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Mobile Produce Markets: A Strategy for Increasing Access to Fruits and Vegetables Among Low Income Urban Residents

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**MOBILE PRODUCE MARKETS: A STRATEGY FOR INCREASING ACCESS
TO FRUITS AND VEGETABLES AMONG LOW INCOME URBAN RESIDENTS**

A Thesis Presented

by

BI-SEK HSIAO

Submitted to the Graduate School of the
University of Massachusetts Amherst in partial fulfillment
of the requirements for the degree of

MASTER OF SCIENCE

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Nutrition

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TO FRUITS AND VEGETABLES AMONG LOW INCOME URBAN RESIDENTS**

A Masters Thesis Presented

by

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DEDICATION

To my husband Gopi, my daughter Paloma, and the Flying Turtle, for the refuge of home.

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ABSTRACT

MOBILE PRODUCE MARKETS: A STRATEGY FOR INCREASING ACCESS TO FRUITS AND VEGETABLES AMONG LOW INCOME URBAN RESIDENTS

SEPTEMBER 2016

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Directed by: Professor Lisa M. Troy

Mobile produce markets (MPM) are a community-based strategy to improve produce access in areas with few fruits and vegetables (FV) retail options. The purpose of this thesis is to assess the functionality of MPM in low-income urban neighborhoods. This thesis includes three studies. Study 1 investigates FV availability in areas around MPM locations (n=13). We found limited fresh FV availability in stores, but high prevalence of 100% juice, and canned FV and beans. Study 2 applied questionnaire data from MPM shoppers (n=143) to assess MPM experiences. Chi Square was used to compare shopping behaviors between older (≥ 60) and younger (18-59.9 years) adults. Separate logistic regression models were used to predict Electronic Benefit Transfer (EBT) use, money spent, shopping frequency, and distance travelled to MPM, with age,

race/ethnicity, sex, living alone/with others, and EBT in models. Participants indicated positive experiences with five dimensions of access: *availability* (variety), *accessibility* (location), *affordability* (price), *acceptability* (freshness), and *accommodation* (EBT use). Older shoppers were more likely to be long-term shoppers ($P=0.002$) and use EBT ($P=0.012$). Living alone predicted EBT use ($P=0.03$), shopping weekly ($P=0.03$), and traveling < 1 mile ($P=0.02$). In Study 3, we interviewed 16 farmers to investigate experiences and perceptions of local markets including MPM. Income and community interaction were prominent themes. Farmers identified community organizations as important liaisons to coordinate MPM distribution and communicate community needs. MPM offer a promising strategy for serving low-income and minority populations—to be organized by communities themselves and to bring needed food directly to neighborhoods.

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ABBREVIATIONS

BRFSS: Behavioral Risk Factor Surveillance System

CDC: Center for Disease Control

CSA: Community Supported Agriculture

C-NEEDS: Community-Nutrition Environment Evaluation Data System

EBT: Electronic Bank Transfer

ERS: Economic Research Service

MPM: Mobile Produce Markets

NEMS-S: Nutrition Environment Measures Survey in Stores

SFMNP: Seniors Farmers Market Nutrition Program

SNAP: Supplemental Nutrition Assistance Program

USDA: United States Department of Agriculture

WIC: Women Infant Children

CHAPTER 1

INTRODUCTION

Chronic disease is a major public health burden that costs the US approximately \$717.4 billion a year for heart disease, stroke, cancer, and diabetes, which are all diet-related conditions (Center for Disease Control (CDC) Costs, 2014). The CDC reports that chronic diseases are the leading causes of death and disability in the United States. As of 2012, about half of all adults have one or more chronic health condition, and one fourth of adults have two or more chronic health conditions (Ward, Schiller, & Goodman, 2014).

Older adults are at increased vulnerability to the cumulative health impediments of chronic diseases. The CDC reports that about 80% of older adults, defined as 65 years and older, have one chronic condition, and 50% have at least two (CDC Healthy Aging, 2011). In addition, infectious diseases and injuries take a disproportionate toll on older adults, creating increased health burden with age (CDC Healthy Aging, 2011). The population of older adults in the US is expected to more than double to 71 million by 2030 (CDC Healthy Aging, 2011). Therefore, the U.S. public health care system faces the need to strategize about caring for the increasing number of older adults.

In addition, non-White racial groups are at higher risk for many chronic diseases due to disparities in health care, income, housing, education, food access, and other aspects of systemic racism in the U.S. (Williams and Mohammed, 2009). For example, studies across the U.S. have shown that low-income and minority neighborhoods have disproportionately fewer supermarkets and healthful food outlets such as larger grocery

stores and specialty fruit and vegetable markets, and more fast food restaurants and greater availability of energy-dense foods (Larson, Story, & Nelson, 2009).

Many nutrition interventions for preventing and managing chronic disease look to improve consumption of fruits and vegetables, an important yet often inadequate component of most people's diets in the U.S. (CDC Strategies, 2011). The current national target is to consume fruit at least two times a day and vegetables at least three times a day (CDC Healthy People Targets, 2013). Yet, the U.S. population has low fruit and vegetable intake. The Behavioral Risk Factor Surveillance System (BRFSS) indicates that in 2013, <18% of adults in each state consumed the recommended amount of fruit and <14% consumed the recommended amount of vegetables (CDC Morbidity and Mortality Weekly Report, 2015). The State Indicator Report on Fruits and Vegetables, 2013 indicates that nationally, adults consume fruit about 1.1 times a day and vegetables about 1.6 times a day (CDC State Indicator Report, 2013). In Massachusetts, median fruit intake is 1.2 times a day and median vegetable intake is 1.7 times a day, with 31.6% and 20.7% of people consuming fruits and vegetables less than 1 time a day, respectively (CDC State Indicator Report, 2013).

While attention has been given to the strengthening of local food systems to improve access and consumption of fruits and vegetables (CDC Strategies, 2011; Johnson, Aussenberg, & Cowan, 2013), scholars and activists have unveiled disproportionate local market patronage by White middle and upper class customers, calling into question the local food movement's capacity to reach to low-income and minority populations, and identifying the need for social justice-based strategies (Allen,

2009; Guthman et al., 2006; Guthman, 2008a; Guthman, 2008b; Kato & McKinney, 2015; Ramirez, 2015; Slocum, 2007).

With growing concern about diet-related chronic disease and the disparities of healthful food access, organizationally operated mobile produce markets (MPM) have emerged as a public health and social justice-based strategy to improve fruit and vegetable access and consumption, particularly among low-income and minority populations in urban food desert neighborhoods where access to fresh produce is limited. MPM are essentially mobile, single-vending unit farmers markets that sell fruit and vegetable. In the past 10 years, approximately 40 new organizationally operated MPM have opened across the country (Zepeda & Reznickova, 2013).

The Go Fresh MPM in Springfield, MA is an example of a multi-organizational collaboration to improve access to locally grown fruits and vegetables. More than half of Springfield census tracts have a significant low-income population with access to a grocery store more than 1/2 mile away, and for approximately 25% of the city, access is more than 1 mile away (Economic Research Service, 2015). Launched in 2011, Go Fresh sells locally grown fresh fruits and vegetables such as berries, apples, tomatoes, leafy greens, and squash and operates seasonally from approximately June to October, and in 2015 served 12 locations in Springfield including subsidized housing complexes, senior centers, and other sites of congregation such as the East Springfield Library.

Very few studies have documented the contribution and use of MPM, and little is known about the experiences and perspectives of local farmers, who play an integral role in production of fruits and vegetables. The purpose of the current research is to assess the functionality of MPM within the context of a local food system and an urban food

environment, and as a strategy to improve access to fruits and vegetables among low-income, urban residents. To this end, the current research focuses on the Go Fresh MPM and investigates the market through 3 studies (see Figure 1.1). Study 1 uses in-store audits to describe fruit and vegetable availability within half-mile radius areas of Go Fresh locations. Study 2 applies questionnaire data to assess MPM influences on fruit and vegetable access within an urban food environment through the perceptions and experiences of Go Fresh MPM shoppers. Study 3 uses farmer interviews to examine farmers' perspectives and experiences of local food marketing, including MPM, and to understand the facilitators and barriers of their involvement, particularly for improving access among low-income and minority populations. To our knowledge, this is the first study to examine MPM through multiple perspectives within the food system.



