

Results: Thirty-one articles met inclusion criteria and most studies (n=22) were qualitative and conducted in urban food stores (n=23). Multiple social-ecological factors influenced retailer decision making and ability or willingness to use marketing-mix and choice-architecture strategies to improve consumers' healthy choices to support dietary quality. These factors included: conflicting training outcomes to enhance retailers' knowledge and skills (individual,

n=9); the importance of trust (interpersonal, n=8); views about marketing-mix and choice-architecture strategies in the food environment (n=25); consumer demand or demographics (community, n=19); supplier and food store management variables (systems or sectors, n=18); local and federal policy (n=8); and support for community health (norms/values, n=8).

Conclusions: Research partnerships can support favorable business and public health outcomes to align with retailers' business models and available resources. A participatory and translational approach to food environment research will likely maximize public health impact. Urban and rural food store retailers are important actors for future research to inform the feasibility of store retailers to apply MMCA strategies that are profitable and promote health.

INTRODUCTION

The Dietary Guidelines for Americans (DGA) 2015-2020[1] defined a healthy diet as one rich in fruits, vegetables, whole grains, lean and plant-based proteins, and low-fat dairy. By these standards, dietary behaviors in the United States (US) are overwhelmingly characterized as poor,[2] and foods and beverages high in saturated fats, added sugars, and sodium are commonly overconsumed.[1] The US food environment is a major influence on the dietary behaviors of consumers that increases their risk for obesity.[3-6] Several reviews of food environment research have assessed one or more strategies to improve the dietary behaviors of consumers at the point of choice in food stores.[7-18] However, no systematic review has been published to investigate the factors that influence US food store owners and managers to promote healthy food environments for consumers.

This is a notable gap as store owners and managers are 'knowledge brokers'[19] who could implement research-based strategies in food stores to promote population health. A popular approach to intervening in food environments is through the use of voluntary strategies to manipulate food and beverage properties and placements[20] to favor healthier products.[14-18, 21-23] For example, a number of marketing-mix and choice-architecture (MMCA) strategies[20] could be used in the food store setting to reduce the cognitive effort for US consumers to purchase DGA-aligned foods and beverages.[21, 22, 24] These behavioral economic approaches have been demonstrated effective[14-18] and base on the ideology of 'libertarian paternalism,' or strategies that favor human biases without restricting choice.[22]

However, the main focus of this literature has been on consumer responses to MMCA use. For example, the impact of applying floor arrows[25] and altering the products available within checkout lanes on the dietary quality of consumer food and beverage purchases.[26]

Nutrition interventions that apply MMCA strategies in US food stores may not be widely feasible or easily sustained from a management perspective, due to the potential for high costs and a negative impact on store revenue.[24] Food store owners and managers are critical gatekeepers to food store interventions as they are responsible for implementing and sustaining any number of MMCA strategies that aim to improve consumers' dietary quality.[27]

This research fills a notable gap by examining US food store owner and manager perspectives that are available within the expansive food store environment literature regarding factors that influence decision making and use of MMCA strategies in food stores. This research can help to inform consumer-oriented public health nutrition strategies in food stores that are economically viable for US food store businesses to implement and sustain.

METHODS

The research question used to guide the research was: What are the influential factors that affect US food store owner and manager decision making and ability or willingness to apply marketing-mix and choice-architecture strategies to encourage healthy consumer food and beverage purchases among consumers?

The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) statement[28] was used to guide this systematic literature review (that is registered with PROSPERO, CRD42016042170). All of the co-investigators are professionals with a variety of expertise within the broad field of public health, including food and nutrition policy, community food systems and food environments, applied economics, and dissemination and implementation science.

Search Strategy

Five electronic databases (see Figure 1) and Google Scholar were used to search for relevant literature published from January 1, 1980 to December 31, 2017. The year 1980 was selected due to the increased growth in overweight and obesity in US population at this time.[29, 30]

Key search terms were constructed around four concepts. These concepts are detailed along with a complete list of key terms per category (displayed within respective parenthesis): (1) population (manager(s), managers, owner*, supervisor*, CEO, owner manager(s)); (2) setting (food environment, store(s), retail, food store(s), corner store, healthy store, bodega, grocery, supermarket*, checkout aisle(s), small food store, store-based, convenience store); (3) nutrition (healthy food(s), nutritious option(s), dietary choice(s), healthy choice(s), fruit(s), vegetable*, whole grain(s), low fat dairy, healthy snack(s), healthy diet(s), consumption, beverage*), and; (4) MMCA strategies (nudge framework, healthy nudge(s), store ambience, store atmosphere, private label brand, portion, price(s), pricing, cost, sales, purchase, food marketing, food promotion, food label, advertis*, product placement, business practices, product display, product sign, product signs, product signage, nutrition profile, nutrient profile, food access, food proximity, health promotion). The key terms noted with (s) were applied in both singular and plural form.

The search protocol was constructed alongside a research librarian. Key word application differed slightly depending on the database. The complete search parameters are available upon author request.

Inclusion and Exclusion Criteria

If an article was original research, peer-reviewed, published in English, within the US food store setting, and reported data from US food store owners or managers (retailers used as the terminology henceforth) it was included in the review of literature. Authors chose to limit research to the US for two reasons: (1) the existence of federal nutrition assistance programs in the US that impact local food store environments, and; (2) evidence of cross-country differences in local food environments.[31]

'Food store' was defined broadly to include any retail location where household food and beverage purchases are made, excluding farm stands or markets. The food store setting of included research was described using the categories grocery or supermarket, drug, mass merchandiser, supercenter, convenience, dollar, club, or other (specialty/small food/corner).[32]

Study Selection, Data Extraction, and Analysis

An EndNote database was used to capture the systematic search and to organize articles that met the criteria for data extraction (Figure 1). Duplicate sources were removed and two authors reviewed the remaining titles and abstracts for study relevance and full text review. References of full text review articles were scanned for additional relevant research, however, no new articles were identified using this method. See Figure 1.

Articles were excluded during full text review primarily because they did not include results from the retailer perspective in the food store setting.[27, 33-37] Two articles were excluded because food store retailers' perspectives were collated with other stakeholder opinions,[38, 39] making it impossible to discern retailer-specific data from other stakeholder insights. Also, although the search strategy was not designed to source food store employee research, this

population was determined by authors to be extensions of management and therefore eligible for review inclusion.

All extracted data were compared among co-authors to ensure accuracy and to resolve discrepancies. Three authors collected pre-determined outcomes data aligned with the Cochrane Collaboration's Tool for Assessing Risk of Bias.[40] This information is available within data tables that are referenced below.

Theoretical Frameworks

All retailer data was extracted and organized within two selected frameworks. The social-ecological model was used to describe multifaceted factors (individual, interpersonal, environmental, community, systems or sectors of influence, policy, and norms/values)[41] on retailer decision making and their ability or willingness to utilize MMCA strategies to encourage healthy consumer purchases. To categorize food environment factors identified, a MMCA framework was used (place, profile, portion, pricing, promotion, healthy defaults, priming or prompting, and proximity) (see published study for category examples).[20] Use of the MMCA framework[20] complemented the overarching social-ecological model[41] used for primary data extraction and allowed for a more specific analysis of the food environment with regard to MMCA perspectives. Data organization among the chosen frameworks was compared and agreed upon by two authors.

Quality Assessment

Two quality assessments were implemented and scoring was completed and reconciled between two authors. The Quality Criteria Checklist for Primary Research[42] was used to evaluate

the quality of quantitative research. Responses were categorized as negative, neutral or positive based on detailed 'yes or no' prompts (e.g., specified outcomes, bias, representativeness, sampling, withdraws, statistical analysis, practical significance, funding).[42] For qualitative articles the Critical Appraisal Skills Programme (CASP) checklist was utilized.[43] CASP does not provide criterion for scoring articles, however authors considered the number of 'yes' responses out of a maximum of ten CASP questions (e.g., appropriateness of qualitative methods, researcher-participant relationship, rigor of data analysis).[43] A 'yes' response of ten was the highest possible score.

RESULTS

Thirty-one articles met review criteria and ranged from the years 2005 to 2017. Extracted outcome results for all studies included within the systematic review of literature are available in a supplementary table (Appendix A). Research included in the review was in majority specific to urban (n=23)[44-66] rather than rural food store environments (n=7),[67-73] and one study included both urban and rural samples.[74]

This review analyzes the perspectives of 788 retailers, across a range of food store formats[32] including grocery/supermarkets[44, 50, 53, 56, 58, 59, 67-69] convenience,[44, 50, 51, 60, 67-69, 71, 74] club or wholesale,[62, 66] dollar,[60] drug,[50, 60] small food/corner,[44, 46, 49, 52, 54, 56, 57, 60-66, 70-73] and specialty/ethnic stores[45, 47, 48, 55] (Appendix A). The foods and beverages of research focus were most commonly fruits, vegetables, and DGA-aligned[1] healthier alternatives to popular consumer products (Appendix A).

Study quality of many of the quantitative articles (n=9) were rated poorly, scoring as either negative[53, 56, 62, 63, 66, 69, 73] or neutral.[45, 71] Scores of qualitative research (n=22) were in

majority positive and ranged from 0-10. The frequency of positive CASP[43] responses were: 0 (n=3);[52, 59, 67] 1 (n=2);[48, 51] 7 (n=3);[47, 54, 60]; 8 (n=4);[49, 58, 61, 68] 9 (n=3);[44, 64, 70] 10 (n=7).[46, 50, 55, 57, 65, 72, 74]

Results derived from these articles are described below with respect to social-ecological factors[41] that emerged from the data. These results are also conceptually displayed in Figure 2. There was evidence of interrelation among social-ecological factors that influence decision making. Researchers categorized the data by best fit and these interactions are referred to throughout.

Individual Level, n=9 papers

Individual-level factors that may impede or facilitate retailer ability to implement MMCA strategies (Figure 2) were conflicting in the data analyzed. For example, interventions that aimed to support the success of healthy food objectives by targeting retailer psychosocial outcomes[62] or by providing employee trainings to enhance self-efficacy, knowledge, and customer service[53] were not always as successful as intended. Other investigations found that retailer trainings or intervention experiences were well received,[45, 47] beneficial[66] and improved retailer capacity,[47] self-efficacy, and knowledge to promote and stock healthy foods.[56, 73] However, ongoing retailer training/education was noted as a requirement for success.[64] Last, retailers' perceptions of what products are 'healthy' did not always align with dietary guidance.[50]

Interpersonal, n=8 papers

Retailer relationships with consumers, interventionists, and staff were identified as important elements that facilitated or impeded the success of food store interventions (Figure 2).

For example, some retailers perceived that establishing consumer trust influenced purchases of new products.[64] Retailers felt that good customer service was important to consumers[55] and one intervention improved retailers' customer relations.[57] Further, enhancing retailer-interventionist trust was perceived to facilitate intervention implementation[47] and enhance the possibility for sustainability.[67, 69, 73] As one example, a study linked retailer intervention support to perceived intervention effectiveness.[57]

In order to enhance trust, similar socio-cultural backgrounds of retailers and intervention/research personnel were perceived to be beneficial for establishing partnerships.[57] Finally, at times retailers and employees disagreed on appropriate intervention components or perceived consumer reactions to them[53, 55] (described more below).

Food Store Environment, n=25 papers

Food store environment variables were perceived to affect the ability or willingness of retailers to implement interventions (Figure 2). For example, the convenience store format was considered to conflict with healthy food goals due to the retailers' described business model favoring quick-grab items rather than grocery products.[64] Retailers also described pride for clean and well-structured food store environments[72] and explained that consumers consider this important to the shopping experience.[64]

Additional retailer perceptions of the food environment are organized by MMCA framework strategies[20] in Table 1. This includes retailer perspectives of applied or the prospective implementation of a variety of MMCA strategies in the food store environment to encourage healthier consumer food and beverage purchases.[44, 46-50, 52, 54-60, 62-65, 67, 68, 70-72, 74] The majority of this data is specific to the category 'Place' and there were often structural limitations

(due to time and costs) in retailer ability to offer healthy food and beverages (Table 1). Much of this data also focused on altering food store stocking practices or 'Profile' and there were notable concerns for enhancing the availability of perishable products.[49, 50, 65, 68] This reservation is related to perceptions of consumer demand, described below. Also, many retailers favored 'Promotion' strategies.[47, 48, 55-57, 64, 65, 67]

Less pronounced within the data are retailer perceptions of pricing strategies,[55, 57, 64] the implementation of subtle consumer cues or 'Priming or Prompting',[55, 56, 58, 59] or alterations of placement or 'Proximity'[47, 55, 70-72] of consumer food and beverage options (Table 1). No extracted data fit within the MMCA categories 'Portion' or healthy default 'Picks'.[20] See Table 1.

Community, n=19 papers

Community-level variables such as perceived consumer demand, community demographic and safety factors, and the food store location were noted to drive retailer decision making and may also impact their ability or willingness to alter the food store environment (Figure 2).

Consumer Demand (n=17). Some retailers expressed the role of the food store as a community meeting place[49] and also indicated a preference to cater to community needs. For example, consumer taste preferences were a consideration for retailer stocking decisions.[64] Overwhelmingly consumer tastes were perceived to favor unhealthy foods and beverages[44, 54, 58, 59, 65, 72, 74] rather than healthy products.[44, 48-50, 54, 57, 59, 64, 68] As such, ceasing the sale of unhealthy items was assumed to result in lost revenue.[44, 54]

Food and beverage promotions and saving potential (i.e., sales) were noted as information that influenced consumers' purchasing decisions or product demand.[55, 59, 64] Also the

importance of convenience was described, a variable that may support consumer purchases of healthy products[55, 72] even if more expensive.[55] However, retailers noted that healthy/produce products were often perceived by consumers to be more expensive to purchase[59, 63] and have less convenience attributes when compared to less healthy foods and beverages.[50] Retailers perceived consumers as amenable to an enhanced selection of foods and beverages[49] and were open to stocking products that consumers request,[44, 46, 49, 50, 60, 68] so changing variables such as price/promotions[55, 59, 64] and convenience[55, 72] may help drive consumer demand (and food store offerings) toward healthier products.

Community Safety and Demographics (n=8). Some retailers considered high community crime or shoplifting rates[50, 52, 57] or drug use and prostitution[50] to strain store resources. Others perceived their consumer base to lack knowledge of healthy diets[59, 65] and to be disinterested in improving dietary behaviors to benefit health.[55, 64, 65] However, seniors and consumers with noncommunicable diseases were thought to be more willing to purchase healthy products.[64] Retailers also perceived US Department of Agriculture's (USDA) Supplemental Nutrition Assistance Program (SNAP) participants[72] or low-income consumers in particular[57, 65] to be disinterested in purchasing healthy foods and beverages. In addition, the economic recession between years 2008-2010 (that affected all communities) was perceived to reduce the amount of healthy consumer purchases.[50]

Food Store Location (n=4). The food store location was described as beneficial or not beneficial for sales. For example, when in close proximity to certain community structures (i.e., schools)[74] or located in a dense residential area with minimal competition[52] location was considered positive. However, the rurality of a food store location was sometimes described as challenging. A shrinking consumer base in rural areas was a business concern.[72] Also, consumer

demand for produce in rural areas was perceived to decrease in the summer when compared with urban locations due to rural gardening practices.[74] Partnerships with local farmers were perceived to positively impact food products stocked in some stores.[73] Rural food stores were also stated to serve as primary consumer access points that provided tailored customer services, allowing retailers to remain competitive amongst outside business competition.[72]

Systems or Sectors, n=18 papers

Two distinct sectors of influence emerged from the data, food store suppliers and food store management variables (Figure 2).

Food Store Suppliers (n=15). Retailers often noted incomplete control over the foods and beverages available in food stores. If the store was a chain or corporate location, stocking decisions were determined within upper management.[50] In addition, unhealthy products were more likely to be delivered and stocked by a supplier, while healthy options were often the retailers' responsibility.[44, 50, 57, 60, 61, 64] Self-stocking healthy options was described as difficult to maintain due mainly to time constrains.[49, 51, 64, 68] Further, contract agreements dictated unhealthy product stocking, promotions, and placement in prime consumer areas,[61, 68, 72] although were good for business despite negative potential impacts on consumer health.[72] Supplier deliveries were also linked with sale frequency.[46]

Supplier product availability[64] prices,[49, 54, 60, 64, 65, 68] purchasing policies (i.e., purchasing amount, package sizes, return policies),[65, 66, 68] and reliability[49, 65] impacted retailers' product decisions. Some retailers noted that supplier recommendations and/or provided incentives influenced stocking decisions, although this was less true among others.[44] If stocking/supply barriers were present, retailers often self-supplied[46, 65] or obtained products via a combination of

supplier and self-stocking methods.[46, 61] In one study, retailers self-sourced sugar sweetened beverages but were less likely to self-source or carry produce.[61] Although self-stocking was considered affordable by some, this practice also required more time[65] and some believed consumers would prefer traveling to other locations to access affordable options[74] due to supply barriers.

Store type or location was also a factor in supply decisions. For example, supplier availability and price were less important factors in stocking decisions for retailers of dollar stores and pharmacies in comparison to smaller stores.[60] Store contracts with suppliers differed by store type, i.e., lacking in small or ethic food stores in comparison to larger stores.[61] Likewise, small store retailers noted less product deliveries,[61] unavailability of products, and a higher expense for healthy options in rural areas.[72] The outsourcing practices of local agricultural producers was also noted as a limitation for rural food stores who could no longer use these avenues for stocking needs.[72]

Food Store Management Variables (n=10). Retailers in one study reported working long hours.[65] Others noted lacking time for processes they considered outside of the scope of their immediate job requirements.[64] Time barriers were at times hesitations to altering 'Place' elements in the food store environment and for self-stocking healthy products, as described above. Further, the dynamics of coordinating a business were described as costly and difficult.[72] Additional barriers included a high employee turnover rate[53] or a lack of prospective employees.[72]

Business models were described as dependent on profits[60] and the convenience of operations.[61] For example, the introduction of new products was perceived as a high risk for retailers, though enhancing consumer demand was noted as a potential way to increase

willingness to expand stocking selections.[68] One study noted the potential for enhanced retailer acceptance of intervention components if food store resources were not strained.[67] Further, some retailers expressed that operating within the small store context may hinder interventions due to continued low profits.[65]

Implemented interventions may not translate into long-term changes of store practices[73] and also may be disruptive to store operations and components of an intervention.[53] Competition with other food stores also impacted retailer decisions and may decrease store revenue[72] and influence the ability or willingness to offer healthier consumer options.[44]

Policy, n=8 papers

Various policies influenced retailer decision making and impacted store food environments and/or consumer demand (Figure 2). One study noted that local policies disallowed retailers from utilizing nearby agriculture avenues to support healthy food stocking practices.[70] Mandated USDA Special Supplemental Nutrition Assistance Program for Women, Infants, and Children (WIC) food package changes[75] were described to widen the consumer base and positively impact profits[49] through increased consumer demand for new food and beverage requirements.[44, 46] However, fresh produce sales were perceived to increase less in comparison to other package items.[46] Due to the requirements for WIC-authorized stores to expand stocking practices to reflect package items, retailers noted that product diversity was enhanced.[49]

Federal guidelines for SNAP and WIC benefit distributions were perceived to positively impact retailers through increased revenue when benefits were released to program participants,[65, 72] specifically via fruit sales as noted in one study.[65] Some retailers expressed a

lack of consumer demand for store SNAP or WIC authorization[74] or noted paperwork and stocking regulations as hindering to store participation.[72]

Sociocultural Norms and Values, n=8 papers

Retailers perceived their food stores to contribute positively to their communities[52, 72] and expressed interest in supporting community needs[45, 57, 64, 65, 70, 72] and in a culturally appropriate manner.[49] Retailers engaged with the community were more responsive to store changes than retailers with less community ties.[64] Other perspectives surrounding the role of a food store in promoting consumer health included supporting families within the consumer base,[52] children's health outcomes[65, 70] and helping to mitigate high observed rates of noncommunicable diseases.[65] Retailers in one study perceived store changes to impact the health of the community, however in another study retailers worried that promoting consumer health might be considered offensive to their base.[64]

DISCUSSION

This review of research used a social-ecological and a MMCA framework to organize and synthesize retailer perspectives available within the US food store environment literature. While the literature search was designed to retrieve research from as early as 1980, the year 2005 was the earliest publication meeting inclusion criteria. This is likely because research outcomes in these earlier years focused mainly on defining the role of food access on consumer obesity[6, 76] and designing measurement tools to distinguish 'healthy' versus 'unhealthy' nutrition environments.[77]

In response to the posed research question, results indicate a multitude of factors spanning the social-ecological model influence retailer decision making and their ability or

willingness to use MMCA strategies (Figure 2). These factors are within the context of the purpose or value of a business in the US, where the outcome of interest is profit (Profit = Revenue – Cost)[24] (Figure 2). Following is a discussion of key results with research, practice, and policy implications regarding the most prominent retailer themes.

It was outside the scope of this review to analyze retailer training or intervention protocol. However, the **individual-level factors** identified described food store retailers conflicting responses to trainings or interventions designed in part to enhance retailer aptitude to deliver and sustain interventions.[45, 47, 53, 56, 62, 64, 66, 73] This is a notable as "training" is perceived to be a strong implementation strategy[78] that improves high quality and sustained intervention delivery. The general guidelines for training are to be a) ongoing and b) dynamic.[79] It is inconclusive, however, as to what training should entail for US food store retailers in urban and rural areas. Only a small number of studies have reported on retailer outcomes in response to trainings or technical assistance[45, 47, 53, 56, 62, 64, 66, 73] and to the authors' knowledge no publications fully explore retailer responses to training protocol, implementation, and fidelity for example. Future research is needed to determine pragmatic and tailored training strategies to improve food store retailer buy-in and intervention capacity.

In the food environment **interpersonal relationships** between retailers and their customers, intervention staff, and subordinates impact decision making and intervention success. The strongest shared theme was the value of trust as a mechanism to improve the success of intervention implementation and enhance the possibility for sustainability.[47, 57, 67, 69, 73] The need for trust-building is unsurprising as it is known to have a ripple effect among intervention stakeholders.[19] In this case, food store retailers are key intermediaries between researchers and consumers, staff, and subordinates. Trust between researchers/practitioners and the food store

retailer is imperative to ensure that proposed interventions fit the needs and resources of the system (e.g., are not in competition with policy or profit).[80] One strategy moving forward may be to engage in dissemination practices[81, 82] that keep retailers informed and involved throughout the entire process of intervention development. Future work should detail such efforts.

Food store environment factors (Figure 2) in majority included information on the application of MMCA strategies at the store level from the retailer perspective.[44, 46-50, 52, 54-60, 62-65, 67, 68, 70-72, 74] Most of the analyzed data was focused on structural/atmospheric store properties or the types of foods and beverages stocked (Table 2). Overwhelmingly it is clear practitioners and intervention teams need to consider the potential for limited space and resources (time, money, equipment) for the design of MMCA strategies that meet store retailers 'where they are' currently. Also, raising consumer demand alongside any expanded food and beverage stocking is essential to prevent perishability and a loss of revenue, and has been noted previously.[27]

MMCA strategies use environmental subtleties[22] to enhance consumer demand for selected products.[14-16, 18] The results presented within this review greatly add to the literature as the context (i.e., retailer perspectives, systems, sectors) of applied MMCA strategies has been under-considered in nudge research.[80] However, there is limited data on the success or uptake of applied behavioral economic strategies from the retailer perspective and more information is warranted spanning various locations and retailer/consumer cultures. Longitudinal and natural experiment designs may be useful for future MMCA research aiming to measure retailer outcomes alongside the dietary quality of consumers' product purchases.