Figure 1.1 Three Studies of Mobile Produce Markets

CHAPTER 2

THE FOOD ENVIRONMENT AND DIET RELATIONSHIP

2.1 Introduction

Food environment research has accelerated over the past decade as people have recognized that personal factors alone are insufficient for characterizing dietary influences. If one were to search for “food environment” and even specify “neighborhood or community” in popular research databases such as Google Scholar, PubMed, Web of Science, one would find thousands of articles, with the majority of them published in the past 10 years.

This section of the literature review synthesizes findings from 10 review articles of food environment studies that include discussion of the food environment-diet relationship(Black, Moon, & Baird, 2014; Caspi, Sorensen, Subramanian, & Kawachi, 2012; Fraser, Edwards, Cade, & Clarke, 2010; Gustafson, Hankins, & Jilcott, 2012; Kelly, Flood, & Yeatman, 2011; Kirkpatrick et al., 2014; McKinnon, Reedy, Morrisette, Lytle, & Yaroch, 2009; Mhurchu et al., 2013; Ohri-Vachaspati & Leviton, 2010; Penney, Almiron-Roig, Shearer, McIsaac, & Kirk, 2014). An additional 3 key articles help to enhance understanding about the concepts and measurements of the food environment-diet relationship(Glanz, Sallis, Saelens, & Frank, 2005; Lytle, 2009; Rose, Bodor, Hutchinson, & Swalm, 2010). Other primary research articles are also included to provide specific research results.

There are several aims to reviewing the food environment-diet relationship. One objective is to illustrate the theoretical models that describe the food environment link to dietary and health outcomes. Another is to identify relevant methodology for studying the food environment in Springfield, MA that incorporates known food environment predictors of dietary outcome. Through a critical review of food environment research, we identify important considerations for future research and gaps in literature that are investigated in the current study.

2.2 Conceptual Framework of the Food Environment

Food environment researchers have commonly used concepts defined by Glanz and colleagues to guide their study focus and to organize their variables (Glanz et al., 2005). Glanz and colleagues created a “Model of Community Nutrition Environments” with four main classifications of nutrition environments—Community Nutrition Environments, Consumer Nutrition Environments, Organizational Nutrition Environments, and Information Environment (see Figure 2.1). The *Community Nutrition Environment* includes the number, type, location, and accessibility of food outlets. The *Consumer Nutrition Environment* includes specific characteristics of the food outlets and the food available, including nutritional quality, price, promotions, placement, and variety of choices, freshness, and presence of nutritional information. The *Organizational Nutrition Environment* refers to home, school, and worksite environments. And finally, the *Information Environment* refers to the realm of media and advertising. (Glanz et al., 2005)

While the terms “nutrition environment” and “food environment” are often used interchangeably, some researchers prefer to use “food environment” to put less emphasis on the nutrient-body interaction(Ohri-Vachaspati & Leviton, 2010).

In addition to providing useful categories of food environments, Glanz and colleagues emphasized the Social-Ecological model of health behavior to show the political and individual variables of influence(Glanz et al., 2005). Government and industry policies often shape the type of stores and food available in any neighborhood. Environmental influences are mediated by individual variables such as socioeconomic status, demographics, health, nutrition knowledge, and individual perceptions of the food environment (Penney et al., 2014). Interventions at any of these levels have the potential to encourage healthy eating.

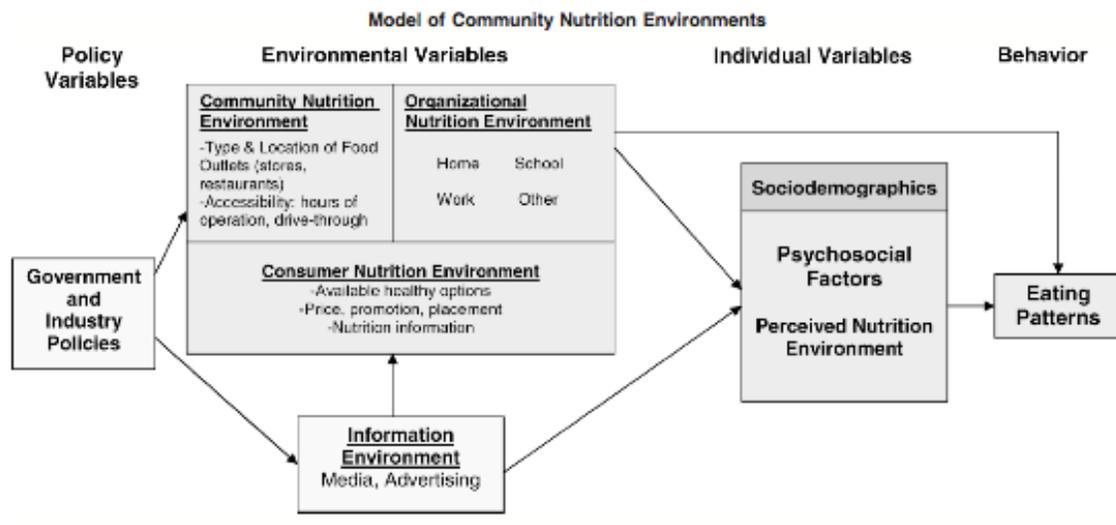


Figure 2.1: Model of Community Nutrition Environments (Glanz et al., 2005)

2.3 The Five Dimensions of Food Access

Food access is often used to explain the link between food environment and health, although there are many ways to define food access. The Five Dimensions of Access was first proposed as a measure of health care (Penchansky & Thomas, 1981), and has recently been applied to the food environment to measure access to healthy and unhealthy food (Caspi et al., 2012; Charreire et al., 2010). Caspi and colleagues use the five dimensions of access—availability, accessibility, affordability, acceptability, and accommodation—to aid in deciphering exposure variables for research and the types of measurement tools (Caspi et al., 2012). The five dimensions in more detail, as outlined by Caspi and colleagues (Caspi et al., 2012), are:

- *Availability*: the supply (amount, type, and variety) of healthy food and the presence of certain types of food stores, restaurants, and other food sources.
- *Accessibility*: the location of the food supply and convenience of reaching the location, with attention to travel time, distance, transportation options, and walkability.
- *Affordability*: the price of food and perceptions of worth and quality relative to cost and expendable funds.
- *Acceptability*: the objective and perceived quality of food relative to some standard.
- *Accommodation*: the extent that food sources are adapted to consumers' needs, with attention to store hours, types of payment, grocery types.

Most studies focus on one or few of these food access dimensions. In a review of 38 articles specifically examining the food environment and diet interaction, reviewers found that most studies used some measure of availability to define exposure variables,

about a third investigated accessibility, and very few examined affordability, acceptability, and accommodation (Caspi et al., 2012).

2.4 Research Instruments and Measures of Food Environment

Researchers use a variety of instruments and measures to investigate food environments, depending on the purpose of study, the dimension of access being investigated, and the resources and expertise available.

Ohri-Vachaspati and Leviton evaluated 48 instruments used to measure the food environment, and identified 11 of them to be useful for researchers, 18 for community organizers, and 19 for public health practitioners, based on the level of detail, the type of information, and the resources and expertise required (Ohri-Vachaspati & Leviton, 2010). They also highlighted the distinction between measuring the objective physical environment and the perceived food environment, each requiring different instruments and assessing different mechanisms of behavioral influence. Observations such as in-store audits and secondary GIS data analysis are often used to assess the objective physical environment, while surveys and interviews are generally used to measure perceived food environment.

Geographic assessment using GIS has been the most common method of measuring the food environment (Caspi et al., 2012; McKinnon et al., 2009). GIS tends to define food access based on store density in a geographic frame, or proximity to the nearest food store (Caspi et al., 2012). Healthy food availability is often defined according to the geographic presence of supermarkets, and unhealthy food availability based on the presence of convenience stores and fast food outlets. The North American Standard Industry Classification System is sometimes used for classification of food environments

on the macro level by deriving the Retail Food Environment Index (RFEI), which indicates the ratio of supermarkets to fast food restaurants and convenient stores in a defined area(Kelly et al., 2011).

Geographic measures have been particularly useful in exposing the disparities of food access. In the US, low income and ethnic communities have greater access to fast foods, fewer supermarkets per capita and farther distances to travel to the closest store than more affluent communities(Black et al., 2014). However, there is overall consensus that macro-level geographic measures alone are insufficient for describing healthy food availability in any neighborhood(Caspi et al., 2012; Kelly et al., 2011; Rose et al., 2010). Convenient stores, often defined as “unhealthy food stores,” may carry significantly different types and quality of food from one store to another. While supermarkets may carry a greater variety of healthy options, they also have the capacity to carry a greater variety of unhealthy options. Also, store turnovers are common and often undetected through GIS(Kelly et al., 2011).

Complimenting geographic measures with *Consumer Food Environment* measures improves the assessment of the neighborhood food environments. Rose and colleagues describe the combination of *Community* and *Consumer Food Environment* measures as the “multi-dimensional approach” (Rose et al., 2010). Measuring shelf space of food types, such as fruits and vegetables, or high-energy dense snack foods, is one method of assessing the presence of a specific food type in neighborhood stores (Bodor, Rose, Farley, Swalm, & Scott, 2008; Rose et al., 2009; Rose et al., 2010). The use of checklists, market baskets, store inventories or in-store audits, sales analyses, nutrient analyses, and menu analyses are other means of assessing the *Consumer Food*

Environment to measure food variety, quality, cost, and promotion of foods (McKinnon et al., 2009).

2.5 Dietary Outcome Measures

The common dietary outcome variables that are investigated in food environment studies include diet quality, fruit and vegetable intake, sugar-sweetened beverage intake, and fast food intake (Black et al., 2014; Kirkpatrick et al., 2014). Measured or self-reported food purchases are also important variables to consider that relate to dietary outcome (Mhurchu et al., 2013).

Kirkpatrick and colleagues closely examined dietary assessment measures in food environment studies (Kirkpatrick et al., 2014). They found that 2/3 of the 38 studies they reviewed used a brief instrument such as a screener or Food Frequency Questionnaire. Among the 38 studies they examined, one or two item screeners were often used, with single-item questions being the most common (35% of studies). More accurate dietary assessments such as 24 hour dietary recalls (10%) and food diaries (4%) were infrequently used. The most frequently studied dietary components were fruit and/or vegetables (69%), sugar-sweetened beverages (27%), and fast food (18%). The most common measures for fruit and vegetable consumption were brief instruments such as a screener or single-item questions. Furthermore, diet quality was assessed in 18% of studies, with Food Frequency Questionnaire most commonly used (Kirkpatrick et al., 2014).

2.6 Evidence on Food Environment-Diet Relationship

Although research suggests an association between greater healthful food availability and access and better dietary outcome, results have been mixed, with some

studies showing results in the expected direction, while other studies show no association, and a few studies show poorer dietary outcomes (Black et al., 2014; Caspi et al., 2012; Gustafson et al., 2012; Kirkpatrick et al., 2014; Mhurchu et al., 2013; Rose et al., 2010). Healthful dietary outcomes have been measured in different ways and reflected fruit and vegetable intake as well as overall diet quality (Black et al., 2014; Kirkpatrick et al., 2014). The exact mechanism of the relationship between healthful food availability and access and diet is not well understood. Generally, there is greater consistency of dietary association when using perceived food environment measures compared to objective measures(Caspi et al., 2012).

Studies using GIS methods to measure store presence and store density have mixed results of associations with dietary outcomes. In one review of 20 GIS-based studies, only 13 of them showed a significant positive association between availability of healthy food and positive dietary outcome such as fruit and vegetable intake or higher diet quality(Caspi et al., 2012). In another review of 24 studies on the relationship between food store access and diet, 10 studies showed that better access to supermarkets and green grocers was associated with healthier dietary behaviors, 2 studies showed an inverse association between density of small grocery stores and convenient stores and fruit and vegetable intake, and 11 studies found no significant associations(Black et al., 2014).

The evidence for a relationship between the presence and density of fast food restaurants and dietary outcome is also mixed. In a review of 3 studies that measured the dietary impact of fast food outlets with fruit and vegetable consumption as an outcome variable, increased fast food availability was associated with decreased fruit and

vegetable intake in all three studies (Fraser et al., 2010). However, studies investigating the association of fast food availability and fast food consumption have had mixed results, with about half showing a positive association and half showing no association or inverse association (Black et al., 2014; Fraser et al., 2010).

Looking specifically at the relationship between fruit and vegetable availability through store audits and consumption of fruits and vegetables as an outcome, there are also mixed results in literature, although the trend of association seems to be positive (Gustafson et al., 2012). In a study of 11-14 year old African American boys (n=172) in Houston, TX, an inverse association was found between fruit availability in nearby stores and consumption of fruit ($R = -0.17$, $P = 0.64$), and a positive association was found between vegetable availability in nearby stores and consumption ($R = 0.02$, $P = 0.95$), but neither results were significant (Edmonds, Baranowski, Baranowski, Cullen, & Myres, 2001). In a cross-sectional analysis of seniors aged 60-90 years old (n= 582) in rural Texas, lower fruit intake was significantly associated ($P = 0.003$) with farther distance to a store with a good selection of fresh and processed fruit, but no significant association was found between vegetable consumption and proximity to a store with good selection of vegetables (Sharkey, Johnson, & Dean, 2010). Another study of participants in an intervention (n=130) in Colorado found that there was a significant positive association between living in communities with stores that had more varieties of produce and increases in fruit and vegetable intake ($P = 0.007$) among participants over a 12-month period (Caldwell, Kobayashi, DuBow, & Wytinck, 2009). In addition, in a study in New Orleans assessing fruit and vegetable shelf space and diet of residents in a 100 m vicinity (n=102), researchers found vegetable availability to predict vegetable intake, with an

additional meter of shelf space associated with 0.35 increased servings per day(Bodor et al., 2008).

Associations of price of fruit and vegetables with consumption also have mixed conclusions in literature (Gustafson et al., 2012). For example, in a study of mixed aged survey respondents (n=420) in an urban area in the UK, fruit and vegetable price in the nearest supermarket was not significantly associated with either fruit or vegetable consumption ($P>0.05$) (Pearson, Russell, Campbell, & Barker, 2005). In a study in Melbourne, Australia, higher prices was associated with,higher fruit and vegetable consumption, which was interpreted as due to having higher quality fruits and vegetables (Thornton et al, 2010). However, an intervention study in Colorado found that as prices increased, fruit and vegetable consumption decreased (Caldwell et al., 2009). The effect of price on dietary outcome was more pronounced with longitudinal studies finding that increased prices on less healthy food was associated with lower consumption(Black et al., 2014).

In summary, research on the food environment-diet relationship has shown mixed results, and researchers continue to explore the mechanism of how the food environment influences diet and health. Nonetheless, two trends have been uncovered in the literature, which are important to our current study. First, studies of the *community food environment* using GIS measures suggest a trend of association between the presence of a supermarket in one's neighborhood and better diet and health outcomes. There is low access to a supermarket for more than half of Springfield, the site of our study, suggesting risk for poor diet and health. Second, studies of the *consumer food environment* using store audits suggest a trend of association between fruit and vegetable

availability and fruit and vegetable consumption. Our current study focuses on access to fruits and vegetables, which is suggested to impact dietary intake of fruits and vegetables.

2.7 Food Environment Research Issues

The published reviews identified several issues pertaining to food environment research. Mentioned in all reviews and highlighted as a priority for improvement, is the lack of psychometric testing among the research instruments (Lytle, 2009; McKinnon et al., 2009; Ohri-Vachaspati & Leviton, 2010; Penney et al., 2014). Only a quarter or less of the studies used instruments that were tested for validity and reliability (McKinnon et al., 2009; Ohri-Vachaspati & Leviton, 2010).

McKinnon and colleagues found that few instruments catered to the specific target population, especially at-risk populations such as low-income, rural, and racial minorities, and recommends development and improvement of population-specific instruments (McKinnon et al., 2009). For example, store audit tools such as NEMS and CNEEDS, and store checklists do not include fruit and vegetable types that are commonly consumed by ethnic groups. GIS food environment analyses usually excludes farmers markets, farm stands, home gardens, food pantries and other alternative food sources that may be particularly important in rural and urban food desert areas.

Also, Lytle emphasizes the need for adequate utility along with validity and reliability, that there needs to be better transparency and detailing of the choice of instruments and the applicability of the environmental data to understand population health (Lytle, 2009). Careful consideration of instruments, pre-testing of instruments across settings and populations, increasing utilization of instruments that have been validated and that have high reliability (such as the NEMS tool), and using several

instruments in a single study for cross-validation, are some of the suggestions for resolving this issue(Ohri-Vachaspati & Leviton, 2010).