Additionally, this review identified retailer perspectives that at times misalign with current literature on consumer responses to MMCA strategies. A recent review of randomized control trials of food store nutrition interventions (in practice or simulated) noted that consumer

coupons or vouchers were most likely to favorably nudge consumer behavior.[17] The results of this review offer very few perspectives on the feasibility or willingness of retailers to use pricing strategies in support of healthier consumer purchases.[55, 57, 64] Moving forward, a greater exploration of retailer perspectives on the use of MMCA strategies is needed to understand those strategies likely to meet both business and public health goals. In turn retailer perspectives could inform consumer investigations exploring the efficacy of MMCA strategies on healthy product purchasing to speed the translation of MMCA theory to practice.

The food store **community** also influences retailers. Overall there was a general low perceived consumer demand for DGA-aligned foods and beverages.[44, 48-50, 54, 57, 59, 64, 68] Concerns of low nutrition knowledge or interest among consumers[55, 59, 64, 65] and community crime[50, 52, 57] were also prominent. In low resource communities it may be advisable to implement retail objectives alongside community social interventions that improve consumers' quality of life in order to impact community health in a more robust and sustainable way.[83] One example within the scope of food access is the concept of introducing a grocery business in a disparate area that has been found to enhance community economic capacity.[84] More interdisciplinary research is needed to identify similar community outcomes of food store interventions (expanding beyond dietary impact). Finally, rural food environments remain understudied[12] and require more investigation.

Supply and management realities are **systems or sectors** that impact retailers. Interestingly, retailers noted the added time or effort required to stock healthy foods and beverages in comparison to unhealthy products, which are often delivered and stocked directly by manufacturers.[44, 49-51, 57, 60, 61, 64, 68] Given the management challenges identified such as long work hours,[65] high employee turnover,[53] a shrinking prospective workforce,[72] and slim profit

margins,[72] it is not surprising that the foods and beverages that are delivered and stocked for rather than by retailers are those represented in food environments. Given this, more supplier network research is warranted as conducted by Mui et al. (2015),[85] because this sector was found to considerably influence retailer decision making behaviors. Future research should also investigate the opportunity scale up and scale out[86] delivery or supply strategies that minimize the time cost for retailers to meet healthy retail objectives.[87]

Both local and federal **policy** were identified as influential on retailers. Perspectives of the WIC food package changes that required authorized retailers to align the food store inventory with WIC participant allowable food and beverage purchases[75] were most represented. A review of WIC policy revisions indicated a favorable impact on consumer food environments and consumer behaviors.[88] Retailers were mainly positive regarding stocking healthy products in response to the policy change.[44, 49, 88] Perhaps this was due to ensured consumer demand[75] that impacted retailers' favorability for in store changes, which mirrors the concept of strategic corporate social responsibility.[24] This indicates that facilitating SNAP participant purchases of healthy foods and beverages in SNAP-authorized food stores may help to overcome the barrier of no ensured demand[89] alongside a recent policy rule adjustment that aims for retailers to enhance healthy food access.[90, 91]

Last, retailers' sociocultural **norms and values** highlighted the importance placed on the health and well-being of store consumers.[45, 49, 57, 64, 65, 70, 72] While there are competing interests,[24] this research captured shared, similar retailer values with public health. Framing a program as both low risk and targeted at improving the health and wellbeing of a community may be effective for building retailer-practitioner partnerships.

Study Limitations

Results are limited in transferability to other locations and contexts given the small number of studies identified, the high amount of qualitative articles, and the mainly urban settings. It is possible the search syntax was ineffective in capturing all literature relevant to review scope. The incorporation of healthy retail toolkits or gray literature was not a focus of this review. Therefore, results may have failed to provide a complete synthesis of retailer perspectives available.

In addition the varying reporting specifications or styles for qualitative research may have been a barrier for assessing study quality, although in majority ratings were positive. Many of the quantitative articles were poorly rated, although available tools do prioritize highly controlled designs. Such approaches to complex systems investigations, including retailer-focused research in the food environment setting, may be unsuitable.[82]

CONCLUSIONS

Multiple social-ecological factors impact retailer decision making and willingness or ability to support healthy food and beverage objectives in food stores. Overall, there is a dearth of retailer information available within the literature. Research approaches and intervention plans must align with retailer goals, business models, and available resources. Review results should be used to guide future investigations and research-practice partnerships that support favorable business and public health outcomes. The processes of these approaches should be rigorously documented and disseminated. More research is also needed to inform the application of numerous consumer-oriented MMCA strategies that ensure retailer profits initially and over

time. Additionally, a participatory and translational approach to food environment research should be utilized to maximize public health impact.

Figure1. Search Protocol and Process Using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis Guidelines

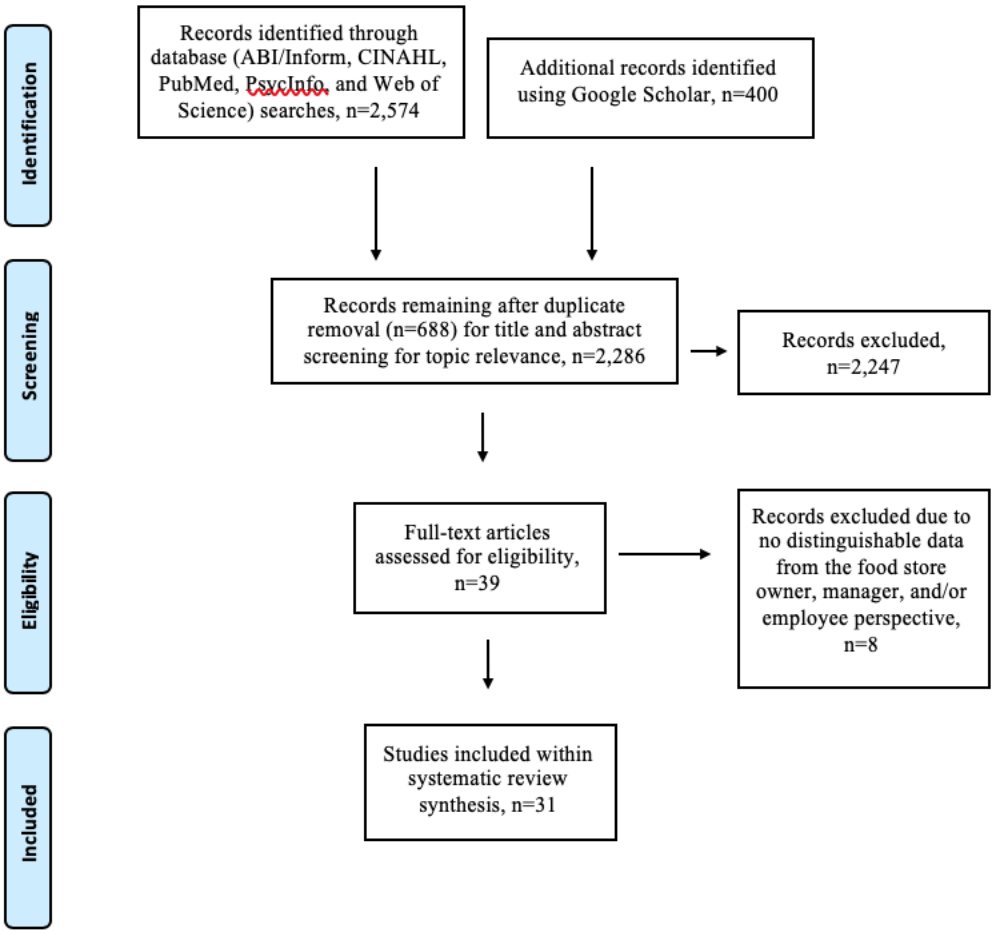

Figure 2. A Socioecological Visual of Influential Factors on Food Store Retailers Decision Making for Promoting Consumer Health

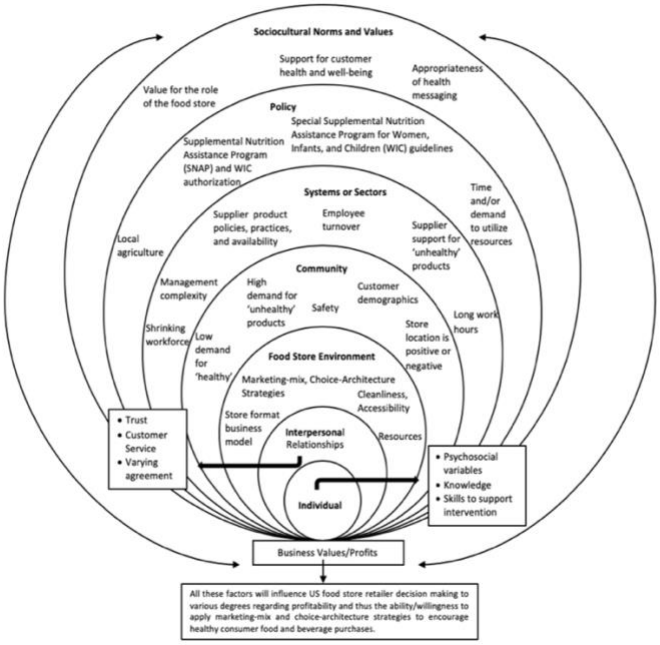

Table 1. Food Store Owner, Manager, and Employee Perspectives that May Impact Decision Making and Intervention Applications.

First Author, Year [In-text Citation]	Retailer Perspectives
Place: Atmospheric or Structural Qualities, n=15	
Andreyeva, 2011;[44] Ayala, 2012;[46] Caspi, 2015;[60] Dannefer, 2012;[48] Gravlee, 2014;[50] Izumi, 2015;[68] Jilcott Pitts, 2013;[74] Kim 2017;[64] Larson, 2013;[52] O'Malley, 2013;[54] Pinard, 2016;[72] Song, 2009[56]	Limited or lacking infrastructure (due to lack of space or equipment, time and/or cost barriers).
Baquero, 2014[47]	Customer service and store cleanliness was improved after a nutrition intervention. The time and space required to install infrastructure is a challenge and may require interventionist assistance.
Gittelsohn, 2012[49]	A produce display improved perceptions of the store atmosphere. The creation of a pleasant store atmosphere was of business interest.
O'Malley, 2013[54]	Interventionist assistance would be required to implement changes.
Song, 2011[57]	Store atmosphere was perceived to improve as a result of establishing trust.
Profile: Food Store Inventory, n=11	
Andreyeva, 2011[44]	Enhancing the store's inventory is of interest to enhance product variety.
Budd, 2017[62]	There were mixed results regarding whether retailers would sustain the stocking of promoted foods post-intervention.

Caspi, 2015[60]	Products such as fresh fruit and low-fat milk were perceived to be low-profit items in comparison to other healthy products that were perceived as average profit items (not high profit).
D'Angelo, 2016[71]	The following percentages of participants noted willingness to stock these items: 74%, low-fat dairy; 66%, whole grain bread; ~51%, three varieties each of fresh fruits and vegetables; 40%, frozen produce; ~40%, pre-cut fresh fruits and vegetables.
DeFosset, 2017[63]	Variety and affordability were the most important stocking indicators and 75% considered offering healthy products a high priority.
Gittelsohn, 2012[49]	Current store inventory informed food purchasing needs. Perishable foods were the greatest challenge with regard to predicting sales and thus ordering needs.
Gravlee, 2014[50]	Few healthy products were currently available in stores, as indicated by participants. Product sales informed stocking needs.
Gravlee, 2014;[50] Izumi, 2015;[68] Mayer, 2016[65]	Perishable products were challenging to sell before they expire.
O'Malley, 2013[54]	There were mixed perceptions on the profitability of fresh fruits and vegetables. Sometimes the high cost of produce was considered a challenge that would require financial assistance from the intervention team.
Pinard, 2016[72]	All except two participants expressed a willingness to stock healthier options if consumers bought them. Competition among stores in the community prompts in-store product variety. It was perceived necessary to expand inventory options that are convenient for consumers.
Pricing: Altering Costs of Food and Beverage Products, n=3	

Kim, 2017[64]	Small stores noted challenges to item sales due to customer expectations for continued affordability. Also, a limited variety of products available was considered a barrier to placing multiple items on sale.
Sanchez-Flack, 2016[55]	Employees believed that tienda coupon dispensers would be an effective approach to facilitate consumer purchases, especially for produce.
Song, 2011[57]	Believed that customers tended to prefered product coupons rather than incentive cards.
Promotion: Increasing Consumer Demand Through Product Promotions, n=8	
Baquero, 2014[47]	Retailers reported liking the recipes and in-store food demonstrations used.
Dannefer, 2012[48]	Participant feedback indicated that use of more posters, cooking and food demonstrations, and promotional events would be preferred.
Escaron, 2015[67]	Perceived that deli tastings, food bundling, and promotional materials were effective in increasing consumer demand for intervention items.
Kim, 2017[64]	Common promotional suggestions included taste testing/free samplings. Fliers were also suggested to draw consumers in.
Mayer, 2016[65]	Some owners expressed a willingness to verbally promote healthy choices as a way to support the community.
Sanchez-Flack, 2016[55]	Food demonstrations were discussed positively. Managers and employees believed that reusable bags for healthy foods would be an effective promotional tactic.
Song, 2009[56]	Taste testing as a component of an intervention was perceived effective.

Song, 2011[57]	Retailers believed the use of culturally appropriate artwork was beneficial in attracting the target intervention population. Food samples tended to be perceived as more successful than chip clip and water bottle promotions. Flyers were considered to be the least effective promotional method. Larger stores preferred posters and some perceived this method to be the most effective intervention material.
Priming or Prompting: Consumer Cues Implemented to Draw Attention to Healthier Foods and Beverages, n=4	
Abarca, 2005[59]	Displays were perceived to be a possible approach to promoting sales.
Sanchez-Flack, 2016[55]	Both managers and employees agreed on the importance of visible, well placed displays. Also, while employees tended to like the concept of using floor stickers to guide consumers with limited space, managers did not agree due to cleanliness concerns.
Song, 2009[56]	The use of shelf labels was preferred for stores with limited space and some considered labels to be the most effective intervention method, although proper placement was important.
Wingert, 2014[58]	Larger displays were considered to have the potential to sway consumer purchasing decisions.
Proximity: Altering the Location of Healthy Foods and Beverages to Reduce Associated Consumer Effort, n=5	
Baquero, 2014[47]	Intervention infrastructure was chosen to be placed at eye-level and near a consumer check out location.

D'Angelo, 2016[71]	The following percentages of participants noted willingness to change the location of certain items: ~70%, move healthy snacks and produce to checkout area; 34%, move unhealthy snacks away from checkout area.
Pinard, 2016[72]	Perceived that placing complementary products within the same area would be a positive sales tactic. Placing aesthetically pleasing food and beverage options near the front of the store was perceived to be beneficial for sales.
Sanchez-Flack, 2016[55]	Managers discussed the importance for effective placement of promotional reusable bags to enhance visibility.
Setala, 2011[57]	Considered the stocking location of promoted intervention items to be an important variable.

CHAPTER 2 REFERENCES

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Chapter 3

Study 1: Rural SNAP-Authorized Food Store Owners' and Managers' Perceived Feasibility to Implement Marketing-Mix and Choice-Architecture Strategies to Encourage Healthy Product Purchasing by SNAP Consumers

ABSTRACT

Background: Using marketing-mix and choice-architecture (MMCA) strategies such as place, profile, portion, pricing, promotion, picks, priming or prompting, and proximity may improve the dietary quality of consumers' purchases. Little is known about Supplemental Nutrition Assistance Program (SNAP)-authorized food store owners' and managers' perspectives toward implementing MMCA strategies to promote healthy dietary purchases.

Purpose: To understand the feasibility and perceived costs of SNAP-authorized food store owners and managers to implement various MMCA strategies to promote healthy purchases.

Methods: A mixed-methods design was used and included: (1) a survey assessing direct/adjustment costs to implement MMCA strategies; (2) a card sort to determine MMCA strategy feasibility; (3) and audio-recorded responses to card sort prompts to understand owner/manager views. Statistical analyses were used to determine if costs differed by MMCA feasibility to implement. Qualitative information was analyzed using the constant comparison method.

Results: Adjustment costs for structural 'place' strategies were higher for SNAP-authorized owners/managers who specified these strategies as not feasible to implement ($p<0.05$). 'Place' strategies were more feasible among independent owners/managers than corporate managers. 'Prompting' and 'proximity' strategies were highly feasible, but approaches to minimize 'unhealthy' products were less feasible. Barriers to implementing MMCA strategies were related

to their appropriateness, including business model fit or perceived MMCA efficacy to increase sales.

Conclusions: 'Unhealthy' foods and beverages were integral to SNAP-authorized owners'/managers' business outcomes. Rather than reducing the accessibility of 'unhealthy' foods and beverages, MMCA strategies 'prompting' and 'proximity' could be used to alter the placement of and draw consumers' attention to healthy products.

INTRODUCTION

The United States Department of Agriculture (USDA) administers the Supplemental Nutrition Assistance Program (SNAP), which is invaluable to improve household food security among vulnerable Americans.[1] In 2017, SNAP consumers spent about US $63 billion benefit dollars on foods and beverages at more than 260,000 (SNAP)-authorized food store locations.[2] Food stores may be an optimal environment for interventions to favorably influence the dietary quality of SNAP recipients,[3, 4] which is a persistent program challenge.[5-7] However, the alignment of intervention strategies with the perspectives and resources of key food store environment stakeholders' (SNAP-authorized owners/managers)[8, 9] is understudied.[10]

The USDA-initiated expansion requirements for healthy product stocking in SNAP-authorized food stores[11] is one example of potential intervention misalignment with businesses' needs. For example, SNAP consumers do not have purchasing restrictions for foods and beverages aside from nonfood items and prepared options.[1] Food store corporations[12] and small business owners[13, 14] have noted a perceived lack of efficacy for healthy product stocking alone to result in healthy food sales or favorable changes to SNAP dietary quality. There is a need for consumer-oriented food store strategies that support and complement SNAP-authorized food store sales and business models.

Generating SNAP consumer demand for products aligned with the Dietary Guidelines for Americans, 2015-2020 (DGA)[15] could be accomplished through the combination of business strategies and nudge theory,[16] or the use of marketing-mix and choice-architecture (MMCA)[17] strategies in SNAP-authorized food stores.[3, 4, 18, 19] MMCA strategies offer various ways to alter food store aesthetics and the properties and placements of DGA-aligned food and beverage products to encourage healthy SNAP purchases.[17] However, little is known about the use of

comprehensive MMCA strategies within SNAP-authorized food stores from the management perspective.[10] This topic is especially understudied in rural food store environments,[10] and is notable given the economic issues experienced in rural versus urban US locations.[20]

Five published studies have explored the use of MMCA strategies from the perspective of rural food store owners and/or managers. D'Angelo et al. (2016) indicated rural retailers were willing to increase the stocking of select healthy food products and to offer healthy options near checkout locations.[21] Other studies have identified strategies that rural retailers perceive as effective to increase consumer demand for healthy foods such as promotions[22] and moving the location (i.e., proximity, placement or positioning) of healthy food and beverage products in stores.[23-25] In contrast, altering product prices or reducing accessibility of unhealthy products were less acceptable strategies among some rural retailers.[21, 25] However, no research explores owner/manager perceptions of a full range of MMCA strategies that could be used in-store to promote favorable dietary choice behaviors for consumers.

To our knowledge, no published investigations have elicited perceptions about the comparative cost related to the implementation of various MMCA strategies. Feasibility, defined as the "actual fit, suitability, or practicability of an intervention in a specific setting,"[26] is important to assess an intervention's fit for different contexts.[27] The cost to implement MMCA strategies in rural SNAP-authorized food stores may be prohibitive[28] or may impact the feasibility of store owners/managers to implement healthy food retail strategies.[29]

Therefore, this research examines owner/manager feasibility (costs and barriers/facilitators) to implement MMCA strategies in rural SNAP-authorized food stores using a MMCA framework with eight strategies including place, profile, portion, pricing, promotion, healthy default picks, priming or prompting, and proximity.[17] The results may inform

partnerships between retailers and public health practitioners to promote health in rural regions and have been used to inform the 'Shop Smart, Eat Smart' healthy retail program in central Virginia.[30]

METHODS

This research used a convergent parallel, mixed-methods design.[31] A 21-item qualitative checklist guided reporting.[32]

Setting

Campbell and Pittsylvania counties in central Virginia are rural,[33] have low food access,[34] high adult obesity prevalence[33] and social deprivation[35] compared to the state's average. These areas were purposefully selected and in close proximity to the SNAP-Ed Healthy Retail Coordinator (LD) at the time of this investigation. Within the two counties there were 84 SNAP-authorized food stores. These food stores were designated as independent (n=42) or corporate (corporate/chain-owned) (n=43) owned.[36]

Recruitment and Data Collection

All owners/managers of the SNAP-authorized food stores within the selected counties were eligible to participate (n=84). Recruitment and data collection occurred from August to October in 2017. Owners/managers were sent a recruitment letter and the first author followed up in-person up to three times. One store was found to be closed. Remaining potential participants were unable to be located (n=11) or declined participation for the following reasons: corporate guidelines (n=19); lack of time (n=7); lack of interest (n=11); disinterest in being

documented (n=1); and, no reason given (n=4). One participant owned two SNAP-authorized food stores within the targeted setting.

The first author is a Registered Dietitian Nutritionist (RDN) and was responsible for leading data collection across all sites and was sometimes assisted by a co-author (LD); both are experienced qualitative researchers. All data collection occurred within participants' SNAP-authorized store setting. The environment was often noisy with frequent interruptions and data collection often occurred in the open (e.g., alongside the register). All participants received between $75-$100 after completing all study protocol instruments. A follow up phone call was initiated by a co-investigator (SC) to collect missing survey information.

Framework

An adapted MMCA framework was used to assess strategy feasibility: place; profile; portion; pricing; promotion; priming; prompting; proximity.[17] Authors did not assess feasibility for the strategy 'picks' due to little supporting information available specific to the food store setting.[10] Categories 'priming' and 'prompting' were separated to capture possible nuances in participant feasibility to implement these MMCA strategies. Further, 'place' strategies encompass both atmospheric and structural changes with the potential to vary widely in costs. This category was split for the purpose of the cost analysis. A definition per each of the MMCA strategies is defined within Table 1.

Instrumentation

Data collection materials were selected in anticipation for reduced time and capacity for prospective participants to be involved in research protocol.[10, 37] Measures are described in the order collected.

Participants first completed a 59-item survey that was adopted from existing formats.[38, 39] The survey assessed two kinds of MMCA costs: (1) direct costs that included labor, material, utility, and capital or infrastructure-related expenses, and; (2) adjustment costs or the 'cost of inconvenience' to change store protocol.[28] The cost analysis captured responses on a continuous scale, from values 1 to 6 (low to high cost) (Appendix B).

Next, participants completed a free list[40] to determine shared owner/manager perceptions of 'healthy' foods and beverages. This method and results are presented in an alternate publication, along with the results of an environmental audit[41] collected as the final store measure (forthcoming).

The third measure used was a card sorting exercise. This technique is an ethnographic and cognitive anthropological method[40] used to determine shared perceptions or similarities among a culturally similar sample. SNAP-authorized owners/managers were instructed to sort 62 MMCA strategies across eight categories (place, profile, portion, pricing, promotion, priming, prompting, proximity)[17] into 'yes' or 'no' piles. Retailers were informed that sorting into the 'yes' pile indicated the strategy was perceived feasible to implement in-store, while 'no' piles indicated not feasible. MMCA strategies were sourced from the scientific literature, available healthy retail toolkits, relevant reports, and co-author ideas. Face validity was assessed among co-authors. The card sort protocol is available upon author request (strategy examples are described below).

SNAP-authorized owners/managers sorted the eight broad MMCA strategy cards first. MMCA cards included a photo and a definition with strategy examples. Of the MMCA strategies determined feasible to implement in-store, owners/managers sorted smaller cards respective to each main strategy. These smaller cards included a singular strategy example that could be implemented in-store. This approach limited the number of cards that required sorting and participants' choices were documented using photographs. This process was audio recorded; participants were prompted to explain why MMCA strategies were feasible or not feasible to implement in-store.