In addition, the heterogeneity of exposure and outcome variables and instruments used make cross-study comparisons difficult. There is currently no gold standard of measurement for food environments, and some researchers call for more standardization(Caspi et al., 2012; Kirkpatrick et al., 2014). Many of the studies lack research rigor, such as neglecting to randomize samples or use control groups, which need to be addressed through improved study designs. Recognizing that the majority of food environment studies have been cross-sectional and that the food environment-diet interaction is complex and dynamic through time and space, many reviews call for the application of longitudinal studies, and the need to take advantage of natural experiments to elicit behavioral and dietary changes through environmental interventions and to disentangle the matrix(Gustafson et al., 2012; Lytle, 2009; Penney et al., 2014).

The oversimplification of geography-related assessments is also a major issue. Assumptions are often made about individual shopping behaviors based on neighborhood characteristics. However, geographic boundaries may not be relevant to residents, and it is important to put the individual back into context, and to strive to understand how individuals choose to behave in the environment. It is important to ask questions about where people shop, how far they are willing to travel to shop, how many and what stores they shop, and what influences where they shop(Lytle, 2009). Therefore, the collection of both individual and environmental-level data is needed (Lytle, 2009).

Nutrition interventions in food environments also need to consider multiple dimensions of influence. For example, a recent study of the effect of opening a new

supermarket in a food desert region of Philadelphia found that it did not lead to improvements in fruit and vegetable intake or BMI(Cummins, Flint, & Matthews, 2014). The authors emphasized the importance of simultaneous behavioral interventions such as increasing motivation and cooking skills, and policy interventions such as food and drink tax and subsidies, recognizing that improving access alone is insufficient.

Although researchers recognize the ecological model and understand that multiple levels of influence factor into diet and health outcomes, study designs do not often take a multi-dimensional approach to data collection and analysis. Particularly missing is research and discussions on the social environment and how it influences dietary decisions. In addition to using multiple instruments, combining multiple exposure and outcome variables, and asking questions that point to the dynamics of individuals and environments, other methodologies have been suggested to improve on the multi-dimensionality of research. Penny and colleagues suggest Ecological Momentary Assessment (EMA), developed from clinical psychology, to relate environmental context to actual eating behavior(Penney et al., 2014). Black and colleagues recommend structural equation modeling to investigate the relative influence of environmental, social, and individual level factors on dietary intake(Black et al., 2014).

Understanding the issues of food environment research helps to justify our current food environment study instrument and methodology. Prioritizing the *consumer food environment* allows us to investigate specific food groups, in this case fruits and vegetables. The instrument of choice for the current study of the Springfield food environment, Community Nutrition Environment Evaluation Data System (C-NEEDS), is a validated store audit tool adapted from a commonly used instrument called Nutrition

Environment Measures Survey-Stores (NEMS-S) to include items that are specific to the Northeast region, therefore considering psychometric testing and regional food choices.

2.8 Dynamic Aspects of the Food Environment—Important Considerations for Future Research

Few food environment studies recognize alternative food sources such as farmers markets, farm stores, home gardens, mobile produce markets, food vendors, food pantries, bulk food buying clubs, and internet food shopping and delivery services. These food sources are harder to detect through GIS mapping and street surveying, yet they may be important sources of healthful food, especially fruits and vegetables. One study in New York City found that including fruit and vegetable markets and farmers markets in the number of healthy food outlets increased the densities of healthy foods particularly in Hispanic and Asian, immigrant, and high-poverty neighborhoods ($P < 0.05$) (Bader, Purciel, Yousefzadeh, & Neckerman, 2010). However, the study did not account for the shorter opening hours for farmers markets, which would require more nuanced measures than a standard store audit.

Seasonality of food availability is also a variable that is rarely explored in food environment research but may be important, particularly with fruit and vegetable availability and pricing in northern parts of the US with distinct growing seasons. Dietary habits also may fluctuate with the seasons. Investigations of seasonality would require repeated store audits and dietary assessments in different months, creating more research burden; but this type of study may provide an important perspective to the fluidity of food environments.

Computer-generated models can help us understand dynamic influences on the food environment. For example, one study used a computer-simulation approach with an agent-based-model (ABM) and validated 4 potentially impactful intervention strategies to increase households stocking fresh fruits and vegetables (Widener, Metcalf, & Bar-Yam, 2013). These simulations/strategies were: 1) including farmers markets; 2) increasing shopping frequency; 3) increasing probability that convenience stores sell fruits and vegetables; 4) introducing mobile markets in areas with high household food insecurity. Introducing farmers markets in the model increased 100-200 households with access to fruits and vegetables. When 25% and 50% of biweekly or monthly shoppers switched to shopping weekly, 600 and 1400 more households, respectively, had fruits and vegetables in stock. When the probability of convenience stores stock fruits and vegetables increased from 0.33 to 1.00, approximately 1000 more households stocked fresh produce. Introducing mobile markets results in the substantial increase of 500 households stocking fruits and vegetables (Widener et al., 2013).

Although the ABM modeling does not address the plethora of personal, social, and economic barriers to the usage of these markets, such as the lack of knowledge and motivation to use fruits and vegetables, and financial limitations, many insights are gained from this model analysis. This study reminds us that in any food desert neighborhood, the simultaneous implementation of a variety of strategies may be needed, and there may be a spillover effect of one strategy into another. For example, increased shopping frequency may be dependent on the existence of farmers markets, mobile markets, and financial incentives, and vice versa.

Spillover effects within food environments are not well understood but are important phenomena to consider. For example, the presence of a once-a-week farmers market may bring attention to fruit and vegetable demand or the normalization of seasonal food changes and influence product availability of other stores in the neighborhood. Or, a nutrition intervention targeting a specific population, such as older adults, may spill over to nutritional changes among other household members or younger members of the community.

2.9 Food Environment Research Gaps Explored in the Current Study

While food environment researchers use food access to explain the link between the food environment and diet, the components of food access are variable. Most food environment research focuses on food availability, with gaps in investigation of other aspects of food access. Furthermore, there are mixed results in research examining the association between healthful food availability and diet outcomes, pointing to the importance of looking at other variables. The model of the Five Dimensions of Access describes components of food access--availability, accessibility, affordability, acceptability, and accommodation. The current study attempts to describe fruit and vegetable access by exploring all five dimensions within the study region. Doing this provides a more in-depth understanding of fruit and vegetable access.

In addition, alternative markets such as farmers markets and MPM are not commonly included in food environment evaluations, yet they may be important sources of healthful food, particularly fruits and vegetables, in urban neighborhoods. Study 1 of our research aims to describe the food environment context of MPM, particularly the

availability of fruit and vegetables in stores in order to assess the potential impact of MPM to the food environment.

CHAPTER 3

**SOCIAL-ECOLOGICAL MODEL OF FRUIT AND VEGETABLE
CONSUMPTION AMONG OLDER ADULTS**

3.1 Introduction

The Social-Ecological Model (see Figure 3.1) provides a useful framework for understanding the various factors that influence nutrition outcomes, and for designing interventions. This model is often categorized into five spheres of influence: individual, interpersonal, institutional/organizational, community, and social structure, policy, and systems (Gregson et al., 2001; Mcleroy, Bibeau, Steckler, & Glanz, 1988). To provide a theoretical framework for the current study, the Social-Ecological Model has been adapted to describe factors that influence fruit and vegetable consumption among older adults (see Figure 3.2). In the adapted model, community aspects are integrated within the social level, and institutional/organizational factors are incorporated into political, environmental, and social levels. The current study uses the adapted Social-Ecological Model to describe how mobile produce markets have the potential to increase consumption of fruits and vegetables among older adults.

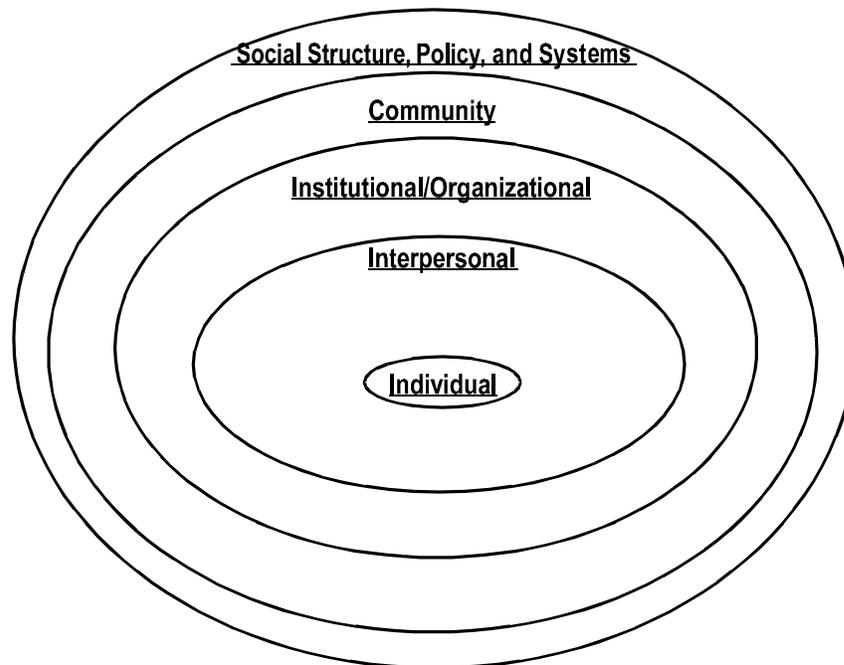


Figure 3.1 A Social-Ecological Model for nutrition evaluation: spheres of influence (Gregson et al., 2001; Mcleroy et al., 1988)

3.2 National Trends in Fruit and Vegetable Consumption Among Older Adults

National statistics reveal that older adults ≥ 65 years consume more fruits and vegetables and have an overall higher dietary quality compared to other age groups (Nicklett & Kadell, 2013; Wang et al., 2014).

Behavioral Risk Factor Surveillance System (BRFSS) data reports that in Springfield, MA and Massachusetts overall, 29.4% and 33.6% of older adults consume 5+ servings of fruits and vegetables per day, respectively, which is highest among all adult age groups, with a range of 17.2% to 27.4% among other adult age groups. For all adults in Springfield and Massachusetts, fewer males (18.6%, 23%) consume adequate amounts of fruits and vegetables compared to females (26.4%, 33.9%). (Massachusetts Community Health Information Profile, 2014)

Even though older adults consume more fruits and vegetables compared to younger adults, close to two-thirds of older adults in Massachusetts still do not consume adequate amounts of fruits and vegetables. Nevertheless, national average scores for consumption of fruits and vegetables is relatively high for older adults. According to national dietary data from 2007-2009 that used the Healthy Eating Index-2005 scoring system, older adults met the target for consumption of whole fruit but not total fruit. In the total fruit category, adults 75 and older had a higher score of 94% compared with a score of 86% for 65-74 year olds. Scores for total vegetables were 82% and 86% for the 75 and older and 65-74 age groups, respectively. However, scores specific to dark green and orange vegetables and legumes were much lower, with scores of 35% and 36% for the 75 and older and 65-74 age groups, respectively (Federal Interagency Forum, 2012).

Overall, average levels of fruit and vegetable consumption for older adults, while higher than other age groups, still do not meet target amounts and are especially deficient in regards to dark green and orange vegetables.

3.3 Importance of Fruits and Vegetables for Older Adults

As men and women age, basal metabolic rates (BMR) decrease. BMR is the rate of energy expenditure at rest to maintain functioning of vital organs. Physical activity tends to decrease with age as well, reducing caloric needs through diet. However, micronutrients continue to be a vital component of maintaining health (Drewnowski and Warren-Mears, 2001).

Older adults' ability to absorb and utilize many nutrients becomes less efficient. Nutrient wasting through drug-nutrient interactions, especially among the B vitamins, is also a concern for older adults. Furthermore, reductions of appetite and taste sensation

due to natural aging and medication influence also interfere in the capacity of older adults to acquire adequate nutrition (National Institute of Health, 2010).

In order to acquire adequate nutrients while cutting back on calories, it is critical for older adults to consume foods that are nutrient dense. Fruits and vegetables are exemplary nutrient dense foods since the amount of vitamins and minerals is high in ratio to calories, and this density of nutrients is essential for reduced caloric needs with aging (Drewnowski and Warren-Mears, 2001). Research devoted to classifying powerhouse fruits and vegetables (PFV), foods most strongly associated with reduced chronic disease risk, have identified cruciferous and leafy green vegetables to be most beneficial (Di Noia, 2014).

Many studies have shown that fruits and vegetables in the diet are protective against the development of chronic disease. One scientific explanation lies in the role of antioxidants in reducing inflammation and oxidative stress-related chronic diseases. Older adults are particularly susceptible to the cumulative effects of oxidative stress with age. Many studies have found that increased fruit and vegetable intake is associated with an improved antioxidant level in older adults, which can reduce development of chronic diseases. Cardiovascular disease, hypertension, cancer, sarcopenia, are just a few of these oxidative stress-related chronic diseases affecting older adults that can be mitigated through higher fruit and vegetable intake.(Anlasik et al., 2005; Hung et al., 2004; Nicklett & Kadell, 2013)

Many studies trace carotenoids, a class of antioxidants and the major biomarker of fruit and vegetable intake, and its influence on health. One study found that low plasma carotenoid relates to sarcopenia, muscle weakness and the loss of muscle mass, and that

carotenoid-rich foods are protective against a decline of muscle strength and walking disability in older adults (Semba, Lauretani, & Ferrucci, 2007). The Women's Health and Aging Studies have found that antioxidant micronutrients from fruit and vegetable intake play a key role in decreasing the risk of mortality/increasing survival in older adult women by reducing the inflammatory response (Nicklett et al., 2012; Walston et al., 2006). Higher fruit and vegetable intake, resulting in higher antioxidant status, is also linked to increased cognitive performance (Polidori et al., 2009). This is of particular benefit to aging brains and mental decline in many older adults.

Furthermore, adequate intake of fruits and vegetables is associated with the consumption of other healthy foods and healthy eating behaviors such as eating meals at home and using nutrition labels when purchasing food (Staser et al., 2011).

3.4 Factors Affecting Fruit and Vegetable Consumption Among Older Adults

Despite the need for the consumption of nutrient dense foods such as fruits and vegetables, older adults do not consistently comply. The Social-Ecological Model of fruit and vegetable consumption (see Figure 3.2) illustrates the interplay of personal, social, environmental, and political factors. The overlapping/encasing visual image seeks to highlight the idea that not one factor alone is responsible for fruit and vegetable consumption, but fruit and vegetable consumption is the result of multiple variables of influence.

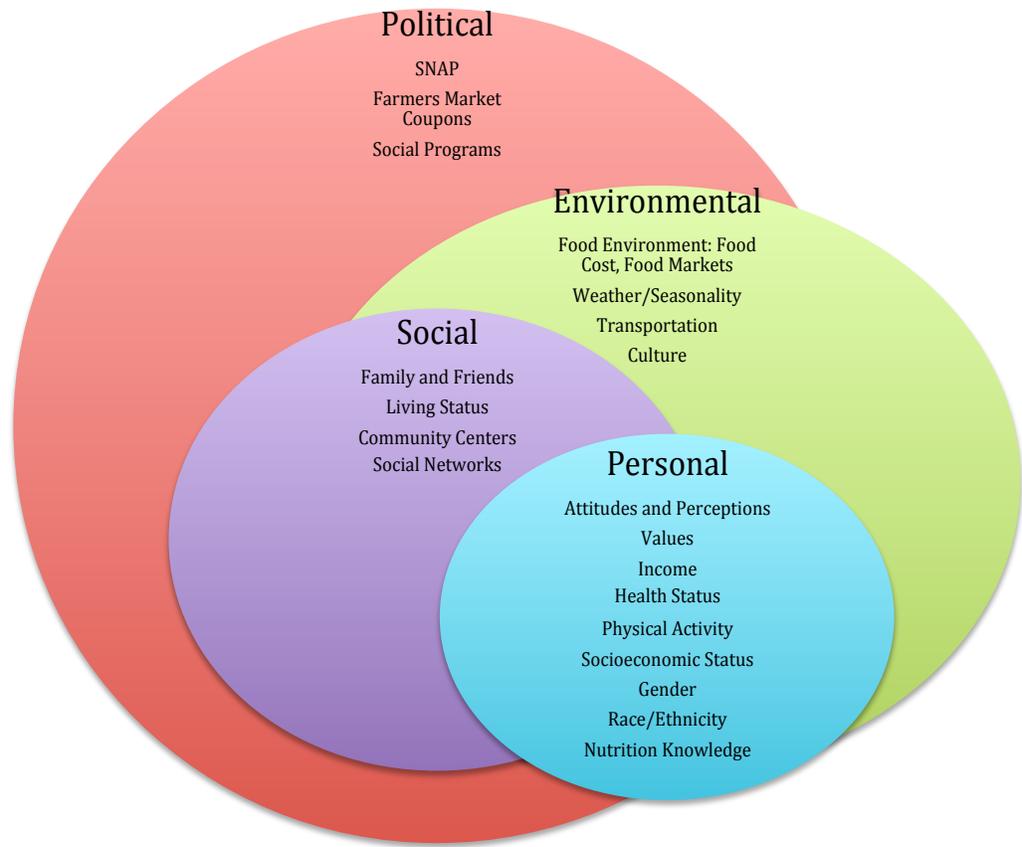


Figure 3.2: Social-Ecological Model of Fruit and Vegetable Consumption

3.4.1 Personal Factors

3.4.1.1 Health Status

As already mentioned, aging is accompanied by physiological changes in appetite, smell, taste, and digestive function that reduces consumption of fruits and vegetables.