Data Analysis

SPSS version 25.0 (IBM Corporation, USA, 2017) was used for all statistical analyses.[42] Due to the small sample size, some participant responses were recoded when they indicated a 'maybe' rather than using the provided 'yes' or 'no' format, for example. These responses were coded as 'no' (due to not being a 'yes').

Frequencies, means, and standard deviations with regard to participant demographics and MMCA strategy costs were calculated. Pearson Chi Square and Fisher's Exact Test were used to test for differences in how independent and corporate SNAP-authorized owners/managers indicated MMCA strategies as feasible/not feasible. Fisher's Exact Test was also used to test for differences in MMCA strategy feasibility (feasible/not feasible) by perceived ability of strategy to increase store revenue. Related-Samples Wilcoxon Signed Rank Test was used to test for differences in median direct and adjustment costs between all MMCA strategies. Independent-Samples Mann-Whitney U Test was to determine if perceived direct and adjustment costs to

implement MMCA strategies were higher for strategies determined not feasible. Significance values were set a priori at 0.05.

Qualitative data (audio-recordings) were transcribed. Independent and corporate SNAP-authorized owners/managers were analyzed separately in Excel using the constant comparison method.[43] The first author drafted a code book. A coding panel of three experienced qualitative researchers (SM, SC, LD) coded and reconciled coded meaning units with the first author to identify emergent themes. The number of participants and meaning units contributing to themes were calculated. Emerged themes were organized by barriers and facilitators to implement MMCA strategies and were coded (BH, SC) using three implementation outcome constructs that indicate intervention acceptability, appropriateness, and feasibility.[27]

RESULTS

Descriptive Results

Most participants were corporate-affiliated (55.2%), managers (69%), managed one store location (86.2%), and were residents of the store community (75.9%). Participants indicated their stores served neighborhood residents (96.6%), SNAP participants (79.3%), families (75.9%), seniors (65.5%), youth/students (55.2%), commuters (51.7%), limited English proficiency consumers (31%), and Special Supplemental Nutrition Assistance Program for Women, Infants, and Children (WIC) participants (13.8%).

Participants noted moderate demand for 'healthy' foods and beverages. Stores varied in size indicated by annual sales (five participants did not know) and the number of customers and employees (Table 1). MMCA strategy implementation in these stores would have the potential to reach a large number of SNAP consumers and community members (Table 1).

MMCA Direct and Adjustment Costs

The types of costs associated with implementing each MMCA strategy along with the overall direct and adjustment costs (measured from 1 to 6, low to high cost respectively) are available in Table 2. The highest perceived direct and adjustment costs were related to structural 'place' in-store changes. The lowest costing MMCA strategy was perceived to be 'prompting'. These differences were often statistically significant (Table 2).

Only adjustment costs for structural 'place' strategies were higher among owners/managers who indicated these strategies were not feasible to implement (Mean (M) =4.84, Standard Deviation (SD), ± 1.7) in comparison to those that indicated MMCA feasibility (M=3.44, SD ± 1.8) (p=0.043). All other associations were not statistically significant (P>0.05). Differences in how owners/managers indicated MMCA strategies as feasible/not feasible were not statistically different when compared with owner/manager perceptions of MMCA potential to increase store revenue (P>0.05).

Feasibility

Feasibility to implement MMCA strategies across the eight domains are described briefly and available in Table 1. The largest differences between independent and corporate owner/manager perceived feasibility to implement MMCA strategies were for 'place' strategies. Independent SNAP-authorized owners/managers were more likely than corporate managers to indicate 'place' strategies as feasible to implement (Table 3). 'Profile' strategies were feasible among a high percentage of participants overall; however, alterations to the macro/micronutrient content of prepared products was an exception (Table 3). Independent SNAP-authorized

owners/managers indicated 'portion' strategies as feasible more often when compared with corporate participant responses. See Table 3.

MMCA 'pricing' and 'promotion' strategies had fewer indications of feasibility. 'Priming' strategies, especially healthy food displays, were perceived feasible (Table 3). Among all participants the highest agreements were regarding the feasibility of using 'prompting' and 'proximity' strategies. This was true for strategies that highlighted 'healthy' foods and beverages. The least feasible MMCA strategies overall were proposed alterations to unhealthy food and beverage products (Table 3).

Qualitative Results

Qualitative themes reflected barriers or facilitators to use MMCA strategies in-store from the owner/manager perspective. Themes are displayed in Table 4 along with example participant quotes. These themes expressed owner/manager acceptability, appropriateness, and feasibility[27] to use MMCA strategies in SNAP-authorized food stores. For example, acceptability is the extent to which owners/managers found MMCA strategies personally acceptable.[27] Appropriateness refers to perceptions regarding MMCA strategy alignment with SNAP-authorized food store business models or the perceived efficacy of MMCA strategies to enhance sales and/or SNAP dietary quality. Feasibility refers to participants' perceived ability to implement MMCA strategies in-store within time, space, and resource constraints.[27] While themes were similar between independent and corporate SNAP-authorized owners/managers, they differed in saturation (e.g., number of meaning units and participants contributing to themes). See Table 4.

DISCUSSION

This research used a mixed-methods study approach to explore the feasibility and costs to implement MMCA strategies in rural SNAP-authorized food stores from a key stakeholder perspective. Results extend upon other rural food store owner/manager research[22-25] by assessing cost factors and the intervention potential of a larger variety of MMCA strategies.[10] As costs are an important consideration for implementation approaches,[29] the cost of MMCA strategies were hypothesized to be higher among owners/managers that determined MMCA strategies were not feasible to implement in-store. However, aside from the associated hassle of implementing structural 'place' strategies, this assumption was not supported. Infrastructure and space concerns to support healthy food initiatives, which impact the implementation of 'place' strategies, were commonly noted in a review of owner/manager perspectives[10, 13, 14] and are less simple to alter.

Few differences were found between how independent and corporate SNAP-authorized owners/managers indicated feasibility to use 62 MMCA strategies in-store. 'Place' strategies were more feasible to implement among independent store owners/managers. This may be due to planograms or corporate designations of store layouts that are less able to be altered, as corporate policies were found to be a large restriction for these SNAP-authorized food store managers. Among all participants, however, both 'prompting' and 'proximity' strategies in support of DGA-aligned food and beverages were indicated as widely feasible (>2/3 of independent and corporate SNAP-authorized owners/managers). These MMCA strategies were also indicated as relatively low cost, low hassle approaches to food store environment change and seem a favorable first step for initiating research-practice partnerships in rural areas.

There was also high agreement against altering the availability or prevalence of 'unhealthy' foods and beverages in SNAP-authorized food store environments. Results indicate approaches to food store environment change that seek to reduce 'unhealthy' food and beverage accessibility will be ill received due to the integral role they play in rural food store businesses. Widely used food environment measures focus on both 'healthy' and 'unhealthy' product variables.[44] However, it may be practical for researchers and practitioners to solely focus on measuring changes to 'healthy' foods and beverages.[41] As owners/managers seem unlikely to alter their product profile of 'unhealthy' foods and beverages, this may save valuable time in the field and/or aid in generating more meaningful data that aligns with strategies likely to be used by key food store stakeholders. In addition, focusing on items able to be incorporated alongside 'unhealthy' food store products may help to build trust when initiating retailer-practitioner partnerships, a construct identified as import for successful food store interventions.[45-49]

In this study, SNAP-authorized owners/managers were prompted to indicate why MMCA strategies were feasible or not feasible to implement in their store. Results indicated there were more barriers to the use of MMCA strategies than facilitators. These barriers largely regarded the appropriateness[27] of MMCA strategy implementation and may indicate misalignment of proposed public health strategies with business models of SNAP-authorized food stores in the US.[10, 28] Future work is needed to adapt[50] the evidence-based strategies for this audience and setting. In this way, interventionists can "begin with the end in mind" and ensure MMCA strategy fit, uptake, and impact.

Policy incentives may be a favorable approach to enhancing the appropriateness of MMCA strategy implementation in these settings to positively impact SNAP dietary quality. For example, alongside the proposed increases in 'healthy' product stocking,[11] the USDA could act

as an outside 'supplier' and contract space or promotion protocols within SNAP-authorized food stores to increase MMCA strategy appropriateness. This may be reasonable given technical or monetary support to make proposed food environment changes to meet the new rule requirements have been noted.[13, 14] Future research across more, diverse locations and demographics is necessary to inform potential policy approaches within this scope.[3, 4, 18]

Limitations

This study was novel in the approach to understanding perceived feasibility and costs to implement a wide array of MMCA strategies from the perspective of key, rural food store stakeholders. However, the purposeful sampling technique, low sample size, and qualitative approach to assessing barriers and facilitators to MMCA implementation limit the capacity for these results to be generalized and/or transferred to other contexts. Further, a non-validated survey was utilized to assess perceived costs associated with implementing MMCA strategies in-store. Finally, there were logistical challenges in finding a time/opportunity to interview owners/managers without disruption, as many of these individuals were the only employee in the store. However, meeting these participants in their environment was meant to reduce travel burden and improve comfort/rapport. Future work is needed on pragmatic methods for data collection in hard-to-reach settings.

Conclusions

Perceptions of key stakeholders are vital to understand intervention fit, inform adaptations, and ensure uptake. In this case, 'unhealthy' foods and beverages were integral to SNAP-authorized owners'/managers' business outcomes and researchers and practitioners

should not prioritize the reduction of consumer's 'unhealthy' food accessibility over other approaches. Rather, MMCA strategies 'prompting' and 'proximity' should be utilized to draw attention to and alter the placement of DGA-aligned products to enhance SNAP consumer likelihood to purchase them. Researchers should also aim to understand the adaptions or incentives required to increase MMCA intervention appropriateness in diverse store contexts.

Table 1. Participant SNAP-Authorized Owner/Manager Characteristics and Store Variables, n=29			
Participant Characteristics	Mean and (±) Standard Deviation	Participant Characteristics	Percentage of Respondents
Age, n=19	45.47 ± 9.6	Female	51.7%
Annual store sales, n=24	$US 1,745,869.57 ± $US 3,391,987.62	Male	48.3%
Proportion of total sales related to SNAP	Percentage of Respondents	Race, n=19	
0-24%	41.4%	White	73.7%
25-49%	48.3%	Black	15.8%
50-74%	6.9%	Pacific Islander	5.3%
Do not know	3.4%	Arab	5.3%
Management responsibilities, n=24		Education, n=19	
Scheduling	83.3%	Grade 8	5.3%
Equipment/ Maintenance Costs	66.7%	Some High School	5.3%
Product Stocking	75%	High School	31.6%
Costs for Store Materials	58.3%	Some College	26.3%
Utility Costs	54.2%	Associate's Degree	26.3%
Length of management position		Some Graduate or Professional School	5.3%
0-2 years	41.4%	Customer demand for healthy products, n=19	
3-5 years	17.2%	<20%	10.5%
6-10 years	10.3%	20-40%	68.4%
10 or more years	31%	41-60%	21.1%
Number of employees		61-80%	10.5%
0-2	17.2%	Number of customers/day	
3-5	17.2%	50-100	3.4%
6-8	31%	101-150	10.3%
9-11	17.2%	151-200	17.2%
12 or more	17.2%	>200	13.8%
Have time to collaborate	82.5%	>500	44.8%

Table 2. Owner/Manager Perceived Costs to Implement Marketing-Mix and Choice-Architecture (MMCA) Strategies in SNAP-Authorized Food Stores in Rural Virginia, n=29[a]

	Types of Direct Costs						
	Labor Costs	Material Costs	Utility Costs	Capital (Infrastructure) Costs	Result in Increased Revenue?	Direct Costs[b]	Adjustment Costs[b]
Place (atmospheric)	65.5%	71.4%	17.9%	67.9%	46.4%	3.1 ± 1.2	3.2 ± 1.8
Place (structural)	50%	77.8%	55.6%	77.8%	51.9%	4.2 ± 1.5[c]	4.2 ± 1.8[d]
Profile	37.9%	71.4%	28.6%	53.6%	67.9%	3.1 ± 1.6	3 ± 1.3
Portion	60.7%	63%	22.2%	40.7%	63%	3 ± 1.6	2.9 ± 1.5
Pricing	55.2%	60.7%	14.8%	28.6%	75%	2.8 ± 1.7	3.3 ± 1.9
Promotion	86.2%	64.3%	35.7%	28.6%	63%	3.3 ± 1.6[e]	3.5 ± 1.5
Priming	55.2%	71.4%	14.3%	17.9%	53.6%	2.7 ± 1.6	3.3 ± 1.4
Prompting	65.5%	71.4%	7.1%	25.9%	60.7%	2.5 ± 1.5[f]	3.2 ± 1.4
Proximity	75.9%	50%	10.7%	57.1%	50%	3.1 ± 1.6	3.3 ± 1.5

[a]Related-Samples Wilcoxon Signed Rank Test was used to test for potential differences in median perceived direct and adjustment costs across MMCA categories.
[b]Mean and Standard Deviation (±) of scaled responses: 1-6 (low to high).
[c]Median differences were statistically significant when compared with all other strategies ($p<0.01$ for all strategies except promotion, which is significant at 0.05.
[d]Median differences were statistically significant when compared with all other strategies except promotion (place (atmospheric) and portion, $p<0.01$; profile, pricing, priming, prompting, and proximity, $p<0.05$).
[e]Median differences were statistically significant when compared with the cost of place (structural) ($p<0.01$), pricing ($p<0.05$), and priming ($p<0.01$) strategies.
[f]Median differences were statistically significant when compared with all other strategies excluding pricing and prompting. ($p<0.01$ in comparison to place (structural), promotion, and proximity; $p<0.5$ in comparison to place (atmospheric), profile, portion).

Table 3. Independent and Corporate SNAP-Authorized Owner/Manager Perceived Feasibility to Implement In-Store Marketing-Mix and Choice-Architecture (MMCA) Strategies in Rural Virginia, n=29.

Card Sort Item	Independent SNAP-authorized Owner/Managers, n=13	Corporate SNAP-authorized Managers, n=16
Place - Changes to the store atmosphere (i.e., lighting, colors, music, etc.) or equipment or infrastructure installations to support purchases of healthier foods and beverages.	10 (76.9%)*	5 (31.3%)
Enhance customer service for the promotion of healthy foods and beverages.	10 (76.9%)*	5 (31.3%)
Make changes to point of sale (POS) system to track or support the use of rebates for healthy foods and beverages.[a]	7 (53.8%)	3 (18.8%)
Provide kid-friendly MyPlate carts.[a]	8 (61.5%)*	3 (18.8%)
Provide MyPlate carts.[a]	8 (61.5%)**	2 (12.5%)
Train staff to support in-store strategies to promote healthy foods and beverages.	9 (69.2%)*	4 (25%)
Upgrade or install equipment for healthy food and beverage stocking.	9 (69.2%)**	3 (18.8%)
Upgrade supply or product systems to aid in locating, promoting, or stocking healthy foods and beverages.[a]	7 (53.8%)	3 (18.8%)
Use colors to highlight healthy foods and beverages.	9 (69.2%)*	5 (31.3%)
Use lighting to highlight healthy foods and beverages.	9 (69.2%)**	3 (18.8%)
Use sound or music to highlight healthy foods and beverages.	61.5%*	25.00%
Profile - Selling a wide variety of healthier foods and beverages. USDA's enhanced stocking standards rule is an example of enhancing the profile of foods.[a]	10 (76.9%)	11 (68.8%)
Alter prepared foods to reduce added sugar, salt and saturated fats, and to increase fruits, vegetables and whole grains.[a]	2 (15.4%)	4 (25%)
Decrease shelf space of unhealthy foods and beverages.[a]	2 (15.4%)	4(25%)
Incorporate local suppliers to support healthy stocking needs.	9 (69.2%)	6 (37.5%)
Increase fresh fruit product stocking.[a]	10 (76.9%)	9 (56.3%)
Increase fresh vegetable product stocking.[a]	10 (76.9%)	8 (50%)
Increase healthy snack product stocking.[a]	10 (76.9%)	11 (68.8%)

Increase lean protein product stocking.	8 (61.5%)	7 (43.8%)
Increase low-fat dairy product stocking.	7 (53.8%)	10 (62.5%)
Increase low/no calorie and low/no added sugar beverage product stocking.[a]	8 (61.5%)	11 (68.8%)
Increase no salt, fat, or added sugar canned fruit and vegetable product stocking.[a]	8 (61.5%)	10 (62.5%)
Increase no salt, fat, or added sugar frozen fruit and vegetable product stocking.	8 (61.5%)	7 (43.8%)
Increase offering of convenient and healthy meals.	9 (69.2%)	8 (50 %)
Increase shelf space of healthy foods and beverages.[a]	10 (76.9%)	11 (68.8%)
Increase whole grain product stocking.[a]	10 (76.9%)	9 (56.3%)
Portion - Offering smaller portion sizes to support purchases of healthier foods and beverages.[a]	10 (76.9%)	8 (50%)
Decrease portions of unhealthy prepared foods and beverages.[a]	3 (23.1%)	5 (31.3%)
Increase stocking of well portioned healthy snack items.	9 (69.2%)	8 (50%)
Increase stocking of well portioned, bundled healthy food and beverage items for convenient home cooking.	9 (69.2%)[*]	5 (31.3%)
Increase stocking of well portioned, prepared healthy food and beverage items.	10 (76.9%)[*]	6 (37.5%)
Pricing - Lowering food prices or providing consumer incentives to support purchases of healthier foods and beverages.[a]	9 (69.2%)	10 (62.5%)
Incorporate local or alternate food suppliers to reduce healthy food and beverage costs.[a]	7 (53.8%)	4 (25%)
Increase the price of unhealthy foods and beverages.[a]	4 (30.8%)	2 (12.5%)
Offer a SNAP match program for fresh fruits and vegetables.[a]	3 (23.1%)	6 (37.5%)
Offer coupons for fresh fruits and vegetables.	6 (46.2%)	9 (56.3%)
Offer coupons for healthy snack products.	7 (53.8%)	10 (62.5%)
Offer incentive cards (frequent purchase) for fresh, canned, and frozen fruits and vegetables.	6 (46.2%)	7 (43.8%)
Promotion – Promoting foods (i.e., signs, displays, consumer education, cooking and tasting demonstrations, etc.) to support purchases of healthier foods and beverages.[a]	11 (84.6%)	10 (62.5%)
Decrease promotions of unhealthy foods and beverages.[a]	6 (46.2%)[*]	2 (12.5%)
Have the check-out cashier ask if the customer would like a $.99 add-on for fruits and vegetables.	5 (38.5%)	8 (50%)
Include signage at check-out locations to specify % of customers that buy a fruit or vegetable.	7 (53.8%)	6 (37.5%)
Offer a customer wellness challenge to promote healthy foods and beverages.	7 (53.8%)	6 (37.5%)

Offer free fresh fruit and vegetable snacks for children while families shop.	6 (46.2%)	6 (37.5%)
Offer in-store cooking demos and taste tests for healthy foods and beverages.	8 (61.5%)	8 (50%)
Offer in-store nutrition education and healthy food and beverage tours.	7 (53.8%)	7 (43.8%)
Provide MyPlate shopping lists for consumers to promote healthy foods and beverages.	9 (69.2%)	7 (43.8%)
Use medias to promote healthy foods and beverages.[a]	7 (53.8%)	4 (25%)
Use signs, posters, and pictures to promote healthy foods and beverages.[a]	9 (69.2%)	9 (56.3%)
Use store fliers to promote healthy foods and beverages.	8 (61.5%)	8 (50%)
Priming - Changing in-store properties (i.e., floor design or stickers, store layout, aisle or shelf presentation, etc.) to help guide consumers to purchase healthier foods and beverages.[a]	10 (76.9%)	10 (62.5%)
Use an appealing display to highlight healthy foods and beverages.[a]	10 (76.9%)	11 (68.8%)
Use cues (floor arrows) to guide consumers to healthy foods and beverages.[a]	9 (69.2%)	10 (62.5%)
Prompting - Use messages, labels, or pictures on the shelves or on foods to support purchases of healthier foods and beverages.[a]	12 (92.3%)	12 (75%)
Attach recipes and nutrition info to convenience food products to support healthy foods and beverages.[a]	10 (76.9%)	11 (68.8%)
Use a standardized shelf or product labeling system to indicate if a food is healthy, unhealthy, or neutral.[a]	10 (76.9%)	10 (62.5%)
Use local labels for fresh foods sourced locally.[a]	12 (92.3%)**	7 (43.8%)
Use messages or photos in support of healthy food and beverage purchases on carts or bags.	9 (69.2%)*	5 (31.3%)
Use product labels (messages or nutrition info) in support of healthy foods and beverages.[a]	12 (92.3%)	11 (68.8%)
Use shelf labels (messages or nutrition info) in support of healthy foods and beverages.[a]	12 (92.3%)*	9 (56.3%)
Proximity - Changing where foods are located in the store to reduce the effort for consumers to purchase healthier foods and beverages.[a]	12 (92.3%)	14 (87.5%)
Add healthy foods and beverages to check-out lanes.[a]	12 (92.3%)	11 (68.8%)
Move healthy foods and beverages closer to the easy reach of children.[a]	12 (92.3%)	10 (62.5%)
Move healthy foods and beverages to the front of the store or to high consumer traffic areas.[a]	11 (84.6%)	11 (68.8%)
Move unhealthy foods and beverages away from the easy reach of children.[a]	6 (46.2%)	5 (31.3%)
Move unhealthy options to the back of the store or away from high consumer traffic areas.[a]	4 (30.8%)	4 (25%)
Place healthy foods and beverages at eye-level locations.[a]	12 (92.3%)	12 (75%)

Remove unhealthy foods and beverages from check-out lanes.[a]	4 (30.8%)	4 (25%)
Remove unhealthy foods and beverages from eye level locations.	6 (46.2%)	6 (37.5%)
Use store aisle endcaps to display healthy foods and beverages.[a]	10 (76.9%)	13 (81.3%)

[a]Fisher's Exact Test was used when parameters did not meet assumptions for Pearson Chi Square.
[*]Statistically significant when compared with the proportion of corporate SNAP-authorized managers that indicated feasibility, $p<0.05$
[**]Statistically significant when compared with the proportion of corporate SNAP-authorized managers that indicated feasibility, $p<0.0$

Table 4. Barriers and Facilitators to Implementation of Marketing-Mix and Choice-Architecture Strategies in SNAP-Authorized Food Stores in rural Virginia, n=29.