Emotional factors also influence appetite. One study showed that poor appetite was associated with commitment/involvement in one's life, and fair to poor emotional wellbeing, which was often reported among older adults (Engel et al., 2011). Decreased consumption of fruits and vegetables is also commonly explained by compromised oral health in the form of gum disease, tooth decay and loss, dentures, and mouth infections,

which disrupts biting and chewing and discomforts in eating (Sahyoun & Krall, 2003; Savoca et al., 2010; Sheiham & Steele, 2001; Walls & Steele, 2004).

In addition, disabilities such as arthritis, poor eyesight, diminished mobility, and mental decline create functional impediments to consuming adequate nutrition. These disabilities particularly affect the ability to shop and prepare food (Nicklett & Kadell, 2013).

3.4.1.2 Motivation

Regardless of the vulnerabilities of declining health that older adults experience, the older adult age group still has higher rates of consuming fruits and vegetables compared to other age groups (Nicklett & Kadell, 2013; Wang et al., 2014). One explanation for this phenomenon is that diminished health status can be a motivating factor for improving nutrition. For example, those with cancer-prevention dietary knowledge are more likely to consume target amounts of fruit and vegetables (Harnack, Block, Subar, Lane, & Brand, 1997). A study comparing motivations for weight loss found that older adults were more likely to be motivated by health and a medical trigger compared to younger adults (LaRose, Leahey, Hill, & Wing, 2013). Another study of Irish adults found that increasing age was associated with a having a higher healthy eating motivation score (Naughton, McCarthy, & McCarthy, 2015). Furthermore, the desire to remain independent has been identified as a factor that motivates older adults to grocery shop (Munoz-Plaza et al., 2013). It is likely that the desire to remain independent motivates other health-promoting habits as well.

3.4.1.3 Income and Socioeconomic Status

Many older adults are retired and living off social security and life savings, with limited opportunity to recover from financial losses being unemployed (Conklin, Maguire, & Monsivais, 2013). With potentially a tighter budget for food, their fixed income status makes them vulnerable to poor diets. A qualitative study in Brooklyn, NY of factors that influenced older adults' food purchasing decisions found that older adults were very mindful of money spent on groceries due to their fixed incomes, and made the majority of their purchasing decisions based on which food items were on sale (Munoz-Plaza et al., 2013). This study also found that older adults relied heavily on Supplemental Nutrition Assistance Program and coupons to purchase food, and depended on food pantries for food (Munoz-Plaza et al., 2013).

Conklin et al reviewed many studies on the dietary impact of the economic shift to retirement. These studies focused on food expenditures as an indicator and revealed mixed results. For some older adults, food expenditure decreased with retirement but for others, food-spending habits did not change; there were differences in spending depending on gender, retirement voluntariness, and living arrangements (Conklin et al., 2013). The variability illustrates that we cannot look at any one factor of influence in isolation and must simultaneously consider social, environmental, and other personal factors.

Nevertheless, low-income status, low socioeconomic status, and perceived high food prices are economic factors commonly known to be associated with poor diet. Fruits and vegetables, in particular, are often perceived as luxury or high cost items that do not get priority on tight budgets. Therefore, low consumption of fruits and vegetables is

particularly salient for older adults with low income and low socioeconomic status (Conklin et al., 2013; Wang et al., 2014).

3.4.2 Social Factors

Many studies have investigated the effects of living arrangements on diet quality of older adults. One of the more consistent findings is that older men living alone have a poorer diet quality than men living with a spouse (Davis, Murphy, Neuhaus, & Lein, 1990; Hughes, Bennett, & Hetherington, 2004; Payette & Shatenstein, 2005). A study in Canada found that older men and women who were married were more likely to consume recommended portions of fruits and vegetables compared to those who were single (Nicklett & Kadell, 2013; Payette & Shatenstein, 2005).

Social activity and family interaction have been found to play meaningful roles in the maintenance of diet quality among older women, according to a longitudinal study of participants in the Women's Health and Aging Study. Leaving one's home was associated with an increase in carotenoid levels, a biomarker for fruit and vegetable consumption, and attending fewer activities determined a decrease in carotenoid levels (Nicklett et al., 2012).

Furthermore, programs that encourage meal sharing and promote social interaction have been found to improve diet quality, showing the positive correlation of socialization and diet quality. In addition, congregate meals have been shown to increase overall quality of life as well as lowering the risk for malnutrition (Vailas, Nitzke, Becker, & Gast, 1998).

3.4.3 Environmental Factors

Transportation options and the walkability and safety of neighborhoods are important environmental influences to food access that are particularly critical for older adults, who often have issues with mobility. A qualitative study of older adult shopping behaviors in Brooklyn, NY found that transportation was a key determinant to buying healthy food, and those who adapted to transportation challenges by purchasing food frequently in small batches or who utilized social networks for transportation assistance were more successful at acquiring healthy food (Munoz-Plaza et al., 2013).

The predicament of urban food deserts is an important environmental consideration that is compounded by racial disparities in our society, resulting in unequal access to fruits and vegetables (Szegda, Robinson, Collins, & Hudson, 2014). In the 1950s, the reduction of small food stores in urban settings in favor of the establishment of larger supermarkets in the suburbs created a void of food availability in many urban settings (Mead, 2008). The USDA has used the term *food deserts* to define census tracts that meet low income and low access thresholds, areas without ready access to fresh, healthy, and affordable food. USDA's Economic Research Service estimates that 23.5 million people in the US live in food deserts. More than half of those people (13.5 million) are low income, and 11.2 million live in urban areas (USDA Agricultural Marketing Service, 2014).

A study by Morland et al, examining the distribution of food stores and food service places by neighborhood wealth and racial segregation, found that poor and minority communities did not have equal access to healthy food choices available to nonminority and wealthy communities. Common food retailers in inner cities are gas

stations, convenience stores, and liquor stores, which do not offer adequate choices of fruits and vegetables and other healthy food items. In addition to lack of supermarkets, urban dwellers pay 3-37% more for groceries in local stores compared to suburban residents who shop at supermarkets due to the higher costs of food. (Morland, Wing, Roux, & Poole, 2002)

These environmental and socioeconomic challenges of access to fruits and vegetables are the main reasons that people of color in the U.S. consume less fruits and vegetables (Dubowitz et al., 2008). When adjusted for socioeconomic status, people of color do not necessarily consume less fruits and vegetables. BRFSS data shows that consumption by race/ethnicity varies by the type of produce (CDC Morbidity and Mortality Report, 2010). For example, in the period 2000-2009, Hispanics had the highest prevalence of consuming fruit two or more times per day (37.2%) but the lowest prevalence of consuming vegetables three or more times per day (19.7%) (CDC Morbidity and Mortality Report, 2010).

Furthermore, nationally low rates of fruit and vegetable consumption across age groups along with the pervasiveness of processed food creates a cultural atmosphere of devaluation and devaluing of fruit and vegetables. Thus it is no surprise that the majority of older adults in the U.S. have not met national targets of fruits and vegetables.

3.5 Mobile Produce Markets in the Social-Ecological Model

Mobile produce markets (MPM) intervene at the environmental level by providing an alternative retail source of fresh fruits and vegetables. In addition, the mobile nature of the market allows the potential to bring produce closer to many residences in urban neighborhoods, making it more convenient to access and consume

fruits and vegetables, particularly for older adults with limited mobility. MPM also have the potential to intervene in personal, social, and political levels. MPM can increase customers' nutrition knowledge, create a space to socialize with vendors and other customers and to network with community organizations, and act as a provider of federal food access programs such as Supplemental Nutrition Assistance Program and Senior Farmers Market Nutrition Program.

Study 2 of our current research aims to examine factors that may influence customers of a MPM to access fruits and vegetables by examining Go Fresh customer demographic profiles, and how personal characteristics might influence their purchasing habits. Age, gender, race/ethnicity, and whether living alone or with others are personal variables that are evaluated to determine the amount of money spent at Go Fresh, distance travelled to Go Fresh, shopping frequency at Go Fresh, and the use of SNAP benefits. Understanding the distance customers traveled to Go Fresh provides clues about environmental influences as to whether close proximity of the market to residences or work sites facilitated shopping at Go Fresh. Examining customer feedback about aspects of the market that they like or would like to see changed, such as location, safety, hours, and cost help to describe the types of influence on their shopping at Go Fresh. Overall, assessing Go Fresh customers and shopping habits at the market, in particular among older adults, adds to the Social-Ecological Model for describing factors that influence fruit and vegetable access among older adults in low-income, urban neighborhoods.

CHAPTER 4

THE LOCAL FOOD MOVEMENT

4.1 Introduction

The problem of inadequate access to fruit and vegetables, due to limited availability and high cost, has been the focus of states' strategies to improve fruit and vegetable consumption (CDC Strategies, 2011). Locally produced food sales, totaling 4.8 billion in 2008 and representing 1.6% of the US market for agricultural products, is a growing trend (Johnson, Aussenberg, & Cowan, 2013). Increasing direct marketing from farmer to consumer through support for farmers markets, community supported agriculture (CSA), and farm-to-school programs has increased access to fresh fruits and vegetables while strengthening the local farm economy. Mobile produce markets often collaborate with local farmers to sell locally grown fruits and vegetables. Other local food endeavors such as community gardens, school gardens, urban rooftop farms and gardens, food hubs, and community kitchens have also worked to increase access and consumption of fruits and vegetables (Johnson et al, 2013; CDC Strategies, 2011).

The local food movement in Massachusetts has gained momentum in the past several years. Although the U.S. observed a national decline in Agriculture from 2007 to 2012, Massachusetts was one of the few states that experienced a 1% growth in both number of farms and acres in farmland. Massachusetts ranks 5th in the country for direct market sales, and 6th in the country for number of farms with Community Supported Agriculture (CSA) with a 95% increase since 2007. (Energy and Environmental Affairs, 2015)

4.2 Strategies to Increase Local Food Sales

4.2.1 Farmers Markets

Farmers markets offer a venue for farmers to directly market fresh farm products to customers without large overhead costs associated with brick and mortar stores. The number of farmers markets in the US has dramatically increased in the past 10 years. The USDA's National Directory of Farmers Markets listed 1,755 farmers markets in 1994 and a steady rise to 8,268 markets in 2014, which is more than 450% increase over the 10-year period (USDA Agricultural Marketing Service, National Count, 2014). The USDA's 2014 Farmers Market Directory lists 306 farmers markets in Massachusetts, having the 6th highest number in the country (USDA Agricultural Marketing Service, Local Food Directories, 2015).

4.2.2 Community Supported Agriculture (CSA)

CSAs have been a popular and growing means of direct farm marketing for the past 20 years. Approximately 6% of farms in Massachusetts in 2014 participate in a CSA distribution, ranking it highest in the country (Keough, 2014). Participation in a CSA usually involves individuals or families purchasing a farm "share" for a season of farm products. Shareholders usually pay for the season up-front at the beginning of the season as a show of investment in the farm operation, and pick up their *farm share* once a week either at the farm or some other distribution site. There is an element of shared risk in a CSA model, with the shareholders paying up front and sharing the burdens of unanticipated crop failures.

4.2.3 Mobile Produce Markets

Mobile Produce Markets (MPM), essentially farmers markets on wheels, have also increased in popularity across the country within the past 10 years as a strategy to increase availability and access to fruits and vegetables, especially in food desert areas. Unlike farmers markets or retail stores, MPM have the advantage of covering a larger area(Widener, Metcalf, & Bar-Yam, 2012; Widener et al., 2013).

Approximately 40 new MPM have started operating in recent years (Zepeda and Reznickova, 2013), including five in Massachusetts in the last 6 years. The MPMs in Massachusetts sell locally grown fruits and vegetables from approximately June to late October, and travel to various locations throughout the week in the city they serve.

4.2.4 Nutrition Assistance Programs

Federal nutrition assistance programs such Supplemental Nutrition Assistance Program (SNAP) and Seniors Farmers Market Nutrition Program (SFMNP) have improved affordability of fruits and vegetables. Many farmers markets and MPMs now accept SNAP benefits, processing EBT cards, and 19 states now authorize farmers to accept Special Supplemental Nutrition Program for Women Infants and Children (WIC) Cash Value Vouchers (CDC State Indicator Report, 2013). In addition, the SFMNP has been implemented in all 52 states, granting coupons to low-income adults older than 60 years for purchasing fruits and vegetables from farmers markets, roadside stands, and CSAs (USDA Food and Nutrition Service, 2015). SFMNP benefits are provided to eligible recipients for use during the harvest season, which is generally May through October in Massachusetts.

A study looking at SNAP use in Boston farmers markets found that Boston markets captured 0.10% of local SNAP dollars, which is ten times the national SNAP farmers market redemption level, and contributed an average of \$556 in vendor sales per market (Obadia, 2010). In a study that investigated whether financial incentives at farmers markets facilitated increased consumption of fruits and vegetables, researchers found that increased vegetable consumption was significant among those with low levels of education (i.e., no high school diploma or GED) and those who consumed low amounts of fruits and vegetables at baseline (consuming fruits and vegetables less than 2 times a day) (Dimitri, Oberholtzer, Zive, & Sandolo, 2015). Therefore, the use of nutrition assistance programs has allowed farmers markets to impact more people in need.

4.3 Benefits to Consumers, Farmers, and Community

Through increased participation in local food systems, consumers benefit from cost savings and increased nutrition and health outcomes. Research in Massachusetts indicates that members of CSAs save 60 to 150% of the price of retail organic produce through their participation (Cooley & Lass, 1998). Many studies indicate that increased availability and access to healthy food in one's local food environment positively impacts dietary outcome (Caspi et al., 2012). Strong local food economies play an important role in disease prevention, with research showing that areas with greater levels of direct farm sales are associated with lower incidence of obesity, diabetes, and mortality (Ahern, Brown, & Dukas, 2011; Salois, 2012). Furthermore, although locally produced food is not necessarily higher in nutritional content compared to non-locally-produced food, research suggests that the nutritional quality of fruits and vegetables is highest right after

harvest and then declines with time, giving locally procured food a slight nutritional advantage (Edwards-Jones, 2010; Favell, 1998).

Increasing local food availability and accessibility also has many benefits to farmers. A national study of 15 food supply chains found that producers received a much greater share of retail prices in local food supply chains, up to more than 7 times the net revenue compared to mainstream chains (King, Hand, DiGiacomo, Clancy, Gomez, Hardesty, Lev, & McLaughlin, 2010). Small-scale farmers are particularly attracted to farmers markets as a low cost way of entering the marketplace (Phillips, 2007) and spreading the word about their operations (Kinney, Lindahl, Creahan, & Richey, 2010). Research on CSAs found them to be business incubators for new growers, and that CSAs helped to expand and diversify farmer operations and livelihoods, prepared farmers for off-farm careers in sustainable agriculture, and increased farmers' knowledge, skill, and confidence in farming and marketing (Bregendahl, 2012).

By strengthening local food systems, communities benefit from a more vital local economy and strong organizational networks facilitating improved public health. An income and job impact analysis in Michigan estimated that almost 2000 jobs and \$200 million in income would be generated from a scenario in which residents meet USDA fruit and vegetable consumption guidelines by eating more seasonally available Michigan-grown fresh produce (Connor, Knudson, Hamm, & Peterson, 2008). Farmers markets are key catalysts in building local and regional food systems because they make local food visible in public spaces on a regular basis and they encourage enterprise diversification and business incubation (Dunning, 2013; Gillespie, Duncan, Hilchey, Hinrichs, & Feenstra, 2007). Farmers markets and CSAs increase the density of healthy

food outlets and improve local food environments (Bader et al., 2010). The Centers for Disease Control uses the supply of local foods (measured by direct farm sales) and the existence of food policy councils as indicators of healthier food environments, revealing the importance placed on local food systems (Dunning, 2013).

4.4 Market Viability

The question of what makes a market viable and sustainable is an important one to consider when working to establish a market and improve a local food network. Having sufficient sales is often considered the most important criteria in a successful market. In a Tufts University study investigating the characteristics that influence sales among Massachusetts's farmers' markets, interviews found that farmers need to make \$250 in net sales each day to be profitable (Obadia, 2010). The study also found that the factors with the greatest influence on sales were the years of experience of a market manager, the manager's age, and the volume of customers. Volume of customers and years of manager experience were positive associated with vendor sales, while increased manager's age was negatively associated.