Independent SNAP-Authorized Owners/Managers, n=13			Corporate SNAP-authorized Managers, n=16		
Emerged Theme	Meaning units (n=x), and percent contributing to theme	Sample Participant Quote	Emerged Theme	Meaning units (n=x) and percent contributing to theme	Sample Participant Quote
Barriers Regarding Feasibility to Implement Marketing-Mix and Choice-Architecture Strategies					
Not Profitable/Effective[b]	n=52, 84.6%	"People love to sample food, they won't always buy it, but they love to sample it (IP23)."	Corporate Policy[b]	n=93, 93.8%	"Not that they couldn't rearrange it, but I'm just saying, it would be a lot of hassle, red tape. It would have to be signed off by… there would be a lot of signatures, let's put it that way (CP2)."
Strategy Misaligned with Consumer Base or Store Model[b]	n=29, 84.6%	"That requires remodeling and that requires also that you have the customer base. If you don't have the customer base for that as a small man you cannot afford to do that (IP29).	Strategy Misaligned with Consumer Base or Store Model[b]	n=44, 75%	"…but in the way we're set up and the way my customers drive my sales as far as what their main reasons for coming in here is, I don't know if really expanding and putting a whole lot more in here would help (CP1)."
Lack of Store Space/Infrastructure[c]	n=30, 76.9%	"We don't have room for all of that (IP7)."	Not Profitable/Effective[b]	n=26, 56.3%	"…it never really helps anything, people don't pay attention to it (CP27)."
Supplier or Manufacturer Control/Contracts[b]	n=16, 53.9%	"…I don't think my Pepsi contract would allow that (IP26)."	Supplier or Manufacturer Control/Contracts[b]	n=21, 56.3%	"…vendors pay for space. So in order to get like the high traffic area, the best space, then they would have

					to put a vendor out. Which they're gonna lose money…(CP18)"
Lack of Consumer Interest in Health[b]	n=9, 38.5%	"People come in… buy a lottery, they might buy a soda, that's it. All that money's going to Virginia lottery (IP10)."	Unhealthy Products Drive Sales[b]	n=9, 56.3%	"…unfortunately, that's my business so I can't do that (CP21)."
Time/Employees[c]	n=6, 30.8%	"This one would probably be time and labor prohibited (IP14)."	Lack of Store Space/Infrastructure[c]	n=17, 37.5%	"That's a no. I don't have the space for the frozen, the only cooler I have frozen, basically, is ice cream (CP2)."
Unhealthy Products Drive Sales[b]	n=5, 30.8%	"It's just, the way it stands, it's smarter to, I guess, push people into their weakness... to unhealthy foods (IP11).	Time/Employees[c]	n=9, 31.3%	"My part time staff people get 15 hours a week and their biggest concern is the duties they're required to do when they're here. Be something they're not gonna be in the store long enough to get done (CP3)."
Store Owner Policy[b]	n=12, 23.1%	"…as I told you, I cannot control (IP12).	Lack of Consumer Interest in Health[b]	n=6, 31.3%	"…a lot of people, they buy a lot of snack foods with SNAP instead of stuff that they could actually cook and would be good for them…(CP4)"
Facilitators Regarding Feasibility to Implement Marketing-Mix and Choice-Architecture Strategies					
Strategy Aligned with Consumer Base or Store Model[b]	n=17, 69.2%	"We do want to do this, change the store atmosphere, the lighting. I don't know about the	Strategy Aligned with Consumer Base or Store Model[b]	n=59, 87.5%	"We kinda already in the process of doing that (CP18)."

		music but there is a lot we want to do there (IP26)."			
Ease of Implementation/Low Risk[c]	n=10, 53.9%	"And this could be a yes, it's pretty easy to put stickers and stuff on something (IP22).	Increase Sales[b]	n=26, 75%	"…now that could work. 'Cause if anything else, they would have me go do that (CP5)."
Implementation at Expense of Collaborators[c]	n=16, 46.2%	"…without financial support we cannot (IP9).	Personal Values[a]	n=10, 43.8%	"I think it would be really good. That's not only coming from a manager, but a grandma. I like bringing it more out and accessible, and more in your face than kind of a background (CP1)."
Personal Values[a]	n=12, 38.5%	"Yeah. I would do that. When it comes to children, I'm willing to do anything (IP24)."	Implementation at Expense of Collaborators[c]	n=19, 37.5%	"If you're promoting it, that would be a good thing (CP19)."
Increase Sales[b]	n=6, 38.5%	"Definitely, if you promote anything it's going to sell more (IP12)."	Ease of Implementation/Low Risk[c]	n=13, 37.5%	"As far as just the manipulating of the location, it can have a huge impact (CP1)."

[a]This theme was related to intervention acceptability or personal factors regarding if an intervention is acceptable to owners/managers.[27]

[b]This theme was related to intervention appropriateness or technical and social factors regarding perceived strategy efficacy and alignment with food store norms/values.[27]

[c]This theme was related to intervention feasibility or practical factors regarding the likelihood an intervention could be implemented in-store based on available time, resources, and space, for example.[27]

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Chapter 4

Study 2: Rural SNAP-Authorized Food Store Product Availability and Owners' and Managers' Healthy Food and Beverage Perceptions Inform the Need for Retailer-Targeted Nutrition Education and Training

ABSTRACT

Objective: To explore rural SNAP-authorized retailer perceptions and store factors to inform a data-driven approach to healthy food retail programs.

Design: A mixed-methods design using free lists and the Market Basket Assessment Tool (MBAT) to assess healthy products.

Setting: Two central Virginia counties.

Participants: Owners/managers (n=29) of grocery, dollar, convenience, and specialty SNAP-authorized food stores.

Main Outcome Measure: Owner/manager 'healthy' food perceptions and (2) the availability of food products aligned with the Dietary Guidelines for Americans.

Analysis: Frequency and salience of 'healthy' products listed among respondents were calculated. This was for perceived 'healthy' foods and beverages in general and for items available in-store. Frequency was used to describe products aligned with dietary guidelines that were available within stores.

Results: There was low salience for what constituted 'healthy'. Some perceptions were misaligned with dietary guidance and the store's healthy food inventory. For example, nuts, seeds, and whole grains were widely available products in-stores, although included less frequently on participants' free lists.

Conclusions and Implications: Nutrition education/training is warranted to connect owner/manager 'healthy' food perceptions with dietary guidelines and pre-existing products in-store. Research is required to understand how this approach impacts owner/manager likelihood to adopt, implement, and maintain healthy food retail interventions.

INTRODUCTION

Supplemental Nutrition Assistance Program (SNAP) consumers' dietary purchasing behaviors could be improved to align with the Dietary Guidelines for Americans, 2015-2020 (DGA).[1, 2] Food store environment cues influence consumers to purchase foods and beverages high in saturated fat, added sugar, and sodium.[3-5] As such, healthy food retail programs are a favorable public health approach to enhance SNAP dietary quality.[6, 7] Retail programs must engage with food store owners and managers (e.g., retailers) or the key intermediaries to improve SNAP consumers' product purchases,[8] however there is a lack of research from this perspective.[9]

Some SNAP-authorized food stores have been documented to offer limited healthy food products for sale.[10-12] Strategies that increase the number of healthy products available in-store may not be feasible, however. Food store retailers have reported several barriers to enhancing the profile of healthy foods and beverages available. Time, cost, perishability, consumer demand, and space constraints are all noted challenges.[9, 13, 14] Therefore, strategies that support consumer purchase of healthy, pre-existing store products are needed.[6, 7, 9, 15] Research is also required that aims to identify approaches that build capacity for SNAP-authorized retailers to implement healthy food retail programs.[9]

For example, SNAP-authorized retailers' nutrition knowledge may influence their likelihood to adopt, implement, and maintain program protocol, however there is limited supporting research. Gravlee et al. (2014) found some deviations from the DGA in food store retailer perceptions of 'healthy.'[16] More investigations are required to explore this potential in other geographic areas.[16] For example, maternal nutrition knowledge that coincided with dietary guidelines positively correlated with home fruit and vegetable availability.[17] However little is known about how food store retailers perceptions of healthy foods and beverages align with

product availability. Exploring these variables could help to inform practical implementation approaches[18-21] to food store change.

Therefore, the presented research explored rural SNAP-authorized retailers' perceptions and store availability of DGA-aligned, healthy foods and beverages. This research as the potential to inform the need for retailer-focused nutrition education or training as a mechanism to build capacity to support healthy food retail programs. Results provide opportunities for data-driven approaches to food store change in a rural region of central Virginia.

METHODS

A convergent parallel mixed-methods approach[22] was used. Sampling and recruitment strategies are described elsewhere (Houghtaling, unpublished data, 2018). This study complemented research that focused on SNAP-authorized food store retailers' perceived feasibility to implement a variety of marketing-mix and choice-architecture (MMCA)[23] strategies in-store (Houghtaling, unpublished data, 2018). Two rural, underserved counties[24, 25] in central Virginia were purposefully selected to recruit SNAP-authorized food store retailers to participate in this research. The Virginia Tech Institutional Review Board approved this research in 2017.

Measures

All participants provided written informed consent. An adapted survey,[26, 27] free list, card sort, and environmental assessment, using the Market Basket Assessment Tool (MBAT),[28] were collected (in this order). See alternate publication for a description of the survey and card sorting exercise (Houghtaling, unpublished data, 2018). A trained qualitative researcher and Registered

Dietitian Nutritionist (RDN) (BH) was responsible for data collection and was assisted by another trained researcher (LD).

Free List. A free list measure was used to elicit shared perceptions of 'healthy' among SNAP-authorized food store retailers. This technique was grounded in cognitive anthropology[29] and has been used once before in retailer-focused food store research.[16] Two free list measures were used. First, SNAP-authorized food store retailers were asked to list 'healthy' foods and beverages. Second, participants were asked list 'healthy' foods and beverages that were currently sold in store. A prompt was used to capture potentially forgotten items: "Are there any other foods and beverages that you can think of, that are like those you have listed?"[16, 29]

The free list provided data on (1) the foods and beverages perceived by a participant to be 'healthy'; (2) a rough estimation of 'healthy' food and beverage knowledge (length of lists); and (3) the salience of participants' 'healthy' food and beverage percpetions.[29]

Environmental Assessment. Researchers were granted permission from SNAP-authorized food store retailers to document the availability healthy food products in-store using the MBAT.[28] The MBAT is a reliable tool and the foods measured in stores included fresh, frozen, and canned varieties of DGA-aligned products based on affordable SNAP consumer options.[1, 28]

Data Analysis

Cultural domain analysis software (ANTRHOPAC)[30] was used to analyze the free list data. List item frequency and average rank were used to calculate a products' salience or Smith's S ($S=((\Sigma (L - R_j + 1))/L)/N$; L was list length; R was an item's rank on the list (j); N was the number of free lists collected).[29, 31] A value of one would indicate perfect item salience across the

sample (e.g., item listed first on every participants' free list). A free list item was reported if the 'healthy' food or beverage perception was shared between at least two participants.[29]

An RDN reviewed free list items to highlight areas where perceptions were misaligned with the DGA and food store product availability (MBAT).[1] Foods and beverages that are aligned with the DGA were defined as products low in saturated fats, added sugars, and sodium. Rather fruit, vegetable, whole grain, low-fat dairy, and lean meat products were considered aligned with the DGA.[1] The MBAT captured DGA-aligned products available in-store that could be promoted by a SNAP healthy food retail program.

Frequencies were calculated using SPSS version 25 (IBM Corporation, USA, 2017)[32] to characterize select survey responses and healthy food availability in-stores.

RESULTS

Twenty-nine SNAP-authorized retailers of convenience (n=19), dollar (n=4), grocery (n=5), and specialty (n=1) stores participated in this research. Two thirds (67%) reported that they had lived in the store community for 10 or more years, and one quarter (25%) (n=24) reported residing in the community for at least three years. The majority of retailers reported either self-stocking (46%) or using a local farm supply (42%) to source produce. Fewer indicated produce delivery by a supplier (29%) (respondents, n=24). Table 1 summarizes participants' SNAP-authorized food store supplier and consumer information.

The majority of SNAP-authorized retailers indicated few store suppliers that were perceived to carry healthy products. Further, customers were often repeat customers and most food stores were perceived to be utilized primarily for snack purchases (Table 1).

Healthy Food and Beverage Perceptions

The first free list, that prompted retailers to list 'healthy' foods and beverages in general, resulted in 168 unique items. Fifty-nine items were shared between at least two participants (Table 2). The average list length was 11.86 items, ranging from 3 to 25 items. No food and beverage items were listed among all respondents. "Fruits" was the item with highest salience among SNAP-authorized retailers, and this item was documented on less than half of participants' free lists. "Water" was the most frequently listed item between both lists (Table 2).

Many of the retailers' general perceptions of 'healthy' foods and beverages were aligned with dietary guidance. However about 42% of listed items were either misaligned or lacked the specificity required for DGA-aligned promotion in-store. For example, dairy, wheat, and meat products were listed rather than indicating products as low-fat, 100%, and lean, respectively. These items are presented in Table 2 using bolded-text.

The second free list, that prompted retailers to list 'healthy' foods and beverages that were currently sold in-store, resulted in 153 unique items. The average list length was 9.62 items and ranged from 2 to 34 items. Forty items were shared among at least two respondents. "Milk" was the most salient item listed across respondents (n=12), and about 53% of the listed items were either misaligned or lacked the specificity required for DGA-aligned promotion in-store. These items are also presented using bolded-text (Table 2).

Healthy Food Availability

Available food products that aligned with the DGA are displayed in Table 3. These food items could be targeted for consumer promotion in SNAP healthy food retail programs. No food product was available within all SNAP-authorized food stores (Table 3). Participants' healthy

food perceptions and actual in-store DGA-aligned food availability did not correspond at times. For example, three 'healthy' foods that were listed by at least seven (24%) participants were captured on the MBAT. Bananas, eggs, and apples were available in sixteen (55%), twenty-one (72%), and thirteen stores (45%), respectively.

There were also many DGA-aligned items captured in the majority of stores that were not listed by many participants. For example, 100% whole wheat/grain bread was available in many stores (n=18) and not represented on the free list in this form (e.g., all breads would not be promoted by SNAP healthy food retail programs). Peanut butter was available within most stores, however was listed by no participants. Nuts were listed among some participants, although nuts, and seeds (not listed), were highly available products across stores in general (Table 3). Canned produce varieties were also available within many measured stores, although only some participants listed canned vegetables (n=5) or fruits (n=4). No participants listed frozen produce varieties. Last, sardines and tuna were the most commonly available meats across stores, however were listed by zero and two participants, respectively. See Tables 2 and 3.

DISCUSSION

A key intermediary is a person who, "construct[s] value, by framing how others engage with goods, affecting and effecting others' orientations towards those goods as legitimate—with 'goods' understood to include material products as well as services, ideas and behaviours."[8] This research captured healthy food perceptions and DGA-aligned product availability among key intermediaries and across SNAP-authorized grocery, dollar, convenience and specialty food stores. There were two main findings from this research. First, there was low agreement of food and beverage products that were perceived as 'healthy' among SNAP-authorized retailers. Some

of these listed items did not correspond to the DGA. These results aligned with previous research conducted among a sample of food store owners and managers in Florida.[16] Second, there were many pre-existing, DGA-aligned food products available in stores that were not commonly listed as 'healthy' by participants.

These results inform the need for nutrition education and/or trainings or dissemination strategies[18-21] targeting retailers. For example, if retailers do not perceive their inventory as healthy, this will likely impact the ability for retailers to effectively promote these foods. However, more information is required to understand any potential connection between healthy food knowledge and intervention success. In addition, trainings could connect retailers' with available DGA-aligned products in-stores. Nuts, seeds, and whole grains, in particular, may be ideal to target in SNAP healthy retail programs in central Virginia due to their wide availability.

Promoting the purchase and consumption of these food products may have a large public health impact, although more evidence is required specific to the US. For example, Lieffers et al. (2018) found that low Canadian intake of nuts, seeds, and whole grains were the largest dietary contributors to high health care costs associated with diet-related noncommunicable diseases (CAD$ 2.6 billion direct; CAD$ 4 billion indirect).[33] SNAP consumers in the US tend to purchase 27% fewer plant-based proteins (indicator includes seafood) and 20% fewer whole grain products than other income-eligible and non-eligible populations.[2]

These food product promotions may also align well with SNAP-authorized retailer business models in the study site area. Retailers indicated that few of their consumers utilized their stores to purchase all household dietary needs. Therefore, healthy food retail programs that highlight DGA-aligned snack choices (e.g., nuts, seeds) or easy-grab items (e.g., 100% whole wheat/grain bread) may be preferred. Namely strategies that use labeling or placement changes

in-store to encourage SNAP consumers to purchase these products, as these MMCA strategies were often preferred (Houghtaling, unpublished data, 2018). However, research is required to understand if trainings or improvements to retailers' nutrition knowledge impacts the adoption, implementation, and maintenance of healthy food promotions.

Limitations

Results are not intended to be generalizable due to the methodological approach used and the small sample size. However, between 20-30 participants is considered sufficient for cultural domain analyses.[16, 29] The limited agreement among the culturally similar sample of SNAP-authorized store retailers' could have resulted from the study's broad inclusion criterion. Further, many of the high agreement foods indicated staple food products which likely help vulnerable consumers to maintain food security.[34] It will be important moving forward for researchers to explore strategies to engage food store retailers' in nutrition education to build capacity for promoting nutritious foods and beverages within constraints of their business model.

Implications for Research and Practice

SNAP-authorized retailers are the intermediaries to impact SNAP consumers' behaviors. Other research groups could use this data-driven approach to inform healthy food retail programming. Nutrition education and/or targeted training or dissemination protocol are warranted to build capacity for retailers to promote 'healthy' and available foods and beverages in store settings. Research is required to understand best approaches. In central Virginia, nuts, seeds, and whole grain options should be promoted due to their wide availability and potential to favorably impact SNAP consumers' dietary quality and health. Research is also warranted to

explore if retailers' knowledge, attitudes, behavior, and self-efficacy toward healthy eating and nutrition impact the adoption, implementation, and maintenance of healthy food promotions, which has been observed among other gatekeepers.

Table 1. Supplemental Nutrition Assistance Program (SNAP-Authorized Food Store Owner/Manager, Store, Supplier, and Consumer Characteristics, n=29

Participant Characteristics	Percentage of Respondents	Supply and Inventory Characteristics	Percentage of Respondents
% of Total Customers that are 'Regulars'		Number of Suppliers with Healthy Products	
20-40%	16%	0-2	24%
41-60%	11%	3-5	45%
61-80%	58%	6-8	17%
81-100%	16%	9-11	7%
Customers shopping primarily for snack products		12 or more	24%
<20%	3%	Control of suppliers over product stocking, n=19	
20-40%	31%	No control	11%
41-60%	38%	Low control	37%
61-80%	24%	Some control	37%
81-100%	3%	High control	16%
Customers shopping primarily for staple products		Store inventory method, n=28	
<20%	31%	Computerized	43%
20-40%	31%	Hand count	46%
41-60%	31%	External audit	14%
61-80%	6.9%	Challenges in stocking fresh produce, n=28	
81-100%	31%	Corporate Guidelines	18%
Customers shopping for all food needs		Finding a Supplier	14%
<20%	66%	Cost	25%
20-40%	10%	Perishability	29%
41-60%	7%	Low Demand	11%
61-80%	10%	Refrigeration	11%
81-100%	7%	Time	11%
Number of Suppliers, n=27			
0-2	4%		
3-5	22%		
6-8	26%		
9-11	19%		
12 or more	30%		

Table 2. Supplemental Nutrition Assistance Program (SNAP)-Authorized Food Store Owners' and Managers' Healthy Food and Beverage Perceptions In Response to a Free List Technique[a], n=29

	General Free List Item	Frequency[b]	Average Rank[c]	Smith's S[d]	In-Store Free List Item	Frequency[b]	Average Rank[c]	Smith's S[d]
1	Water	16	8.3	0.257	Water	15	6.5	0.318
2	Fruits	13	4.2	0.333	**Milk**	12	3.3	0.335
3	Vegetables	12	5.5	0.249	Bananas	8	5.4	0.197
4	**Milk**[e]	10	6.2	0.191	Eggs	8	4.6	0.177
5	**Juice**	9	5.7	0.161	**Cheese**	8	5.6	0.152
6	Eggs	7	7.4	0.131	Apples	7	5.4	0.182
7	Bananas	7	3.4	0.194	Oranges	6	7	0.132
8	Apples	7	2.1	0.224	Nuts	5	8.4	0.06
9	**Yogurt**	6	7.3	0.116	Canned Vegetables	5	7.4	0.076
10	Lettuce	6	11	0.089	Tomatoes	5	10.8	0.079
11	**Cheese**	5	6	0.119	Fruits	5	2.6	0.129
12	Oranges	5	5.2	0.122	Vegetables	4	11.8	0.055
13	Broccoli	5	8.6	0.105	**Juice**	4	7.5	0.070
14	Nuts	5	9	0.068	**Dried Fruits**	4	11.8	0.025
15	Fresh Produce	5	2	0.150	**Bread**	4	7.8	0.054
16	Tomatoes	5	11.6	0.069	**Orange Juice**	4	6	0.078
17	**Orange Juice**	4	13.5	0.045	**Canned Fruits**	4	10	0.045
18	**Cereal**	4	7.3	0.068	**Rice**	3	6	0.037
19	Pears	4	9	0.077	**Apple Juice**	3	6.7	0.064
20	Baked Chicken	4	6.8	0.083	**Protein Bars**	3	6.7	0.066
21	**Bread**	4	7.3	0.073	**Cereal**	3	8.3	0.051
22	**Whole Grain Products**	4	6.5	0.064	**Yogurt**	3	12.7	0.057
23	**Meats**	3	10.7	0.036	Lettuce	3	3.7	0.077
24	Beans	3	12	0.032	**Gluten Free Products**	3	4.3	0.071
25	**Dairy Products**	3	4.7	0.069	Fresh Produce	3	7.7	0.063
26	Baked Fish	3	6.7	0.053	2% Milk	3	5	0.055

27	Carrots	3	7	0.072	**Grape Juice**	3	7.7	0.053
28	**Salads**	3	4	0.077	Tuna	2	13	0.018
29	**Gluten Free Products**	3	6.3	0.053	**Fruit Juice**	2	3	0.061
30	Lean Meats	3	9.7	0.041	Fresh Vegetables	2	6	0.038
31	Fish	3	14	0.026	Pears	2	14	0.040
32	Fresh Fruits	3	1.7	0.099	**Cheese Sticks**	2	8.5	0.041
33	**Wheat Bread**	3	14.3	0.031	**Wheat Bread**	2	7	0.037
34	**Green Tea**	2	3.5	0.044	Dried Beans	2	13	0.024
35	**Organic Products**	2	3	0.049	**Power Bars**	2	13	0.031
36	**Sugar Free Products**	2	11.5	0.028	Baked Chicken	2	18.5	0.025
37	**Veggie Straws**	2	9	0.026	**Salads**	2	5	0.032
38	Cabbage	2	12	0.025	**Sugar Free Products**	2	12	0.010
39	**Protein Drinks**	2	7	0.026	**Whole Wheat Products**	2	3.5	0.026
40	**Chicken Salad**	2	14	0.025	Potatoes	2	4	0.043
41	**Rice**	2	3.5	0.047				
42	Fresh Vegetables	2	2	0.059				
43	Brown Rice	2	12.5	0.015				
44	Leafy Greens	2	3	0.060				
45	**Whole Wheat Products**	2	3	0.046				
46	Oatmeal	2	6	0.035				
47	Cucumbers	2	13	0.030				
48	**Apple Sauce**	2	6	0.052				
49	Pineapple	2	8	0.039				
50	**Protein Bars**	2	12.5	0.037				
51	Turkey	2	8	0.009				
52	Peppers	2	8.5	0.037				
53	100% Fruit Juice	2	9	0.025				
54	**Fruit Juice**	2	6	0.034				

55	Peaches	2	6.5	0.048
56	**Dried Fruits**	2	17.5	0.006
57	Watermelon	2	10	0.025
58	2% Milk	2	6	0.044
59	Tofu	2	6	0.047

[a]In response to a free list prompt that asked respondents to list as many healthy foods and beverages that they could think of.
[b]Indicates the number of free lists that an item was listed on.
[c]Indicates an item's position on participants' free list responses.
[d]A value of 1 would indicate perfect item salience across the sample. Salience is a function of frequency and rank.
[e]Bolded text indicates misalignment with dietary guidance.

Table 3. Healthy[a] Food Availability Across Rural Supplemental Nutrition Assistance Program (SNAP)-Authorized Convenience, Dollar, Grocery, and Specialty Food Stores, n=29

Item	Number of Stores Product Available	Item	Number of Stores Product Available	Item	Number of Stores Product Available
100% Whole Wheat/Grains		**Dairy Products (low/no-fat)**		**Dried Beans, Nuts, and Seeds**	
Bread	18 (62.1%)	Eggs	21 (72.4%)	Peanut Butter	28 96.6%)
Cold Cereal[b]	11 (37.9%)	Cheese	12 (41.4%)	Sunflower Seeds	23 (79.3%)
Oatmeal	11 (37.9%)	Milk	7 (24.1%)	Cashews	22 (75.9%)
Pasta	7 (24.1%)	Egg Mixtures	4 (13.8%)	Almonds	18 (62.1%)
Rice	6 (20.7%)	Yogurt	2 (6.9%)	Pinto Beans	17 (58.6%)
Popcorn	6 (20.7%)			Mixed Nuts	16 (55.2%)
Tortillas	5 (17.2%)			Peanuts	14 (48.3%)
English Muffins	1 (3.5%)			Pumpkin Seeds	12 (41.4%)
				Pistachios	12 (41.4%)
				Black Beans	7 (24.1%)
				Lentils	4 (13.8%)
Fresh Produce		**Frozen[c] Produce**		**Canned Produce[d]**	
Banana	16 (55.2%)	Broccoli	7 (24.1%)	Green Beans	24 (82.8%)
Tomatoes	14 (48.3%)	Corn	7 (24.1%)	Corn	22 (75.9%)
Apples	13 (44.8%)	Beans	5 (17.2%)	Peaches	20 (69%)
Oranges	12 (41.4%)	Green Beans	5 (17.2%)	Tomatoes	17 (58.6%)
Potatoes	8 (27.6%)	Spinach	4 (13.8%)	Oranges	16 (55.2%)
Pears	7 (24.1%)	Berries	3 (10.3%)	Pineapple	12 (41.4%)
Peaches	5 (17.2%)	Carrots	3 (10.3%)	Carrots	12 (41.4%)
Carrots	5 (17.2%)	Peaches	2 (6.9%)	Potatoes	12 (41.4%)
Cauliflower	5 (17.2%)	Pineapple	2 (6.9%)	Beans	11 (37.9%)
Cucumber	5 (17.2%)	Mixed	2 (6.9%)	Mixed	10 (34.5%)
Onion	5 (17.2%)	Cauliflower	2 (6.9%)	Beets	8 (27.6%)
Pineapple	4 (13.8%)	Mixed	2 (6.9%)	Spinach	8 (27.6%)
Broccoli	4 (13.8%)	Mango	1 (3.4%)	Asparagus	7 (24.1%)
Cabbage	4 (13.8%)	Asparagus	1 (3.4%)	Pears	5 (17.2%)
Melon	3 (10.3%)			Cabbage	4 (13.8%)

Berries	3 (10.3%)			Mixed	4 (13.8%)
Corn	3 (10.3%)				
Asparagus	2 (6.9%)				
Green Beans	2 (6.9%)				
Spinach	2 (6.9%)				
Beets	1 (3.4%)				
Fresh Meat		**Frozen Meat**[e]		**Canned Meat (≤360mg sodium/serving)**	
Chicken Breast	5 (17.2%)	Shrimp	6 (20.7%)	Sardines	24 (82.8%)
Ground Turkey	4 (13.8%)	Chicken Breast	5 (17.2%)	Tuna	22 (75.9%)
Chicken Pieces	3 (10.3%)	Salmon	5 (17.2%)	Salmon	15 (51.7%)
Whole Chicken	3 (10.3%)	Tilapia	4 (3.8%)	Clams	5 (17.2%)
Ground Beef (≤10% fat)	2 (6.9%)	Chicken Pieces	2 (6.9%)	Chicken Breast	4 (13.8%)
Tilapia	2 (6.9%)	Clams	1 (3.4%)	Ground Chicken	4 (13.8%)
Salmon	2 (6.9%)	Tuna	1 (3.4%)	Turkey Breast	3 (10.3%)
Tuna	1 (3.5%)	**Lunch Meat (≤480mg sodium/serving)**		Shrimp	2 (6.9%)
Shrimp	1 (3.4%)	Turkey Breast	8 (27.6%)	Ground Turkey	1 (3.4%)
		Ham	8 (27.6%)	Tilapia	1 (3.4%)
		Chicken Breast	1 (3.4%)		

[a]The Market Basket Assessment Tool (MBAT) measures the availability and quality of foods that are aligned with dietary guidance.
[b]With at least 3 grams of fiber and no more than 7 grams of sugar per serving.
[c]No added fats, sugars, or sodium.
[d]Fruits canned in water, 100% juice, or light syrup.
[e]No combination foods or fried meats.

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Chapter 5

Study 3: An Examination of Prevalent Supplemental Nutrition Assistance Program (SNAP)-Authorized Chain Retailers in the United States, California, and Virginia to Inform Large-Scale Healthy Food Retail Initiatives

ABSTRACT

Enhancing the diet quality of Supplemental Nutrition Assistance Program (SNAP) populations is a public health priority. SNAP-Education (SNAP-Ed) healthy food retail programs and the Partnership for a Healthier America's (PHA) Fruits & Veggies (FNV) Campaign are two initiatives that encourage SNAP consumers to purchase foods and beverages aligned with the Dietary Guidelines. This study characterized prevalent SNAP-authorized chain retailers by store format in the US, in two states (California/Virginia), and by state urban/rural areas in order to inform future programming with the potential to reach numerous SNAP consumers. The SNAP-Authorized Retailer Locator was accessed to extract SNAP retailer information and used to determine retailer prevalence. Eight store format categories were used to classify stores: supermarket, drug, convenience, mass merchandiser, supercenter, dollar, club, or non-food store. Frequencies were calculated and Chi Square (Pearson χ^2) tested if proportions of prevalent SNAP-authorized formats differed ($P<0.05$) by state/rurality. Results indicated a high prevalence of convenience, dollar, and drug SNAP-authorized chain retailers in the US. The proportion of prevalent SNAP-authorized formats differed by state ($p<0.001$; Phi 0.229), urbanity/rurality (California, $p<0.001$, Phi 0.305; Virginia, $p<0.001$, Phi 0.187), and by cross-state urban ($p<0.001$; Phi 0.220) and rural comparisons ($p<0.001$; Phi 0.318). SNAP-Ed healthy food retail programs and the FNV campaign should target convenience, dollar, and drug SNAP-authorized chain retailers to maximize program reach to SNAP-consumers in the US. Results provided information that could be used to tailor statewide or urban and rural health promotion programs in CA or VA to focus on the most prevalent SNAP-authorized formats.

INTRODUCTION

In 2017, the United States Department of Agriculture's (USDA) Supplemental Nutrition Assistance Program (SNAP) provided financial assistance for dietary purchases to more than 42 million (1 in 8) vulnerable Americans.[1] Participants redeemed over US $63 billion in electronic benefits for household dietary needs at over one-quarter million chain and independently-owned SNAP-authorized retailers, such as supermarkets, grocery, convenience, and drug stores.[2] These retail sites represent possible locations for targeted public health strategies that encourage SNAP consumers to purchase and consume more fruit, vegetable, and whole grain products.[3, 4]

Stocking policies from the USDA ensure that SNAP-authorized retailers have available perishable and nonperishable varieties of produce, dairy, meat/poultry/fish, and bread or cereal products for purchase.[5] However, the available products aligned with these categories may differ by store format and chain retailer.[6, 7] SNAP-authorized Walgreens stores, for example, have been found to stock more frozen produce options and less whole wheat pasta products in comparison to other drug format chains (e.g., Rite Aid).[6] SNAP-authorized Dollar Tree stores stocked more frozen vegetables and less low-fat dairy products than Dollar General stores.[7]

Further, low and high income consumers utilize different store formats for their household food and beverage needs.[8-10] For example, lower income consumers tend to frequent certain less-traditional (e.g., dollar, drug, and convenience) food store formats more often,[10] which have been associated with food and beverage purchases that score lower on measures of dietary quality.[8, 11] Disparities in food access characteristics by sociodemographic and geographic variations have also been noted.[12-14] These differences likely impact the potential success of healthy food retail strategies and more research could help to design effective messaging techniques that reach a large number of SNAP consumers.

SNAP-Education (SNAP-Ed) policy, systems, and environmental approaches to health promotion[15] represent an ideal mechanism to engage with chain retailers to ensure mutually beneficial outcomes (e.g., enhanced SNAP dietary quality, healthy food sales, statewide reach).[16] The SNAP-Ed program supports the implementation of evidence-based interventions that promote SNAP dietary behaviors aligned with the Dietary Guidelines for Americans, 2015-2020 (DGA).[17] Healthy food retail programs that use evidence-based strategies to transform marketing-mix and choice-architecture[18] properties in food stores to favor DGA-aligned products are an especially popular SNAP-Ed approach.[19-21] More evidence is warranted to inform which food stores SNAP-Ed should consider systematically approaching.

SNAP-Ed stakeholders are further encouraged to engage in multi-sectoral partnerships to address complex problems. For example, the Partnership for a Healthier America's (PHA) Fruits & Veggies (FNV) Campaign, which uses creative advertising to promote the sale and consumption of fruits and vegetables,[22] was listed as an appropriate social marketing program to partner with in the 2017 SNAP-Ed guidance.[23] Since launching in two California and Virginia markets in 2015, the FNV Campaign has expanded through new partnerships and scaled-up to new locations across the US. This has included SNAP-Ed programs in California,[24] Colorado, Georgia, North Carolina, and Wisconsin.[25] Partners have also included Farm Fresh retailers in Virginia,[26] rural Kansas communities,[25] and Giant Food stores across Washington D.C., Delaware, Maryland, and Virginia.[27]

Enhancing the reach of these programs could result in favorable improvements to the dietary quality of SNAP consumers.[28] This presented research was initiated to better understand which SNAP-authorized chain retailers and formats were most prevalent to inform future SNAP-Ed and public policy approaches to best reach SNAP target audiences. Two geographically and

demographically diverse states, California (CA) and Virginia (VA), were utilized as case studies. Aims of this investigation were to: 1) identify the SNAP-authorized chain retailers that were most prevalent nationally and in both states; and 2) determine if the most prevalent SNAP-authorized chain retailers differed by format between the two states and their urban and rural areas.

METHODS

This research was a cross-sectional investigation of prevalent SNAP-authorized chain retailers. National store information was obtained to characterize prevalent SNAP-authorized chain retailers across many states and informed research that aims to identify healthy food retail partnership potential (forthcoming). California and Virginia were selected as case study sites for more in-depth investigation because: 1) rural and low income areas of Virginia and California have been highlighted as locations where healthy food access programming could favorably impact consumer obesity rates; and 2) cities within these states were selected to pilot the FNV campaign.[22, 29]

The SNAP Retailer Locator[30] was used to source SNAP-authorized food store information. This database was publicly available and should have reflected current SNAP store information. SNAP-authorized food store information was extracted in December 2017 for the US overall, and for CA and VA. Stores were listed by name in Excel and included address and county location information.

Identifying Prevalent SNAP-Authorized Chains

The sorting technique in Excel was used to identify the SNAP-authorized retailers most prevalent nationally and within CA and VA. Each dataset was systematically searched to ensure accuracy. For example, the first few letters of a store name were used as keywords in addition to use of the full store name in Excel searches. This allowed for an accurate identification of stores, as the entry of store names were at times varied (e.g., 'Shell' versus 'Main Street Shell') or misspelled.[30] This process was continued to determine the SNAP-authorized retailers most prevalent within urban and rural CA and VA areas.

To ensure accuracy, the top 60 retailers nationally (e.g., defined as those with the most US locations) were identified. This cutoff included SNAP-authorized chains with at least 300 locations nationwide. In CA and VA, the top 15 retailers were identified due to a lack of recurring stores, especially in rural areas. For example, the 15th most prevalent store in rural CA had only six locations. Four or fewer stores were defined as independently-owned SNAP-authorized retailers.[31]

The 2013 Rural-Urban Continuum Code (RUCC)[32] classifications were applied to store county information to discern food store locations as urban (RUCC 1-3) or rural (RUCC 4-9).[32]

Food Store Format Classification

Food stores were classified by format due to evidence that suggests low income consumers frequent certain stores more often than high income consumers and purchase foods and beverages less aligned with the DGA in comparison.[8] The food store format categories used were: traditional (e.g., supermarket or grocery); club; supercenter; mass merchandiser; convenience; drug; and dollar.[8]

There are USDA classifications for SNAP-authorized stores that have been used in other research.[14] However, a large limitation of this classification system was the grouping of multiple formats (e.g., dollar, drug) under the term "combination grocery".[14] For this research it was of interest to ensure greater specificity; therefore, stores were categorized using the aforementioned format designations by best fit (see report for definitions).[8] For example, Walmart stores could either be categorized as mass merchandisers or supercenters, depending on the breadth of foods and beverages available.[8] Food stores in the US, including Walmart, that were perceived to be most prevalent as a supercenter format were all categorized the same. Any SNAP-authorized stores not meeting definition criteria for food stores (e.g., restaurant) were categorized as a non-food store. A high prevalence of non-food store formats have been associated with a high consumer risk for obesity.[33] Finally, when store names were unfamiliar, Google searches were used to accurately categorize SNAP-authorized stores by format. All SNAP-authorized chains were categorized using this method, due to the overall relative ease of finding their business model information. All SNAP-authorized chains identified in this research are available in Table 1, categorized by format.

Research Sample Used in Comparison to SNAP-Authorized Retailer Data

The described national sampling technique captured 41.25% of all SNAP-authorized stores in the US (N=257,839). In CA, 28.3% of all SNAP-authorized stores available statewide (N=25,141) were captured; additionally, 28.5% of all available stores in urban CA (N=24,281) and 26.9% of all available stores in rural CA (N=860) were identified. In VA, 46.1% of all SNAP-authorized stores available statewide (N=6,491) were selected; additionally, 48.2% of all

available stores in urban VA (N=5,126), and 42.9% of all available stores in rural VA (N=1,365) were captured.

Data Analysis

SNAP-authorized food store format frequencies in the US were calculated using Excel. Statistical software SPSS, version 25 (IBM Corporation, USA, 2017),[34] was used for the remaining analyses. Chi Square test of independence (Pearson χ^2) determined if there were differences in the proportion of prevalent SNAP-authorized retailers between CA and VA and between both states' urban/rural areas (including cross-state comparisons, e.g., urban VA and urban CA). A Bonferroni adjusted, post-hoc analysis (e.g., z test) was applied if the a priori value for significance was met ($p<0.05$). Sample sizes were large and differed by location analyzed. Therefore, Phi was used to determine effect size. Significant differences were reported if there was at least a small effect.[35] The Phi values used and corresponding effect sizes were: 0.1 (small); 0.3 (medium); and 0.5 (large).[35]

RESULTS

Seventy SNAP-authorized chain retailers were identified as the most prevalent in the US and within two state areas (Table 1). SNAP-authorized convenience, dollar, and drug formats were the most prevalent nationally (Figure 1). Meaningful differences were identified between state locations (CA/VA, urban/rural CA, urban/rural VA, urban CA/urban VA, and rural CA/rural VA). These results are available in Table 2. All comparisons were significant with small and medium effect (Table 2), warranting post-hoc testing. Post hoc results are described below.

The proportion of SNAP-authorized dollar (21.6%) and traditional (11.6%) formats were higher in VA than in CA (Table 2). There were more convenience (38.6%), drug (28.9%), supercenter (7.9%), and mass merchandiser (4%) formats in CA than in VA. These differences were statistically significant (Table 2).

With regard to urban-rural differences, the proportions of prevalent traditional and supercenter formats did not significantly differ within or between states. However, there were more SNAP-authorized drug and convenience formats in urban, rather than rural, locations ($p<0.05$) in all comparisons. The state of CA, and specifically urban but not rural locations of CA, contained SNAP-authorized mass merchandiser formats (Table 2). In rural CA, SNAP-authorized non-food store formats were prevalent (8.7%) and this format was not captured in any other location analyzed. There were also more SNAP-authorized drug formats (21.6%) in rural CA than in rural VA (11.8%) ($p<0.05$). Finally, rural areas in all comparisons had higher proportions of SNAP-authorized dollar formats, especially in rural VA where dollar store formats represented over 40% of the most prevalent SNAP-authorized retailers.

DISCUSSION

This research identified the most prevalent SNAP-authorized chains in the US, in CA and VA, and in both states' urban and rural counties. These chains were categorized by format[8] and meaningful differences were identified regarding the SNAP-authorized formats most prevalent by location. These findings were aligned with similar research that identified more 'limited variety' SNAP-authorized formats (e.g., contained few DGA-aligned fresh dietary options) than traditional grocers in urban and rural areas.[12-14] Future research should explore these findings

within the context of consumers' sociodemographic characteristics in order to explore barriers and facilitators to accessing these prevalent SNAP-authorized chain retailers and formats.[12-14]

Results of this research suggest that implementing SNAP-Ed healthy food retail programs and FNV Campaign protocols in partnership with SNAP-authorized convenience, drug, and dollar chain retailers has potential to reach a large number of SNAP consumers in the US. Targeted health promotion strategies may require changes to approach depending on the location. For example, to reach the largest number of SNAP consumers in urban CA, SNAP-authorized drug formats may be an ideal partner. In rural VA, program or campaign implementation should focus on SNAP-authorized dollar formats, as these chains were nearly twice as prevalent when compared to other locations.

Even though SNAP consumers utilize traditional formats for most of their household food and beverage needs, they tend to frequent nontraditional retail locations more times per week in comparison to non-SNAP consumers.[10] Therefore, targeted public health strategies could increase SNAP consumer exposure to health messaging in these sites. Barriers noted by FNV Campaign stakeholders included the perceived low effectiveness of the campaign in reaching low income, SNAP consumers due to initial targeted retail locations that were associated with more affluent shoppers.[36] The approach used in this research could be applied to new joint SNAP-Ed and FNV initiatives to inform strategic SNAP-authorized retail partnerships that amplify reach to target audiences. Research is required to evaluate the impact of any targeted approach.

Additionally, more investigations are required to assess food store offerings at a variety of SNAP-authorized chain retailers.[6, 7] This research could further inform the best in-store MMCA strategies[18] and/or health messaging approaches to highlight available, DGA-aligned

foods and beverages that encourage SNAP consumers to purchase them.[16] Approaches should be aligned with business models and aim to meet both retailer and public health goals for sustainability.[16] The high prevalence of SNAP-authorized dollar formats in rural VA is another variable worth future investigation. Dollar stores have been charged with driving health inequities rather than alleviating them, leading some communities to initiate zoning laws that limit the number of possible dollar stores within a geographic area.[37]

Strengths and Limitations

The food store retailers identified in this research were primarily leading, global entities with high annual revenue,[38] whereas the share of independent food retailers in both urban and rural communities are slight in comparison.[31] Therefore, focusing on SNAP-authorized formats that demonstrate high reach and power within the US food system was a strength of this research.

Accessing publicly available USDA SNAP-authorized store information,[30] rather than sourcing this information directly from the USDA, is another possible limitation. There may be differences between their publicly available database and their current retailer information. Due to database documentation inconsistencies that created sorting and searching difficulties, it is possible the frequencies of SNAP-authorized chain stores were not fully accurate. While store definitions were used[8] and Google was accessed to clarify formats, other researchers may have categorized stores differently. Ground truthing[39] SNAP-authorized retailer data was not possible for this investigation.

Conclusions

Based on these findings, SNAP-Ed healthy food retail programs and other promotional programs at the retail setting, like the FNV campaign, should target SNAP-authorized convenience, dollar, and drug chain retailers to maximize program reach to SNAP consumers in the US. Specifically, SNAP-authorized drug chain formats may be ideal locations to reach SNAP consumers in urban areas and especially in CA whereas dollar stores may result in reaching more SNAP consumers in rural areas, especially in VA. Future research is warranted to explore the potential for public-private partnerships with the prevalent SNAP-authorized retailers identified in this research, as well as the adoption, implementation, effectiveness, reach, and maintenance of interventions at prevalent retailers.[40]

Figure 1. Prevalent Supplemental Nutrition Assistance Program (SNAP)-Authorized Chain Stores by Format in the United States, n=106,356

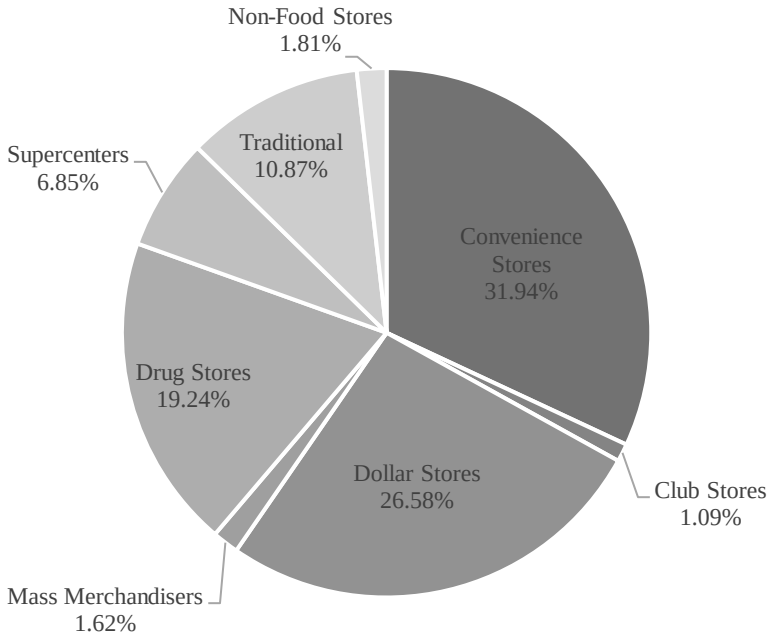

Table 1. The Most Prevalent Supplemental Nutrition Assistance Program (SNAP)-Authorized Chain Stores in the United States, Virginia, and California by Store Format Categorization.

Traditional (Grocery or Supermarket) Store Formats			
• Albertsons	• H-E-B	• Ray's Food Place	• Trader Joe's
• Aldi	• Hy-Vee	• Safeway	• Vons
• Food City	• Kroger	• Save-A-Lot	• Whole Foods Market
• Food Lion	• Piggly Wiggly	• Smart & Final	• Winn-Dixie
• Giant	• Publix	• Stop & Shop	
Convenience Store Formats			
• 7-Eleven	• Colonial Energy	• Kwik Trip	• Sheetz
• Allsup's	• Corner Store	• Love's	• Shell
• Arco ampm	• Cumberland Farms	• Marathon	• Speedway
• Black Diamond Market	• E & C Enterprises	• Maverik	• Stewarts Shop
• BP	• E-Z Mart	• Nmso	• Stripes
• Casey's General Store	• Exxon	• Pilot	• Sunoco
• Chevron	• Fas mart	• QuikTrip	• Valero
• Circle K	• Holiday	• RaceTrac	• Wawa
• Citgo	• Kum & Go	• Redwood	
Club Store Formats			
• Costco	• Sam's Club		
Dollar Store Formats			
• Dollar General	• Family Dollar	• Dollar Tree	
Drug Store Formats			
• CVS Pharmacy	• Rite Aid	• Walgreens	• Fred's
Mass Merchandiser Formats			
• 99 Cents Only	• Big Lots		
Supercenter Formats			
• Kmart	• Walmart	• Target	
Non-Food Store Formats			
• Papa Murphy's	• Schwan's Home Delivery		

Table 2. Statewide and Rurality Differences in the Proportion of Prevalent Supplemental Nutrition Assistance Program (SNAP)-Authorized Food Store Formats – Five Comparisons by Location

Locations	California N=7,117	Virginia N=2,995	Urban California N=6,920	Rural California N=231	Urban Virginia N=2,470	Rural Virginia N=585	Urban California N=6,920	Urban Virginia N=2,470	Rural California N=231	Rural Virginia N=585
χ^2	χ(5, N=10,112) = 529.324, p<0.001 Phi[1]=0.229		χ^2(6, N=7,151) = 665.998, p<0.001 Phi[1]=0.305		χ^2(4, N=3,055) = 106.345, p<0.001 Phi[1]=0.187		χ^2(6, N=9,390) = 455.879, p<0.001 Phi[1]=0.220		χ^2(5, N=816) = 82.498, p<0.001 Phi[1]=0.318	
Post-Hoc Results Indicating Differences in the Proportion of SNAP-Authorized Food Stores by Format										
Traditional	10% (n=709)	11.6%* (n=346)	12.5% (n=866)	11.3% (n=26)	13.6% (n=336)	12.8% (n=75)	12.5% (n=866)	13.6% (n=336)	11.3% (n=26)	12.8% (n=75)
Club	-	-	-	-	-	-	-	-	-	-
Supercenter	7.9%* (n=560)	6.6% (n=197)	7.9% (n=549)	6.9% (n=16)	6.7% (n=166)	5.1% (n=30)	7.9% (n=549)	6.7% (n=166)	6.9% (n=16)	5.1% (n=30)
Mass-Merchandiser	4%* (n=283)	-	4.1%* (n=282)	-	-	-	4.1%* (n=283)	-	-	-
Convenience	38.6%* (n=2,750)	35.8% (n=1,072)	38.6%* (n=2,674)	30.3% (n=70)	36.5%* (n=901)	28.5% (n=167)	38.6% (n=2,750)	36.5% (n=901)	30.3% (n=70)	28.5% (n=167)
Drug	28.9%* (n=2,058)	20% (n=598)	29%* (n=2,008)	21.6% (n=50)	21.4%* (n=529)	11.8% (n=69)	29%* (n=2,008)	21.4% (n=529)	21.6%* (n=50)	11.8% (n=69)
Dollar	10.6% (n=757)	21.6%* (n=782)	7.8% (n=541)	21.2%* (n=49)	21.8% (n=538)	41.7%* (n=244)	7.8% (n=541)	21.8* (n=538)	21.2% (n=49)	41.7%* (n=244)
Non-Food Store	-	-	-	8.7%* (n=20)	-	-	-	-	8.7%* (n=20)	-

[1]Phi values and corresponding effect sizes are: 0.1 (small); 0.3 (medium); and 0.5 (large) (Pearson Chi Square with post-hoc z-test).

*Statistically different than corresponding percentage (P<0.05).

The – symbol indicates that no chains were identified for the format category within the location analyzed.

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Chapter 6

Study 4: An Analysis of Voluntary Commitments of Prevalent Supplemental Nutrition Assistance Program (SNAP)-Authorized Food Retailers to Use Marketing-Mix and Choice-Architecture Strategies to Influence the Healthfulness of Consumers' Dietary Purchases

ABSTRACT

Objective: To examine public commitments of prevalent United States (US) Supplemental Nutrition Assistance Program (SNAP)-authorized retailers to use marketing-mix and choice-architecture (MMCA) strategies to favorably influence the dietary behaviors of consumers.

Design: A cross-sectional review of publicly available information occurred between November 2016 and February 2017. Webpages and gray literature sources were accessed to identify voluntary corporate social responsibility (CSR) commitments to improve consumers' dietary purchasing behaviors aligned with the Dietary Guidelines for Americans 2015-2020. Data were organized using a MMCA framework to characterize the types of strategies utilized: place, profile, portion, pricing, promotion, priming, prompting, and proximity.

Setting: The top 15 most frequently occurring SNAP-authorized retailers were identified nationally, in two states (California and Virginia), and each state's urban and rural areas. These retailers were included in the search for relevant information.

Results: Thirty-eight SNAP-authorized retailers were identified. Most (n=20) provided no information in the public domain about using MMCA strategies to encourage healthy product purchases in stores. Few SNAP-authorized retailers (n=8) had relevant CSR information. Most CSR information was identified in gray literature sources (n=52 articles across 17 stores). These sources most commonly described SNAP-authorized retailers' commitments to increasing the number of healthy products available for purchase.

Conclusions: Future research should seek to understand if SNAP-authorized retailers with commitments to consumer health are more open to mutually beneficial public-private partnerships. Additionally, to understand if those with no CSR messaging within this scope would be interested in strategic approaches to creating CSR that addresses public health concerns.

INTRODUCTION

Engaging with food retailers to create environments that encourage consumers to choose nutritious options aligned with the Dietary Guidelines for Americans, 2015-2020 (DGA)[1] is a critical step for addressing obesity in the United States (US).[2-4] Currently foods store retailers use marketing-mix and choice-architecture (MMCA)[5] strategies to prompt consumers to purchase foods and beverages high in saturated fats, added sugar, and sodium.[1, 6-8] Thus, corporate food retailers have been under increasing scrutiny for their contribution to consumer obesity;[9-11] where 39.8% of US adults and 18.5% of US children were classified as obese in 2016.[12]

Underserved US consumers may be most vulnerable to business practices that favor the consumption of energy dense and nutrient poor dietary products.[13, 14] Low-income populations, including the US Department of Agriculture's Supplemental Nutrition Assistance Program (SNAP) participants, are disproportionately targeted for unhealthy product advertisements[15, 16] and further experience reduced access to foods and beverages aligned with the DGA.[17, 18] These factors contribute to the low dietary quality scores of SNAP consumers' purchases when compared to foods and beverages purchased by high income consumers.[19, 20]

The identification of shared goals between food retailer business and public health nutrition priorities may help to initiate feasible marketplace change that supports both parties' interests (e.g., revenue and improved dietary behaviors).[21, 22] Corporate social responsibility (CSR) is a voluntary platform for corporations to commit to using their reach to help improve social and environmental issues.[23-25] Researchers have explored food retailers' CSR commitments to food system sustainability[26] and healthy consumer nutrition behaviors.[27, 28] However, lacking is an exploration of voluntary corporate commitments to use MMCA strategies

to encourage consumer purchases aligned with the DGA among SNAP-authorized retailers, which represent prevalent food store locations in many underserved US communities.[29]

The purpose of this research is to determine the extent to which prevalent SNAP-authorized food retailers have publicly committed to use MMCA strategies to improve consumers purchase of foods and beverages aligned with the DGA.

METHODS

A cross-sectional review of publicly available information was conducted from November 2016 to February 2017. The most frequently occurring (i.e., top fifteen) SNAP-authorized retailers were identified nationally, within two regionally diverse states (California and Virginia),[30] and within states' respective urban and rural areas.[31] These areas were chosen due to a noted regional need for food access interventions[32] and due to study authors' focus areas.[33]

For each chosen area, the SNAP Retailor Locator[30] was used to sort SNAP-authorized retailers by store name to identify the stores with the most locations. The frequency of SNAP-authorized food store retailers per identified area is available upon author request and is not presented. Retailers identified via this sampling method are listed in Table 1.

Publicly Available Commitments

All of the identified SNAP-authorized retailers (Table 1) were included in a search for publicly available information. Any information that focused on encouraging consumer behaviors aligned with the DGA in food stores was eligible for inclusion. The DGA recommended that consumers primarily purchase foods and beverages low in saturated fats,

added sugars, and sodium.[1] For example, multiple forms of fruits, vegetables, lean and plant based proteins, and low-fat dairy products. In addition, due to the research focus on SNAP, all commitments were required to be US-based. Two methods for identifying relevant information were used, and included SNAP-authorized webpage searches and a gray literature search.

Webpage Searches

SNAP-authorized retailers' (Table 1) webpages were identified using Google searches between November 3, 2016 and November 7, 2016. All areas of a webpage were browsed to locate CSR reports or any CSR-type commitments to improve the likelihood for consumers to choose foods and beverages aligned with the DGA. The CSR sources of data were assumed to indicate more concrete intentions to use MMCA strategies to promote healthy dietary purchases than data shared via press statements or releases. If no CSR report was identified, annual or business reports were scanned for information meeting inclusion criterion. Sustainability reports were also scanned in this instance; however, none were found to include any information relevant to this topic.

Gray Literature Search

The search strategy and terms were formulated with the help a Research Librarian. Three databases were used: LexisNexis Academic; Access World News; and Ethnic News Watch. These databases were chosen to capture smaller food stores' commitments in California and Virginia (Ethnic News Watch) and because of the transnational status of many of the captured corporations. Search terms included the SNAP-authorized retailers' name (Table 1) (e.g., 7-Eleven) along with key words: healthy food(s), nutritious option(s), dietary choice(s), healthy

choice(s), fruit*, vegetable*, whole grain(s), low fat dairy, healthy snack(s), healthy diet(s), and nutrition. Articles published post-2010 were of interest as this was when the Partnership for a Healthier America (PHA) began engaging with food industry stakeholders to address childhood obesity.[34]

The gray literature search occurred between January 19, 2017 and February 2, 2017. All search items (n=2,712) were extracted to an EndNote database where titles and content were analyzed for study relevance. Duplicates from multiple press or news statements were removed. Fifty-two independent items met this study's focus. The search information is detailed in Table 1, which displays the types of materials identified or not identified for research inclusion.

Marketing-Mix and Choice-Architecture Framework

A MMCA framework was used to categorize CSR and press commitments.[5] This framework has been utilized in food store research previously.[22] Eight MMCA strategy categories were used: place, profile, portion, pricing, promotion, priming, prompting, and proximity. Place was used to describe structural or atmospheric properties of food stores that encouraged consumers to choose foods and beverages aligned with the DGA. Profile strategies included commitments to enhance the dietary quality of foods and beverages available in stores. Portion referred to alterations to the sizes of products.

Data were categorized as a pricing strategy if retailers committed to make dietary products aligned with the DGA more affordable for consumers. Promotion strategies included a range of methods to market healthy products in stores. Priming strategies described subtle visual cues in the store environment that helped guide consumers to healthy dietary products. Prompting strategies included labels or messaging on shelves or products in support of DGA

aligned products at the point of choice. Last, proximity strategies represented retailers' commitments to move the physical location of food and beverages aligned with the DGA to locations where consumers were more apt to pick them.

RESULTS

A total of thirty-eight SNAP-authorized retailers were included in this research. A limited number were found to have CSR reports/statements (n=8, 21%) that included information about using MMCA strategies to encourage consumers to purchase foods and beverages aligned with the DGA. In comparison, more press sources were identified that included this information (Table 1). The majority of the SNAP-authorized retailers (n=20, 53%) had no publicly available information that was relevant to the research scope (presented in bolded text in Table 1).

Of the SNAP-authorized retailers who were found to have information that met the research inclusion criterion, most committed to enhancing the number of DGA-aligned foods and beverages available for purchase (profile) (Table 2). In comparison, all other MMCA strategies to enhance the quality of consumers' dietary choices were minimally represented, with portion strategies the least regularly documented (n=1). See Table 2.

In addition, identified information usually represented national-level commitments that seemed relevant to all US store locations. Some SNAP-authorized retailer commitments (mainly press sources), however, indicated smaller-scale, regional strategies.[35-51] For example, a Dollar Tree location discontinued the sale of sugar-sweetened beverages in response to the Berkeley soda tax and a select Shell store in Massachusetts partnered with practitioners to offer more healthful options.[50, 51]

DISCUSSION

SNAP-authorized retailers are well positioned to influence the dietary behaviors of numerous consumers.[29] Frequently occurring SNAP-authorized retailers nationally and in two geographically different areas were selected to examine their publicly available commitments in support of using a host of MMCA strategies to encourage DGA-aligned product purchases. There were few SNAP-authorized retailers that used CSR or press sources to commit to favorably impacting consumer health in stores beyond increasing the number of healthy products available for purchase. Most of the SNAP-authorized retailers identified had no commitments to encourage DGA-aligned purchases.

These results align with other work that has in majority identified food retailers' commitments to environmentally sustainable practices rather than to obesity reduction strategies.[26-28] While food system sustainability is a necessary component of global health, food retailers are not advised to commit to one goal without the other as both are inherently interconnected.[3] The dearth of information identified may indicate a misalignment of public health and food retailer business values, as SNAP-authorized food store retailers may not perceive MMCA strategies that encourage the purchase of DGA-aligned products a feasible method to balance social issues, profits, and costs.[21] Future research should investigate corporate stakeholder perceptions of these results in order to identify feasible solutions.

In addition, evidence suggests that enhancing the profile of DGA-aligned products without applying complementary strategies that alter placement and promotion variables[5] may do little to initiate changes to consumers' dietary behaviors.[52] More information is required that investigates the corporate value of implementing MMCA strategies that encourage healthier consumer choices beyond expanding the product profile. Strategic SNAP-Education (SNAP-Ed)

partnerships with prevalent SNAP-authorized retailers may help to create health messaging within the context of CSR and could help to transform local food environments and improve corporate communications in this regard.[25]

The results of this research may inform those retailers who would be most open to such partnerships due to their public commitments to consumer health. Further, the many SNAP-authorized retailers with no identified commitments may indicate opportunities for dynamic teams (e.g., nutrition scientists, health economists, corporate marketing professionals) to create mutually beneficial CSR messaging to favorably impact business outcomes and consumers' dietary behaviors. Future research should document and disseminate the success or failure of these approaches. Practitioners should use available frameworks that help guide public-private partnerships.[53]

Further, PHA aimed to make healthy foods and beverages more available and affordable to US consumers by engaging with large US food retailers.[34] At the time of this investigation three of the identified SNAP-authorized retailers were engaged with PHA and this campaign likely influenced their CSR communications.[34] PHA could use the MMCA framework[5] to guide future food retailer engagements as a mechanism to influence store practices. However, there is a lack of information regarding how and if CSR translates to the food store environment. Lam et. al. (2018) analyzed corporate food stores' policies for health promotion and found their existence to be linked with the purchase of healthy products from checkout lanes.[54] More investigations are warranted that link CSR messaging to favorable food store change, as food retailers' accountability on this front is controversial.[25, 55]

Limitations

There are limitations to this work. The selected search databases and key terms could have been inadequate in locating all relevant CSR and press information meeting inclusion criterion. Also, the webpage and gray literature searches were conducted at different time points and represented a cross-sectional identification of information. Limiting the scope of publicly available commitments to healthy MMCA strategies was another limitation, as SNAP-authorized food store retailers may commit to other forms of obesity prevention/reduction strategies. In addition, only one author was responsible for extracting eligible information. There was potential for bias without multi-author agreement.

Conclusion

Few prevalent SNAP-authorized retailers used CSR to commit to using MMCA strategies to encourage consumer food and beverage purchases aligned with the DGA. Future research should seek to understand if SNAP-authorized retailers with commitments to consumer health are more open to mutually beneficial public-private partnerships. Additionally, to understand if those with no CSR messaging within this scope would be interested in strategic approaches to creating CSR that addresses public health concerns. These approaches require research and results should be disseminated to inform feasible approaches to food store change in this sector. Finally, research is required that links CSR commitments with favorable changes in food store environments.

Table 1. Public Commitments* to Use Marketing-Mix and Choice-Architecture Strategies Among Prevalent Supplemental Nutrition Assistance Program (SNAP)-Authorized Food Stores to Encourage Healthy Consumer Purchases as a Mechanism to Reduce Obesity in the United States.

Corporate SNAP-Authorized Food Retailer	Corporate Social Responsibility (CSR) Report or Annual or Business Report Identified?	Sustainability or Other Corporate Report or Statements Identified?	Gray Literature Search Yielded Relevant Information?
7-Eleven, Inc.	Yes[56]	No	Yes[57-59]
99 Cents Only Stores	**No**	**No**	**No**
Ahold Delhaize	Yes[37]	Not Applicable (N/A); relevant obesity-related information identified in CSR	No
ALDI	Yes[60]	N/A; relevant obesity-related information identified in CSR	Yes[61-65]
Big Lots Stores, Inc.	No	No	Yes[49]
BP West Coast Products LLC	**No**	**No**	**No**
C & K Market, Inc.	**No**	**No**	**No**
Casey's General Stores, Inc.	**Yes; no relevant obesity-related information identified**	**No**	**No**
Chevron, Corp.	**Yes; no relevant obesity-related information identified**	**No**	**No**
Circle K Stores and Alimentation Couche-Tard, Inc.	**Yes; no relevant obesity-related information identified**	**Yes; no relevant obesity-related information identified**	**No**
Colonial Group, Inc.	**Yes; no relevant obesity-related information identified**	**Yes; no relevant obesity-related information identified**	**No**
CVS Health	Yes[38]	N/A; relevant obesity-related information identified in CSR	Yes[40, 66-68]

Dollar General Corp.	Yes; no relevant obesity-related information identified	Yes; no relevant obesity-related information identified	Yes[69]
Dollar Tree, Inc.	No	Yes; no relevant obesity-related information identified	Yes[44]
E&C Enterprises, Inc.	**No**	**No**	**No**
Family Dollar Stores, Inc.	**Yes; no relevant obesity-related information identified**	**Yes; no relevant obesity-related information identified**	**No**
GPM Investments	**No**	**No**	**No**
Harris Teeter, LLC	No	No	Yes[70-72]
K-VA-T Food Stores, Inc.	**No**	**No**	**No**
Anabi Oil Corp. (NMSO, Inc.)	**No**	**No**	**No**
Papa Murphy's International, LLC	**No**	**No**	**No**
Redwood Oil Co.	**No**	**No**	**No**
Riggs Oil Co.	**No**	**No**	**No**
Rite Aid Corp.	No	Yes; no relevant obesity-related information identified	Yes[73-75]
Safeway, Inc.	Yes[76]	N/A; relevant obesity-related information identified in CSR	Yes[77-84]
Sears Brands, LLC	**No**	**Yes; no relevant obesity-related information identified**	**No**
Sheetz, Inc.	No	No	Yes[85, 86]
Royal Dutch Shell, plc.	Yes; no relevant obesity-related information identified	Yes; no relevant obesity-related information identified	Yes[51]
Smart & Final, Inc.	No	No	Yes[50, 87]
Speedway, LLC.	**Yes; no relevant obesity-related information identified**	**Yes; no relevant obesity-related**	**No**

		information identified	
Stater Bros. Markets	No	Yes; no relevant obesity-related information identified	Yes[88]
Target Brands, Inc.	Yes[89]	N/A; relevant obesity-related information identified in CSR	Yes[90]
The Kroger Co.	No	Yes; no relevant obesity-related information identified	Yes[47]
Trader Joe's	**No**	**No**	**No**
Walgreen Co.	Yes[35]	N/A; relevant obesity-related information identified in CSR	Yes[39, 41-43]
Walmart Stores, Inc.	Yes[36]	N/A; relevant obesity-related information identified in CSR	Yes[45, 46, 48, 91-99]
Wawa, Inc.	**No**	**No**	**No**
Wilco	**No**	**No**	**No**

*Bolded text indicates no relevant information identified among all search indicators

Table 2. Available Corporate Social Responsibility (CSR) or Press Information of Prevalent Supplemental Nutrition Assistance Program (SNAP)-Authorized Food Store Retailers in the United States to Use Marketing-Mix and Choice-Architecture Strategies to Encourage Consumer Purchases Aligned with Dietary Guidance.

Corporation	Place		Profile		Portion		Price		Promotion		Priming		Prompting		Proximity	
	CSR	Press	CSR	Press	CSR	Press	CSR	Press	CSR	Press	CSR	Press	CSR	Press	CSR	Press
7-Eleven, Inc.			X					X		X						
Ahold Delhaize			X				X		X		X		X		X	
ALDI			X	X				X		X		X		X	X	X
Big Lots Stores, Inc.		X														
CVS Health	X		X	X									X	X	X	X
Dollar General Corp.				X												
Dollar Tree, Inc.				X												
Harris Teeter, LLC				X												
Rite Aid Corp.										X						
Safeway, Inc.		X	X	X				X		X			X	X		

Sheetz, Inc.				X				X		X						X
Royal Dutch Shell, plc.				X												
Smart & Final, Inc.		X		X		X										
Stater Bros. Markets				X				X								
Target Brands, Inc.				X					X						X	X
The Kroger Co.				X						X						
Walgreen Co.			X	X					X	X						
Walmart Stores, Inc.			X	X			X	X		X			X	X		

CHAPTER 6 REFERENCES

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Chapter 7

CONCLUSIONS AND FUTURE DIRECTIONS

Food stores are an important component of the built environment[1] and promoting healthy dietary behaviors in this setting could favorably impact consumers and complement ongoing nutrition support within communities.[2-4] Results of this research expand the knowledge base regarding a key intermediary[5, 6] population that is responsible for engaging in and sustaining healthy food retail programs: food retailers. A systematic review of food store retailer perspectives of healthy marketing-mix and choice-architecture (MMCA)[7] strategies and determinants of decision-making characterized the state of the science as rather new.[8] However, obvious are the multiple variables that influence food store (and food purchasing) practices, which require in-depth investigation moving forward.[8] Researchers and practitioners are encouraged to use the Social-Ecological figure that resulted from the review manuscript as a starting point for formative evaluations to inform food store change in other settings.[8]

Food store research in rural United States (US) areas is scarce[8, 9] despite higher obesity rates experienced among rural consumers.[10] A field investigation in rural, central Virginia was conducted to explore food store retailers' perceived feasibility and costs to implement MMCA strategies across eight categories, which have not been comprehensively evaluated in this context previously:[8] place; profile; portion; pricing; promotion; priming; prompting; proximity.[7] The results of the research, presented in manuscript 2, identified two strategy categories, prompting and proximity, as highly feasible and low cost. In the broader literature, perceptions of these strategies are lacking when compared with favorable views of promotion cues, for example.[8] This may provide one example of rural and urban differences in retailers' preferred MMCA

strategies, perhaps due to the potential for limited consumer exposure in rural areas which may impact promotion efforts. Future rural store research is required[8] and may inform the need for different approaches to food store change in rural settings.

Rural communities may also require unique strategies to health promotion in the food store setting due to a lack resources.[11] Public funding to build capacity for improved food store environments could be a worthy pursuit. Especially given the shrinking grant-funding avenues that are integral to support development in this area.[12] Research and practice approaches alongside rural community stakeholders should determine the potential for using state-generated funds (e.g., funding has been derived from sugar-sweetened beverage taxes and used to improve communities in urban areas)[13] to build capacity for retailers to use comprehensive MMCA strategies[7] in their stores. A portion of these funds could be matched by the US Department of Agriculture and used to incentivize retailers to promote healthy food and beverage purchases among rural SNAP participants, for example.[12] Research and advocacy approaches should be investigated to determine suitable public funding streams within rural communities. Success could result in scaling out approaches to improve other built environment settings.[1, 14]

In central Virginia, rural SNAP-authorized retailers were also asked to list healthy foods and beverages they perceived to be 'healthy'. These perceptions were compared with foods available in store that were aligned with the Dietary Guidelines for Americans, 2015-2020 (DGA) using the Market Basket Assessment Tool (MBAT).[15] Prior to this, only one other investigation had explored the healthy food perceptions of food store retailers in the US.[16] The results of this research, presented in manuscript 3, identified *what* available foods/beverages should be promoted in healthy retail initiatives to complement *how* these products should be promoted (manuscript 2). This is essential given retailer-stated barriers to incorporating new

products into a store's inventory.[8] Findings identified nuts, seeds, and whole grains as potential food products for promotion in this context. However, given the limited number of retailers who identified these products as 'healthy', formative evaluations to inform training approaches are warranted.[8]

Food store retailers likely experience long work hours and limited time for operations outside of the store's business model.[8] A "retailer training" protocol that meets these constraints should be developed, documented, and evaluated alongside SNAP-authorized retailer stakeholders using a participatory research approach, considering the lack of research on this audience.[17] For example, phone-based education or training materials may be a way to disseminate information without requiring extensive travel and time commitments.[18] SNAP-Education (SNAP-Ed) networks may also provide a feasible framework for utilizing community-based approaches to define, implement, and evaluate training protocols in hard to reach communities. Ultimately, training protocols should be informed by reviewing available evidence for successful training/education strategies among hard-to-reach populations and retailers should be considered the experts on how strategies may need to be adapted to improve training protocol acceptability, appropriateness, and feasibilty.[19]

In addition, healthy food retail practitioners use the DGA as a guide for identifying the foods and beverages that should be promoted in stores.[20] In 2021, the DGA will be updated to reflect advances in nutrition science and momentum for sustainability inclusion in future guidelines is gaining.[21-23] A sustainable food system promotes health and justice for humans, animals, and the planet to ensure longevity and quality life for all.[21-23] Public health approaches that benefit the dietary quality of consumers may also negatively impact environmental indicators, requiring unique solutions. The results of the research presented in manuscript 3

indicated that focusing food store promotions on nuts could be a strategy that complements business models while ensuring public health impact.[24] While increasing consumer purchase of these products aligns with current DGA recommendations, this strategy could conflict with future versions of the DGA that may include sustainability.[21-23]

For example, theoretically, using MMCA strategies to cue the purchase of nut products in rural Virginia, which are commonly sold in single-serving plastic packaging, would result in increased sales.[7, 25] Certain nuts including almonds (e.g., high water requirements and commonly produced in drought-prone areas)[26] and cashews (e.g., associated with poor pay and hazardous working conditions in high production country, India)[27] are negatively associated with environmental and human outcomes. Therefore, negative implications of this public health approach potentially include additional plastic waste,[28] increased strains on scarce water resources,[26] and wider disparity gaps among vulnerable populations.[27] Researchers, practitioners, and retailers should carefully choose products for promotion while remaining advocates for wider policy changes. Supporting start-up companies in rural areas (e.g., design of compostable packaging) or encouraging retailer sourcing from fair-trade suppliers[29] may be possible solutions; however, a persistent challenge will be keeping these items affordable for SNAP consumers to purchase.[30] Research that identifies feasible solutions is warranted and future versions of the DGA should address these concerns to promoting optimal diet quality alongside environmental sustainability in community settings.

The final two research investigations explored opportunities to systematically approach SNAP-authorized retailers to partner on SNAP-Ed initiatives that aim to create healthier food store environments that meet business goals. The methods described briefly above, and in more detail within manuscripts 2 and 3, could be used to inform setting-specific approaches to food

store change; however, little is known about which SNAP-authorized retailers should be targeted to reach numerous SNAP consumers. Results of an investigation presented in manuscript 4 found many nontraditional SNAP-authorized retailers as prevalent (e.g., formats other than grocery stores such as dollar, drug, and convenience)[31] and also identified differences between two US states. Therefore, SNAP-Ed approaches may require variation depending on if the target communities are located in urban or rural areas for example. More investigation is warranted to understand how using targeted approaches to healthy food retail programs is successful or not in reaching the intended audience (e.g., SNAP consumers). The RE-AIM framework would be a useful evaluative tool in this instance, because reach (e.g., SNAP consumer exposure to targeted healthy retail programs using prevalent SNAP-authorized store formats as health promotion settings) is a core component.[32, 33]

Finally, to form successful public-private partnerships there must be shared goals between partners that are not compromised when issues arise.[34, 35] An analysis of voluntary, public corporate social responsibility (CSR) commitments to alter food store environments to favor the choice of DGA-aligned products was conducted among prevalent SNAP-authorized retailers and is presented in the fifth manuscript. Results provided information about the existence or lack of commitments to use MMCA strategies to improve consumers' dietary behaviors. Retailers without such commitments may be less likely to partner with SNAP-Ed on healthy retail initiatives or potentially interested in technical assistance to incorporate these approaches into their corporate climate and messaging agenda.[36] Pursuing research or public-private partnerships with corporate food store stakeholders is necessary and should be approached with an acceptance that sales and revenue are a driving force of corporate decision-making.[37] The results of this research should be used to lay the groundwork for approaching such

conversations that are guided by available accountability and public-private partnership frameworks.[34, 35]

Last, results of manuscript 5 identified healthy food retail strategy commitments specific to store settings; however, many corporations may use alternate avenues to help reduce obesity within communities. The Business Impact Assessment Tool for obesity and population nutrition (BIA-Obesity)[38] should be utilized in future US research to score SNAP-authorized retailers on comprehensive obesity reduction commitments. Scores should be publicly disseminated (e.g., as some groups do for retailers' sustainability practice indicators)[39] in order to inform a public health and business friendly approach that uses media coverage and competition to initiate business model change toward healthy food store environments and practices.[38]

Further implications of this compiled work are discussed within the context of research, practice, and policy recommendations.

Key Recommendations for Research

While many MMCA approaches[7] to influencing consumer behavior in food store settings have demonstrated success, there is a need for research that assesses outcomes across diverse settings (e.g., rurality, regions, store formats, corporate stores) and populations.[40-44] Larger sample sizes and quantitative analyses should complement qualitative data that describes program successes and challenges moving forward.[8] Using a combined effectiveness and implementation outcome approach to studying food store settings could help to speed the translation of behavior change strategies that support business and public health goals to practice.[8, 45, 46] Research partnerships with community organizations including SNAP-Ed should be utilized to speed the translation of research to practice settings.[47]

Key Recommendations for Practice

SNAP-Ed teams are well situated within underserved communities in the US to influence policy, systems, and environmental changes that promote health and prevent disease.[48] Drawing connections within communities to ongoing nutrition support – for example using store settings to recruit SNAP and SNAP-eligible populations for nutrition education activities or using social marketing campaigns to promote healthy food choices – could help to increase consumer demand for promoted items in SNAP-authorized healthy food retail programs.[3] In addition, statewide or regional training could be expanded to include community partners responsible for integrating changes into their settings that promote health,[5, 6] such as SNAP-authorized food store owners, managers, or corporate stakeholders, as a way to strengthen community partnerships and ensure favorable intervention outcomes.[8, 17] Strong research-practice partnerships could expand the type and number of resources available to aid in measuring the outcomes of such approaches.

Key Recommendations for Policy

The US Department of Agriculture (USDA) could have a key role in transforming SNAP-authorized food store environments to favor healthy choices. For example, MMCA strategies have been identified by the USDA and USDA funded groups as a favorable mechanism to positively influence consumer behavior in SNAP-authorized settings.[49, 50] However, retailers are currently not incentivized to initiate and sustain such changes within their food store environments. Recent proposed rule adjustments (2016)[51] to SNAP-authorized retailer stocking standards arguably did not take a combined public health and business model approach to inform mutual success. For example, the new rule indicated that for SNAP stores to remain

authorized, retailers would need to stock seven product varieties (previously four) per each of the four staple food categories: (1) meat, poultry, fish; (2) bread or cereals; (3) fruits or vegetables; and (4) dairy.[51] Many public comments in response to this rule expressed disagreement and the unsuitability of rule changes for SNAP-authorized retailers because of low perceived consumer demand for these products and the financial risk of increasing the number of healthy and perishable products available (SNAP consumers do not have to purchase products aligned with the DGA).[52]

Moving forward, USDA policy could initiate rule changes that include parameters for SNAP-authorized retailers to adopt a certain number of MMCA strategies to promote SNAP consumer purchases aligned with the DGA.[7] This approach to policy change could mirror funding mechanisms used in the National School Lunch Program (NSLP) that do not require school meals to adhere to the defined NSLP nutrient standards; however, schools that do adopt these standards receive federal funding to assist in serving healthy school meals.[53] Likewise, retailers that choose to adopt MMCA strategies as defined by the USDA could receive incentives and technical support to initiate and maintain changes to increase SNAP authorization policy acceptability, appropriateness and feasibility[19] for SNAP-authorized retailers.

CHAPTER 7 REFERENCES

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APPENDICES

Appendix A: Literature Review Primary Study Information

Additional file 1: Table S1 Characteristics of Original Research Included within Systematic Review of Store Owner, Manager, and Employee Data

Author, Year In-text Citation	Study Design and Purpose	Store Details and Location	Participant Characteristics and Sample Size	Data Collection Procedure and Instrumentation	Foods and/or Beverages of Focus
Abarca et al., 2005 [59]	A cross-sectional study aiming to develop a grocery store survey specific to community indicators for nutrition	8 Grocery stores in AZ	Managers, n=8	Semi-structured interviews with questions about purchasing, healthy/unhealthy food demand, and barriers to purchasing healthy food	Low-fat dairy and mayonnaise, margarine, lean protein, sugar substitute and sugar-free products, olive oil, canola oil, whole wheat or grain products, 100% juice, diet soda, and sodium substitute
Andreyeva et al., 2011 [44]	A quasi-experiment to identify food retailors' perceptions of healthy foods pre/post the 2009 U.S. Department of Agriculture's (USDA) Special Supplemental Nutrition Program for Women, Infants, and	68 in 2009 and 58 in 2010 WIC and non-WIC authorized convenience stores, non-chain grocery stores, and non-supermarket	Owners and/or managers involved in food purchases, n=68	Pre/post survey and semi-structured interviews with questions about stocking factors, pricing/profits, WIC revisions, consumer demand, perceived barriers, and healthy food perceptions	Fresh, frozen, and canned produce, whole wheat or grain breads and cereals, low-fat dairy, tofu, soy milk, infant formula and jarred baby food

	Children (WIC) revisions	food marts in CT			
Ayala et al., 2012 [46]	A cross-sectional study to assess the impact of the 2009 WIC food package	52 WIC-authorized small food stores in multiple states (MD, MN, IL, CT, LA, CA, PA, CA)	Owners and/or managers with at least 1 year of experience, n=52	Interviews with questions about supply, products and profits, stocking factors, and perceived sales	WIC-approved foods such as fresh, frozen, and canned produce, whole grain/wheat bread, whole grain tortilla, brown rice, and low-fat dairy
Ayala et al., 2015 [45]	Cluster randomized controlled trial to test a multi-component intervention in small/medium tiendas to improve availability and accessibility, and consumer purchases and consumption of produce	16 tiendas in CA	Managers at least 18 years old, work at least 20 hours/week for six months; plans to continue position for one year, decision making authority, and not employed by participating tiendas, n=16	Interviews with questions about tiendas and manager eating habits	Plato Total or USDA's MyPlate translation of the Dietary Guidelines for Americans (DGA)
Ayala et al., 2017 [61]	A cross-sectional qualitative investigation to understand small food store management perspectives of food and beverage supplier's role in unhealthy food access characteristics	72 small food stores in Baltimore MD, Durham NC, Minneapolis/St. Paul MN, and San Diego CA	72 owners or managers of small food stores that had supplier negotiation duties that impacted stocking practices of only the store of interest, had one year or more of experience, and was 18 years of age or older	Guided interview with questions about sourcing of targeted products, agreements surrounding sourced items, placements and promotions, supplier expectations and incentivizing, and store and participant characteristics	Savory snacks, sugar sweetened beverages and snacks, confections, frozen treats, and produce
Baquero et al., 2014	Comprehensive process evaluation of "Vida	4 Tiendas in NC	Managers and/or employees, n=19	Surveys and interviews with questions about	Fruits and vegetables

[47]	Sana Hoy y Manana" designed to increase Latino customers' produce consumption			satisfaction and perceived effectiveness of intervention components	
Budd et al., 2017 [62]	A randomized control trial to determine the impact of store level pricing and communication strategies on healthy product sales and prices, and store owner psychosocial indicators	24 corner stores and 2 wholesale stores in Baltimore, MD	Owners of stores located in low income and high African American residence areas, n=24	A pre/post intervention questionnaire with questions about demographics, sales and stocking habits of targeted foods, stocking intentions, and outcome expectations of intervention components	Low/no calorie beverages, low fat milk, wheat bread, frozen vegetables, tuna packed in water, low sugar/calorie snack alternatives, baked chips, fresh fruit
Caspi et al., 2015 [60]	A descriptive analysis to determine healthy food availability, stocking practices, and perceptions across types of food store establishments	Corner or small grocers, gas-marts, dollar stores, and pharmacies in MN	Owners and/or managers of both non-WIC and non-traditional food retail establishments (corner/small/dollar/gas/pharmacy stores), n=71	Close-ended interviews with questions about stocking practices and perceptions of stocking healthy and unhealthy food products	69 items such as fresh, frozen, and canned produce, whole grain or wheat products, 100% juice, low-fat dairy, legumes, cheese, nut butters (plain), canned fish in water, and tofu
D'Angelo et al., 2017 [71]	Observational and cross-sectional study to understand current store practices and willingness to change	Small food stores including grocery and convenience formats with three or fewer cash registers in NC	Independent owners and/or managers, n=55	Demographic and scaled survey questions to assess willingness to make positive store changes	Produce, low-fat dairy, 100% whole wheat bread, healthy snacks such as fruit

Dannefer et al., 2012 [48]	A pre/post, mixed method evaluation of Healthy Bodegas Initiative in 2009 that aimed to increase availability and promotion of healthy foods	55 bodegas in NY	Owners and/or managers included in intervention, n=46	Pre/post survey assessing healthy food sales, barriers to stocking healthy food, and intervention areas for improvement	Fresh or canned produce, low-fat dairy, no sugar added, no-low salt products, soup, healthier snack alternatives, whole grain bread, and enhanced healthfulness of convenience foods
DeFosset et. al., 2017 [63]	Evaluation of a food distribution program on produce access factors, member stores, and prices	17 small stores in Los Angeles, CA	Member store representatives, n=12	Semi-structured questionnaire assessing purchasing habits and available suppliers, and store characteristics	Fruits and vegetables
Escaron et al., 2015 [67]	Quasi-experiment to describe a community-academic partnership that developed and implemented "Waupaca Eating Smart (WES)," a healthy eating program in restaurants and supermarkets	1 supermarket and 1 local convenience store chain in WI	Store operators, n=2	Survey with scaled questions assessing healthy food specials/promotions, and response to consumer preferences	Fruits and vegetables, and deli options that include calorie limits and fruits and vegetables
Gittelsohn et al., 2012 [49]	Qualitative investigation to understand small grocery store owners/managers' views about 2009 WIC revisions	52 WIC-authorized small food stores in multiple states (MD, MN, IL, CT, LA, CA, PA, CA)	Owners and/or managers in role at least one year prior to 2009 WIC revisions, n=52	In-depth interview with questions about store operations and impact of 2009 WIC revisions	Items included in the 2009 updated WIC foods package that are based on the DGAs

Gravlee et al., 2014 [50]	Exploratory, mixed methods study to understand business practices, contextual factors, and food environment perceptions of store owners/managers	2 supermarkets, 5 grocery stores, 8 convenience stores, 4 gasoline stations, and 1 pharmacy in FL	Owners and/or managers, n=20	Semi-structured interviews to understand stocking and business practices along with a free listing exercise to elicit perceptions of healthy foods in general and those stocked in store	Not applicable
Izumi et al., 2015 [68]	Mixed method, convergent study to measure the nutrition environment and understand storeowner perspectives of stocking foods/beverages	5 Grocery stores, 6 convenience stores, and 4 gas station food marts in OR	Owners, n=6	Semi-structured interviews with questions about snack/beverage ordering, sales, and barriers to stocking healthy snacks/beverages	The former Institute of Medicine's (IOM) Tier 1 nutrition standards specific to healthy snacks and beverages and fresh produce
Jetter et al., 2010 [51]	A case study to examine impact of a pilot study aimed to increase the availability of fresh produce in a low access neighborhood	1 convenience store in CA	Management (changes mid-intervention resulted in multiple proprietor input), n=1	Unstructured discussions about intervention process	Fresh produce
Jilcott Pitts et al., 2013 [74]	A qualitative investigation to examine feasibility of increased food access with stakeholder engagement	11 Convenience stores and food marts in NC	Rural and urban owners and/or managers, n=11	In-depth interviews with published questions from healthy corner store website and the New Orleans Corner Store Survey	Low-fat dairy, whole wheat bread, water, baked chips, and produce
Kim et. al., 2017 [64]	A qualitative investigation of barriers and facilitators to stocking healthy products	15 small stores in Baltimore, MD	Store owners, n=17	In-depth interviews with questions focused on feasibility and effective methods for stocking	Products low in sugar, salt, and fat

				healthy in addition to barrier perceptions	
Larson et al., 2013 [52]	Cross-sectional investigation aiming to increase fresh produce, low/non-fat dairy, and 100% whole wheat bread in food deserts	5 corner stores in TN	Owners, n=5	Semi-structured interviews with questions about strengths/challenges of food retail	Fresh produce, low-fat dairy, and 100% whole wheat bread
Lee et al., 2015 [53]	Evaluation of "Eat Right-Live Well!" intervention designed to increase the availability/ affordability/recognition of healthy foods to increase consumer purchases	1 large supermarket in MD	Employees, n=63	Employee Impact Questionnaire, survey assessing self-reported knowledge, self-efficacy, and behavioral intent of healthy purchasing	Healthier alternatives to popular products, as defined by the U.S. Food and Drug Administration and IOM food selection guidelines
Martinez-Donate et al., 2015 [69]	Process evaluation using RE-AIM of "WES," that aimed to improve the nutrition environment and promote healthy eating in restaurants and food stores	1 supermarkets and 1 local convenience store chain in WI	Operators, n=9	Surveys that assessed intervention sustainability, business impact, and satisfaction	Fruits and vegetables, and deli options that include calorie limits and fruits and vegetables
Mayer et. al., 2016 [65]	A qualitative investigation to understand store roles in general and within the community in addition to challenges to operating food stores	6 small food or corner stores in NJ and 17 in PA	Owners and/or managers involved in healthy food initiatives with an emphasis on recruiting high performance participants with regard to initiative indicators, n=23	Interviews with questions about perceptions of health and diet, store role in the community, and reasons for participating in the healthy food initiative	Indicators for healthy foods as designated by the Healthy Corner Store Initiative

O'Malley et al., 2013 [54]	Mixed methods study to examine feasibility and acceptability of increased access to fresh produce	12 corner stores in LA	Owners and/or managers, n=12	Semi-structured interviews with questions about customers, produce, stocking characteristics, community, and interest in healthy food access collaborations	Fresh produce
Pinard et. al., 2016 [72]	A qualitative investigation of business and community factors in addition to the viability and ability to apply and sustain healthy food choice strategies	15 small food stores in NE	Owners and/or managers, n=15	Semi-structured interviews with questions about store characteristics, operations, practices, barriers based on store location, and attitudes	Not available
Rushakoff et al., 2017 [73]	A cross-sectional quantitative assessment to determine potential improvements to rural food stores, specifically access to and awareness of healthy foods	10 small stores located in Cumberland Valley, KY	Owners of stores located in food deserts or food poor district areas, n=10	A store owner survey with questions about the benefits, barriers, and impact of the food store intervention	Fresh, frozen, and canned fruits and vegetables, 100% juice, non-sugar beverages, healthy snacks, low-fat dairy, cheese, whole grain varieties, lean animal and plant-based proteins
Sanchez-Flack et al., 2016 [55]	Qualitative investigation to understand consumer shopping experiences	20 Small-medium tiendas in CA	Managers and/or employees working at least 30 hours per week and employed for 6 months, n=38	Semi-structured interviews with questions about customer base and behaviors, management, and intervention strategies	Not applicable

Schwendler et al., 2017 [66]	Process evaluation for the development and initiation of an intervention targeted at corner stores and wholesalers to improve healthy food access within communities	53 corner stores and 2 wholesalers in Baltimore, MD	Owners of stores included within the intervention trial, n=29	Process evaluation metrics that assessed intervention reach, dose, and fidelity specific to corner stores	Low/no calorie and low/no sugar beverages, low fat dairy, granola bars, 100% fruit juice, fresh, frozen and canned fruits and vegetables, seeds, low fat snacks, whole grains, low fat cooking fats, and low sodium condiments
Setala et al., 2011 [70]	Qualitative investigation to examine Navajo Nation farming practices to evaluate feasibility of a Farm-To-Table program to increase community produce intake	7 small food stores in AZ	Owners, n=7	In-depth semi-structured interviews with questions about fruits/vegetables sold and the potential to sell local produce	Produce sourced locally
Song et al., 2009 [56]	Quasi-experiment that aimed to increase availability and sales of healthier food options	13 corner stores and 4 supermarkets in MD	Owners, Korean-American, n=17	Semi-structured interviews to gauge storeowners' psychosocial factors (food-related knowledge, self-efficacy for healthy food stocking, outcome expectations, and intervention effect), and recorded physical store characteristics	Healthy alternatives to frequently reported foods and beverages consumed, aligned with the DGAs and at the same or a lower cost to purchase
Song et al., 2011	Exploratory investigation to	7 corner stores in MD	Owners, Korean-American, n=7	In-depth interviews with open-ended questions	Low sugar and high fiber cereal, low-fat

[57]	understand storeowner acceptability of a healthy retail intervention			about intervention characteristics; owners were categorized by program support (weak, moderate, or strong)	dairy, cooking spray, reduced fat chips, low-sodium pretzels, fresh fruit, whole wheat or split top bread, diet soda, and water
Wingert et al., 2014 [58]	A qualitative investigation to understand low-income shoppers' perceptions of children's influence on purchasing decisions and the supermarket environment's role in promoting healthy options	1 full-service supermarket in MD	Owner, n=1	Semi-structured interview questions about product placement, availability, and potential store changes	Not applicable

Appendix B: Participant Survey (Study 1 &2)

You may choose not to take the survey, to stop responding at any time, or to skip any questions that you do not want to answer
(Survey adapted from EatSmart MoveMore NC + BRFSS 2017)

Store Name: _____ Address: _____

Demographic Information

1. I am a: □ Male □ Female

2. Age: _____

3. What is the highest grade or year of school you completed?
- □ Some high school
- □ High school graduate
- □ Some college
- □ Associate's degree
- □ College graduate
- □ Some graduate or professional school

4. Which of these groups would you say best represents your race? ***Check all that apply***.
- □ White
- □ Black or African American
- □ American Indian or Alaska Native
- □ Asian
- □ Pacific Islander

5. Are you Hispanic/Latino?
□ Yes □ No

6. Which of the following health issues apply to you? ***Check all that apply.***
- □ high blood pressure
- □ heart condition
- □ overweight/obesity
- □ type 1 diabetes
- □ type 2 diabetes
- □ no health issues
- □ Other _____

7. How important is eating a healthy diet and/or having good health to you? ***Place an 'x' at any point on the line.***

Not at all						Very
0	1	2	3	4	5	6

8. Not including juices, how many times per day or week do you eat fruits?

Number: _____ ***Choose***: □ per day **or** □ weekly

9. How often do you eat green leafy vegetables or lettuce?

Number: _____ ***Choose***: □ per day **or** □ weekly

10. How often do you eat any kind of fried potatoes, including french fries, home fries, or hash browns?

Number: _____ ***Choose***: □ per day **or** □ weekly

11. Not including lettuce salads and potatoes, how many times per day or week do you eat other vegetables?

Number: _____ ***Choose***: □ per day **or** □ weekly

Employment Information + Store Operations

12. I am a store: □ Owner □ Manager

13a. How long have you owned or managed this store?
- □ 0 to 2 years
- □ 3 to 5 years
- □ 6 to 10 years
- □ 10+ years

13b. Do you own or manage other stores?
□ Yes (***how many?***) _____ □ No

14a. Are you a resident of the community in which your store is located? □ Yes □ No

(if yes) 14b. For how long have you lived in this community?
- □ 0 to 2 years
- □ 3 to 5 years
- □ 6 to 10 years
- □ 10+ years

15. How many employees do you have at this store (not including yourself)?
- □ 0 to 2
- □ 3 to 5
- □ 6 to 8
- □ 9 to 11
- □ 12+

16. What proportion of total store sales ***per month*** would you estimate are attributed to SNAP/EBT?
- □ 0% to 24%
- □ 25% to 49%
- □ 50% to 74%
- □ 75% to 100%

17. What are your, estimated, average store sales ***annually***? _____

18. Do you accept WIC? □ Yes □ No

19. Are you aware of USDA's new enhanced stocking standards rule for SNAP-authorization that will require increased stocking of staple food varieties by January 2018?
□ Yes □ No

20a. What kinds of costs do you manage at your store? ***Please check all that you are responsible for.***
- □ Salaries/hourly rates of employees

☐ Work scheduling for employees
☐ New equipment or store maintenance costs
☐ Food and beverage products for stocking
☐ Materials (i.e., signs, displays, store circulars)
☐ Utility costs (i.e., water, electric, garbage)
☐ None/not applicable
☐ Other_____

20b. To what extent are you able to change or make your own decisions about the costs you are responsible for? ***Place an 'x' at any point on the line.***

Not at all						High
0	1	2	3	4	5	6

21a. How many food and beverage vendors or suppliers do you have?
☐ 0 to 2 ☐ 3 to 5 ☐ 6 to 8 ☐ 9 to 11 ☐ 12+

21b. How many of them offer healthy products?
☐ 0 to 2 ☐ 3 to 5 ☐ 6 to 8 ☐ 9 to 11 ☐ 12+

21c. How much control do these vendors or suppliers have in deciding the foods and beverages that are stocked in your store (*outside of your control*)?
☐ Low ☐ Some control ☐ High

22. How do you track inventory and sales of your food and beverage products? ***Check all that apply:***
☐ Computerized inventory
☐ Count inventory, non-computerized
☐ I do not do an inventory count
☐ Other _____

23a. Do you have fresh produce in store year-round?
☐ Yes ☐ No

(If yes) 23b. Where do you get the fresh produce? ***Check all that apply***:
☐ A food vendor or supplier delivers it
☐ I/someone purchase(s) it from another store
☐ Local farmer or producer
☐ Other: _____

24. What, if any, challenges have you had in your ability to carry fresh produce? ***Check all that apply.***
☐ Corporate guidelines for food stocking
☐ Finding a food vendor or supplier
☐ Cost of fresh produce
☐ Spoilage before it sells
☐ Lack of consumer demand or interest
☐ Having adequate refrigeration
☐ Time to find and stock fresh produce
☐ No challenges
☐ Other: _____

Customer Base

25. What percent of your customers are 'regulars'?
☐ less than 20% ☐ 61 to 80%
☐ 20 to 40% ☐ 81 to 100%
☐ 41 to 60%

26. Which of the following describes your customer base? ***Check all that apply***:
☐ SNAP/EBT ☐ WIC participants
☐ Neighborhood residents ☐ Seniors
☐ Youth/ Students ☐ Families
☐ Commuters
☐ Limited English Proficient (LEP)
Which language(s)? _____
☐ Other _____

27. On average, how many customers do you have each day?
☐ under 50 ☐ 50 to 100 ☐ 101 to 150
☐ 151 to 200 ☐ over 200 ☐ over 500

28. Who shops at the store most frequently? ***Choose only one***.
☐ SNAP/EBT ☐ WIC
☐ Neighborhood residents ☐ Seniors
☐ Youth/ Students ☐ Families
☐ Commuters
☐ Limited English Proficient (LEP).
Which language(s)? _____
☐ Other: _____

29. What percentage of your customers are interested in purchasing healthy products?
☐ less than 20% ☐ 20 to 40% ☐ 41 to 60%
☐ 61 to 80% ☐ 81 to 100%

30. What percentage of your customers, do you estimate, come in primarily for snack foods (i.e., soda, chips, candy)?
☐ less than 20% ☐ 20 to 40% ☐ 41 to 60%
☐ 61 to 80% ☐ 81 to 100%

31. What percentage of your customer do you estimate come in primarily for *staples* - like eggs, milk, butter, fruits and vegetables?
☐ less than 20% ☐ 20 to 40% ☐ 41 to 60%
☐ 61 to 80% ☐ 81 to 100%

32. What percentage of your customers do you estimate come in for *all* of their food needs?

☐ less than 20% ☐ 20 to 40% ☐ 41 to 60%
☐ 61 to 80% ☐ 81 to 100%

Costs to Implement Food Promotion Strategies

These questions ask about direct expenses to use healthy food and beverage promotions in your store. ***The questions differ, but the provided responses are the same throughout.***

33a. **(Place)** If you changed your store's atmosphere by enhancing customer service or by altering/adding lighting, colors, or music to highlight healthy products, what would it cost? ***Check all that apply***:

☐ **Your or employees' time**
☐ **Store changes** (i.e., adding or upgrading coolers, freezers, equipment, or shelving, etc.)
☐ **Materials to support changes** (i.e., more foods and beverages, signs, tools, displays, containers etc.)
☐ **Utility or resource costs** (i.e., water, garbage, electric, etc.)

33b. Overall how costly would these changes be? ***Place an 'x' at any point on the line.***

Not at all — Very

0 1 2 3 4 5 6

33c. Would making these changes increase sales of healthy products, increase revenue, and also exceed the costs needed to make the changes?

☐ **Yes** ☐ **No** ☐ **Unsure**

34a. **(Place)** If you changed your store's equipment or infrastructure by adding or upgrading shelving, coolers, or freezers in order to stock more healthy products, what would it cost? ***Check all that apply***:

☐ **Your or employees' time**
☐ **Store changes** (i.e., adding or upgrading coolers, freezers, equipment, or shelving, etc.)
☐ **Materials to support changes** (i.e., more foods and beverages, signs, tools, displays, containers etc.)
☐ **Utility or resource costs** (i.e., water, garbage, electric, etc.)

34b. Overall how costly would these changes be? ***Place an 'x' at any point on the line.***

Not at all — Very

0 1 2 3 4 5 6

34c. Would making these changes increase sales of healthy products, increase revenue, and also exceed the costs needed to make the changes?

☐ **Yes** ☐ **No** ☐ **Unsure**

35a. **(Profile)** If you added inventory so your store sold a wider variety of healthy products, what would it cost? ***Check all that apply***:

☐ **Your or employees' time**
☐ **Store changes** (i.e., adding or upgrading coolers, freezers, equipment, or shelving, etc.)
☐ **Materials to support changes** (i.e., more foods and beverages, signs, tools, displays, containers etc.)
☐ **Utility or resource costs** (i.e., water, garbage, electric, etc.)

35b. Overall how costly would these changes be? ***Place an 'x' at any point on the line.***

Not at all — Very

0 1 2 3 4 5 6

35c. Would making these changes increase sales of healthy products, increase revenue, and also exceed the costs needed to make the changes?

☐ **Yes** ☐ **No** ☐ **Unsure**

36a. **(Portion)** If you added inventory to your store in the form of portioned healthy product options for sale, what would it cost? ***Check all that apply***:

☐ **Your or employees' time**
☐ **Store changes** (i.e., adding or upgrading coolers, freezers, equipment, or shelving, etc.)
☐ **Materials to support changes** (i.e., more foods and beverages, signs, tools, displays, containers etc.)
☐ **Utility or resource costs** (i.e., water, garbage, electric, etc.)

36b. Overall how costly would these changes be? ***Place an 'x' at any point on the line.***

Not at all — Very

0 1 2 3 4 5 6

36c. Would making these changes increase sales of healthy products, increase revenue, and also exceed the costs needed to make the changes?

☐ **Yes** ☐ **No** ☐ **Unsure**

37a. **(Pricing)** If you lowered the price of healthy products in your store OR provided sales, incentives,

or coupons for healthy products, what would it cost? ***Check all that apply***:

- ☐ **Your or employees' time**
- ☐ **Store changes** (i.e., adding or upgrading coolers, freezers, equipment, or shelving, etc.)
- ☐ **Materials to support changes** (i.e., more foods and beverages, signs, tools, displays, containers etc.)
- ☐ **Utility or resource costs** (i.e., water, garbage, electric, etc.)

37b. Overall how costly would these changes be? ***Place an 'x' at any point on the line.***

Not at all — Very

0 1 2 3 4 5 6

37c. Would making these changes increase sales of healthy products, increase revenue, and also exceed the costs needed to make the changes?
☐ **Yes** ☐ **No** ☐ **Unsure**

38a. **(Promotion)** If you used promotional materials, education, or cooking and tasting demonstrations in your store to highlight healthy products, what would it cost? ***Check all that apply***:

- ☐ **Your or employees' time**
- ☐ **Store changes** (i.e., adding or upgrading coolers, freezers, equipment, or shelving, etc.)
- ☐ **Materials to support changes** (i.e., more foods and beverages, signs, tools, displays, containers etc.)
- ☐ **Utility or resource costs** (i.e., water, garbage, electric, etc.)

38b. Overall how costly would these changes be? ***Place an 'x' at any point on the line.***

Not at all — Very

0 1 2 3 4 5 6

38c. Would making these changes increase sales of healthy products, increase revenue, and also exceed the costs needed to make the changes?
☐ **Yes** ☐ **No** ☐ **Unsure**

39a. **(Priming)** If you used designs in your store like floor stickers or displays to guide customers to healthy products, what would it cost? ***Check all that apply***:

- ☐ **Your or employees' time**
- ☐ **Store changes** (i.e., adding or upgrading coolers, freezers, equipment, or shelving, etc.)
- ☐ **Materials to support changes** (i.e., more foods and beverages, signs, tools, displays, containers etc.)
- ☐ **Utility or resource costs** (i.e., water, garbage, electric, etc.)

39b. Overall how costly would these changes be? ***Place an 'x' at any point on the line.***

Not at all — Very

0 1 2 3 4 5 6

39c. Would making these changes increase sales of healthy products, increase revenue, and also exceed the costs needed to make the changes?
☐ **Yes** ☐ **No** ☐ **Unsure**

40a. **(Prompting)** If you used messages, labels, or pictures on shelves or products in your store to draw attention to healthy options, what would it cost? ***Check all that apply***:

- ☐ **Your or employees' time**
- ☐ **Store changes** (i.e., adding or upgrading coolers, freezers, equipment, or shelving, etc.)
- ☐ **Materials to support changes** (i.e., more foods and beverages, signs, tools, displays, containers etc.)
- ☐ **Utility or resource costs** (i.e., water, garbage, electric, etc.)

40b. Overall how costly would these changes be? ***Place an 'x' at any point on the line.***

Not at all — Very

0 1 2 3 4 5 6

40c. Would making these changes increase sales of healthy products, increase revenue, and also exceed the costs needed to make the changes?
☐ **Yes** ☐ **No** ☐ **Unsure**

41a. **(Proximity)** If you were to change where foods are located in your store to reduce the effort for customers to find and buy healthy products, what would it cost? ***Check all that apply***:

- ☐ **Your or employees' time**
- ☐ **Store changes** (i.e., adding or upgrading coolers, freezers, equipment, or shelving, etc.)
- ☐ **Materials to support changes** (i.e., more foods and beverages, signs, tools, displays, containers etc.)
- ☐ **Utility or resource costs** (i.e., water, garbage, electric, etc.)

41b. Overall how costly would these changes be? ***Place an 'x' at any point on the line.***

Not at all						Very
0	1	2	3	4	5	6

41c. Would making these changes increase sales of healthy products, increase revenue, and also exceed the costs needed to make the changes?

☐ **Yes** ☐ **No** ☐ **Unsure**

Adjustment and Change Costs

For the following questions indicate on the scale provided ***the associated hassle and inconvenience of having to change established operating procedures to the make the changes*** specified.

42. **(Place)** Changes to your store's atmosphere by enhancing customer service or by altering/adding lighting, colors, or music to highlight healthy products. ***Place an 'x' at any point on the line.***

Low hassle						High hassle
0	1	2	3	4	5	6

43. **(Place)** Changes to your store's equipment or infrastructure by adding or upgrading shelving, coolers, or freezers in order to stock more healthy products. ***Place an 'x' at any point on the line.***

Low hassle						High hassle
0	1	2	3	4	5	6

44. **(Profile)** Changes to your inventory so that your store sold a wider variety of healthy products. ***Place an 'x' at any point on the line.***

Low hassle						High hassle
0	1	2	3	4	5	6

45. **(Portion)** Changes to portion sizes of items available in your store or adding healthy, portioned products to your store. ***Place an 'x' at any point on the line.***

Low hassle						High hassle
0	1	2	3	4	5	6

46. **(Pricing)** Changes to the pricing of healthy products in your store or adding sales, incentives, or coupons for healthy products. ***Place an 'x' at any point on the line.***

Low hassle						High hassle
0	1	2	3	4	5	6

47. **(Promotion)** Changes to highlight healthy products in your store, including adding promotional materials or being involved in collaborations that host nutrition education or cooking and/or tasting demonstrations in your store. ***Place an 'x' at any point on the line.***

Low hassle						High hassle
0	1	2	3	4	5	6

48. **(Priming)** Changes to guide customers to healthy products in your store, including adding designs or displays. ***Place an 'x' at any point on the line.***

Low hassle						High hassle
0	1	2	3	4	5	6

49. **(Prompting)** Changes to draw attention to healthy options, including adding messages, labels, or pictures on shelves or on food and beverage products in your store. ***Place an 'x' at any point on the line.***

Low hassle						High hassle
0	1	2	3	4	5	6

50. **(Proximity)** Changes to reduce the effort for customers to find and buy healthy products by moving their location in your store. ***Place an 'x' at any point on the line.***

Low hassle						High hassle
0	1	2	3	4	5	6

Corporate Influence

51. Is your store a corporate or chain managed store?

☐ Yes ☐ No ***(if no, continue to the next section, question 60)***

52a. **(Place)** Do you have corporate guidelines for interior store settings or properties and shelving structures or equipment?

☐ Yes ☐ No

(if yes) 52b. To what extent are you able to deviate from corporate policy and make your own decisions? ***Place an 'x' at any point on the line.***

Not at all						High
0	1	2	3	4	5	6

53a. **(Profile)** Do you have corporate guidelines for the foods and beverages stocked in store?

☐ Yes ☐ No

(if yes) 53b. To what extent are you able to deviate from corporate policy and make your own decisions? ***Place an 'x' at any point on the line.***

Not at all — High

0 1 2 3 4 5 6

54a. **(Portion)** Do you have corporate guidelines for the portion sizes of foods and beverages available for sale?

☐ Yes ☐ No

(if yes) 54b. To what extent are you able to deviate from corporate policy and make your own decisions? ***Place an 'x' at any point on the line.***

Not at all — High

0 1 2 3 4 5 6

55a. **(Pricing)** Do you have corporate guidelines for the prices of foods and beverages available?

☐ Yes ☐ No

(if yes) 55b. To what extent are you able to deviate from corporate policy and make your own decisions? ***Place an 'x' at any point on the line.***

Not at all — High

0 1 2 3 4 5 6

56a. **(Promotion)** Do you have corporate guidelines for how foods and beverages are promoted or highlighted?

☐ Yes ☐ No

(if yes) 56b. To what extent are you able to deviate from corporate policy and make your own decisions? ***Place an 'x' at any point on the line.***

Not at all — High

0 1 2 3 4 5 6

57a. **(Priming)** Do you have corporate guidelines for how foods are displayed or for using floor designs or structures to guide consumers to a place within the store?

☐ Yes ☐ No

(if yes) 57b. To what extent are you able to deviate from corporate policy and make your own decisions? ***Place an 'x' at any point on the line.***

Not at all — High

0 1 2 3 4 5 6

58a. **(Prompting)** Do you have corporate guidelines for the use of labels, stickers, or photos on shelves or food products?

☐ Yes ☐ No

(if yes) 58b. To what extent are you able to deviate from corporate policy and make your own decisions? ***Place an 'x' at any point on the line.***

Not at all — High

0 1 2 3 4 5 6

59a. **(Proximity)** Do you have corporate guidelines for where foods and beverages are placed or located in the store?

☐ Yes ☐ No

(if yes) 59b. To what extent are you able to deviate from corporate policy and make your own decisions? ***Place an 'x' at any point on the line.***

Not at all — High

0 1 2 3 4 5 6

Collaborations

60. How interested are you in a future collaborative project to help encourage consumers to purchase healthier food and beverage products in your store? ***Place an 'x' at any point on the line.***

Not at all — Very

0 1 2 3 4 5 6

61. How much time do you have available for a collaboration? ***Place an 'x' at any point on the line.***

None — A lot

0 1 2 3 4 5 6

62. What would help or hinder the possibility for a collaboration?

_____

_____

_____

_____

63. May we contact you in the future about potential collaborations or for your input?

☐ Yes ☐ No

Appendix C: Virginia Tech Institutional Review Board Approval (Study 1 & 2)

Office of Research Compliance
Institutional Review Board
North End Center, Suite 4120
300 Turner Street NW
Blacksburg, Virginia 24061
540/231-3732 Fax 540/231-0959
email irb@vt.edu
website http://www.irb.vt.edu

MEMORANDUM

DATE: July 3, 2018

TO: Sarah Anne Misyak, Elena L Serrano, Bailey Elizabeth Houghtaling, Liza Dobson, Susan Chen

FROM: Virginia Tech Institutional Review Board (FWA00000572, expires January 29, 2021)

PROTOCOL TITLE: SNAP-Authorized Retailers’ Perceptions of Behavioral Economic Strategies and Costs to Promote Purchases of Healthy Foods and Beverages

IRB NUMBER: **17-701**

Effective July 3, 2018, the Virginia Tech Institution Review Board (IRB) approved the Continuing Review request for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB-approved protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the IRB as an amendment request and approved by the IRB prior to the implementation of any changes, regardless of how minor, except where necessary to eliminate apparent immediate hazards to the subjects. Report within 5 business days to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at:

http://www.irb.vt.edu/pages/responsibilities.htm

(Please review responsibilities before the commencement of your research.)

PROTOCOL INFORMATION:

Approved As:	**Expedited, under 45 CFR 46.110 category(ies) 5,6,7**
Protocol Approval Date:	**July 21, 2018**
Protocol Expiration Date:	**July 20, 2019**
Continuing Review Due Date*:	**July 6, 2019**

*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

FEDERALLY FUNDED RESEARCH REQUIREMENTS:

Per federal regulations, 45 CFR 46.103(f), the IRB is required to compare all federally funded grant proposals/work statements to the IRB protocol(s) which cover the human research activities included in the proposal / work statement before funds are released. Note that this requirement does not apply to Exempt and Interim IRB protocols, or grants for which VT is not the primary awardee.

The table on the following page indicates whether grant proposals are related to this IRB protocol, and which of the listed proposals, if any, have been compared to this IRB protocol, if required.

Appendix D: Recruitment Letter (Study 1 & 2)

Sample Letter to be followed up by a similarly structured email or phone call to determine participation interest.

Dear owner or manager of [enter store name]:

On behalf of Virginia Tech's Family Nutrition Program, I am contacting you to determine your interest in participating in our exciting research. You will be compensated $75.00 for participating. We are interested in your perspectives as a store owner or manager on in-store healthy retail programs that are becoming a popular mode of promoting community and consumer health. Participation would mean taking approximately one hour to complete a survey and participate in a cart sort activity. All of your and your food store's information will remain confidential.

Specifically, we are seeking to determine the feasibility of using various in-store strategies to enhance consumer purchases of healthy foods based on your perceptions. This includes the new U.S. Department of Agriculture's (USDA) enhanced stocking standards policy ruling for Supplemental Nutrition Assistance Program (SNAP) that will affect authorized retailers in Virginia. You are being contacted because you are a current SNAP-authorized retailer and your contact information is listed within USDA's SNAP-retailer locator.

Please call Bailey at 406-224-1942 or email her at baileyh@vt.edu to express interest in participation, decline, or ask any clarifying questions. We will follow up with you within 2 weeks if we have not heard from you.

We hope you will seriously consider participating in this research. The results will be used to help identify opportunities for the Family Nutrition Program to work with SNAP-authorized retailers to support sales of healthy options.

Thank you for your time.

Sincerely,
Bailey Houghtaling and Liza Dobson
Virginia Family Nutrition Program, SNAP-Ed
Department of Human Nutrition, Foods, and Exercise
Virginia Polytechnic Institute and State University
Blacksburg, Virginia

Appendix E: Participant Informed Consent (Study 1 & 2)

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
Informed Consent for Participants in Research Projects Involving Human Subjects

Title of Project: SNAP-Authorized Retailers' Perceptions of Behavioral Economic Strategies and Costs to Promote Purchases of Healthy Foods and Beverages

Investigator(s): **Bailey Houghtaling – (406) 224-1942, baileyh@vt.edu**
Liza Dobson – (434) 455-3745, liza7@vt.edu
Sarah Misyak – (540) 231-8541, sbudowle@vt.edu
Elena Serrano – (540) 231-3464, serrano@vt.edu

I. Purpose of this Research Project
The purpose of this study is to identify healthy food promotion strategies that SNAP-authorized retailers, like yourself, are willing to implement, including USDA's enhanced stocking standards, based on feasibility and cost considerations. This information will help to add management or business perspectives to a growing national interest in healthy food promotions in food stores. Results will be used to add to the current food research literature and to inform potential future collaborations with the Family Nutrition Program to promote low-income consumer health. We are looking to recruit about 78 owners and managers of SNAP-authorized food stores in rural Virginia to be involved in this research.

II. Procedures
Should you agree to participate you will be asked to participate in the following activities, to take about 1 hour:

- **63-point survey**: a researcher will assist you with a survey that includes demographic and store information in addition to a cost analysis for different healthy food promotion strategies.
- **2-part free list exercise**: you will be asked to list healthy foods, from your perspective.
- **Multi-component card sort**: you will be asked to sort cards into infeasible or feasible piles of different strategies that could be used to promote healthy foods and beverages. You will be asked to talk through this process or answer questions.

We will voice record these activities. This is to document accurate information to be used at a later date.

III. Risks
There are minimal risks associated with this research other than taking up to about 1 hour of your time.

IV. Benefits
There are no guaranteed direct benefits for participating in this research. Your responses will help to inform broad healthy food promotion strategies in food stores and potential partnerships to promote low-income consumer health.

V. Extent of Anonymity and Confidentiality
Your personal and store information, including all responses to the exercises you participate in will remain confidential. Only the researchers listed above will have access to this information. All surveys, free list responses, card sort responses, and voice recordings will be assigned a code independent from your personal and store information. Identifiable information will be stored separately and securely from coded data. At no time will the researchers release identifiable results of the study to anyone other than individuals working on the project without your written consent.

The Virginia Tech (VT) Institutional Review Board (IRB) may view the study's data for auditing purposes. The IRB is responsible for the oversight of the protection of human subjects involved in research. Note: in some situations, it may be necessary for an investigator to break confidentiality. If a researcher has reason to suspect that a child is abused or neglected, or that a person poses a threat of harm to others or him/herself, the researcher is required by Virginia State law to notify the appropriate authorities. If applicable to this study, the conditions under which the investigator must break confidentiality must be described.

VI. Compensation
If you would like to completely participate in this research, we will provide a $75.00 cash incentive. If you would like to withdraw before completing all portions of the data collection tasks, you will be compensated for each portion completed. For example, you will receive $25.00 for completing the survey only, $50.00 for completing the survey and the free list only, and then the full $75.00 for completing all three data collection tasks.

VII. Freedom to Withdraw
It is important for you to know that you are free to withdraw from this study at any time without penalty. You are free not to answer any questions that you choose or respond to what is being asked of you without penalty.

Please note that there may be circumstances under which the investigator may determine that a subject should not continue as a subject.

Should you withdraw or otherwise discontinue participation, you will be compensated for the portion of the project completed in accordance with the Compensation section of this document.

VIII. Questions or Concerns
Should you have any questions about this study, you may contact one of the research investigators whose contact information is included at the beginning of this document.

Should you have any questions or concerns about the study's conduct or your rights as a research subject, or need to report a research-related injury or event, you may contact the VT IRB Chair, Dr. David M. Moore at moored@vt.edu or (540) 231-4991.

IX. Subject's Consent

I have read the Consent Form and conditions of this project. I have had all my questions answered. I hereby acknowledge the above and give my voluntary consent:

_____ Date_____

Subject signature

_____

Subject printed name