Customer satisfaction is another indicator of a successful market, which would logically affect customer volume and sales, consumer diets, and health outcome. The few studies investigating the use of MPMs show that nutrition education through the offerings of nutrition counseling, taste samples, recipes, and cooking demonstrations, was important for the overall satisfaction of customers and encouraged use of MPMs (AbuSabha, Namjoshi, & Klein, 2011; Hu, Acosta, McDaniel, & Gittelsohn, 2013; Zepeda et al., 2014).

Research has explored challenges to participation in farmers markets among customers and farmers. The time and staff needed to sell at farmers markets (Tessman and Fisher, 2009) and weather (Oberholtzer and Grow, 2003; Griffin and Frongillo, 2003) were found to be barriers to farmer participation. Consumer perceptions of high price (Briggs, Fisher, Lott, Miller, & Tessman, 2010; Colasanti, Conner, Smalley, 2010; Zepeda, 2009), and limited hours of operation (Tessman and Fisher, 2009; Oberholtzer and Grow, 2003; Griffin and Frongillo, 2003) were important factors deterring customers. Furthermore, with increased number of farmers markets, increased competition for customers is a challenge influencing the success of many markets (Lohr, Diamond, Dicken, & Marquardt, 2011; Stephenson, Lev, & Brewster, 2008). (Obadia, 2010)

4.5 Summary and Future Research

Many local food distribution systems have been established in Massachusetts, including farmers markets, CSAs, and mobile produce markets. These markets increase availability and access of fruits and vegetables by facilitating direct farmer-consumer sales, by bringing produce closer to urban residences, and through financial incentives. In particular, many low-income urban dwellers have the potential to greatly benefit from these markets. Yet, we know little about what motivates farmers to participate in these markets, their experiences with the markets, and their perceptions on the viability of these markets. **Study 3** of our research aims to capture the farmers' perspective in order to contribute to the discussion about how to increase access and consumption of local fruits and vegetables in low-income, urban food deserts through a view of the local food system.

CHAPTER 5

MOBILE MARKETS LITERATURE REVIEW

5.1 Introduction

Mobile food marketing is a common enterprise worldwide and its practice has been popular in the history of rural and urban centers in the United States. Although occupying a role in the food environment, mobile markets have received little attention in food environment and public health research. Mobile produce markets, or small, portable fruit and vegetable vending, present a promising strategy for increasing healthful food access to communities of need, but there is a scarcity of research to document the contribution.

We found 16 articles published from 2010 to 2015 that present observational and intervention studies on the characteristics and contribution of mobile food vending, all in the U.S. except for one in the U.K. A few more articles capture historical perspectives and policy issues pertaining to mobile food vending. In addition, program evaluations provide valuable information about organizational operations of mobile markets. This section summarizes the history and background of mobile food vending in the U.S. and presents two distinct mobile food market constructs and the concept of the Mobile Produce Market (MPM). In addition, we review the research and current literature on mobile food markets, explore the gaps in literature, and provide direction for future research.

5.2 Advantages of Mobile Food Markets for Increasing Food Access

Several characteristics of mobile food markets make them an ideal venue for increasing food access. Without the high overhead costs involved in marketing from

stationary store buildings, food vending from mobile structures such as push carts and trucks has the advantage of only needing small structural investments and little business starting costs. This allows for individuals and families who don't have a lot of capital and social mobility to be able to own and manage a mobile marketing business, and likewise enables local community organizations to initiate healthy food market interventions without huge financial burden.

Unlike a typical grocery store, a mobile food market typically sells a small range of products, allowing for specialization of niche food items that may include healthy food items such as fresh fruits and vegetables. Mobile markets also have the advantage of covering a larger area compared to farmers markets or retail stores, with the ability to travel to food desert areas to increase food availability.

5.3 Comparison of Mobile Produce Markets and Farmers Markets

Mobile Produce Markets (MPM) are essentially mobile farmers markets that sell fresh fruits and vegetables. Similar to farmers markets, MPM are alternative markets that do not rely on a brick and mortar infrastructure, and that provide fresh, seasonal produce with the benefit of connecting directly with local farms and farmers. Similar to farmers markets, MPM often accepts Electronic Bank Transfer (EBT) cards, Women Infant and Children (WIC) vouchers, and Senior Farmers Market Coupons (Zepeda et al., 2014).

In addition to the mobility and travelling range of MPM, there are other major differences between farmers markets and MPM (see Table 2.1). MPM tend to operate as a single vendor, while farmers markets include multiple vendors. The USDA defines farmers market as “two or more farmer-producers that sell their own agricultural products directly to the general public at a fixed location” (United States Department of

Agriculture, 2016) Farmers markets typically have farmers selling directly to customers. But MPM usually involve a middle party, such as an organization or individual vendor who is often not the producer, to sell to customers. Also, farmers markets tend to target the general public, while MPM usually have a distinct target population of low-income people with limited access to local produce and with limited mobility (The National Mobile Market, 2014). MPM particularly appeal to older adults with limited mobility (AbuSabha et al., 2011; Zepeda et al., 2014), because MPM bring food closer to home.

Table 5.1: Comparison of Mobile Produce Markets and Farmers Markets

	Mobile Produce Markets	Farmers Markets
Products for sale	Mainly fruits and vegetables, sometimes other grocery items	Fruits and vegetables and other local farm products
Location	Travels to several locations in a city or neighborhood, usually areas without other produce markets nearby	Set up at one central location; not necessarily a place without other produce markets nearby
Timing	Seasonal; usually stays at each stop for 1-2 hours	Seasonal; usually open for 3+ hours
Size	One vending unit	Multiple vendors/ stalls
Vendors	Individual or organizational middle party; sometimes farmers/producers	Usually farmers/producers
Target customers	Food deserts; Low income people with limited mobility and access; older adults	General public
Nutrition incentives	Usually accepts EBT, WIC, Farmers Market Coupons	Usually accepts EBT, WIC, Farmers Market Coupons

5.4 Comparison of Two Mobile Food Market Constructs—Individual/Familial

Mobile Food Vending and Organizational Mobile Food Vending

An exploration of the history of mobile food vending in the United States reveals different characteristics of vending. Below are two distinct models of mobile food

markets-- Individual/Familial Mobile Food Vending and Organizational Mobile Food Vending. Table 2.2 compares characteristics of the two mobile market constructs.

The Individual/Familial Mobile Food Market model is an individual/family owned business that sells food from a mobile structure like horse and buggy, pushcart, or truck, or a small impermanent structure like a farm stand that can easily be assembled and disassembled. Typically each vendor specializes in a few products, but there is a large range of food types sold from vendor to vendor, including prepared foods such as hot dogs and tacos, ice cream, and non-processed food items such as whole fruits and vegetables. Historically, the purpose of this vending model has been more about generating income than to provide healthy food to populations in need.

Some cities in the United States have appropriated this vendor model to improve healthful food access. Tester and colleagues found “healthy vending policies” in New York, Chicago, San Francisco, and Kansas City, allocating mobile vendor permits in food-deprived areas and providing incentives to mobile food vendors who sell healthful food (Tester, Stevens, Yen, & Laraia, 2010). For example, in 2008, the NYC Department of Health and Mental Hygiene established 1000 permits to increase produce sales in areas of low reported rates of fruit and vegetable consumption, specifically East and Central Harlem, South Bronx, North and Central Brooklyn, and portions of Queens and Staten Island(Li, Cromley, Fox, & Horowitz, 2014).

On the other hand, the Organizational Mobile Food Vending model is typically a social service strategy to improve food access to underserved communities or to communities in need, and these mobile markets intentionally stock “healthy food” items such as fruits and vegetables and staple food items like grain and milk. This model often

emphasizes the delivery of local, seasonal farm products, and involves collaboration between local farmers, community members, local organizations, state and federal programming. It also tends to be less profit-driven and is often supported by private grants.

Table 5.2: Comparison of Mobile Food Vending Constructs

	Mobile Food Vending Constructs	
	Individual/Familial Mobile Food Vending	Organizational Mobile Food Vending
Purpose/Intention	Individual income/Family business	Social service; increase food access; improve public health
Type of food	Prepared and non-prepared food; variety of food types such as fruits and vegetables, nuts, hot dogs, tacos, pretzels, ice cream, etc.	“Healthy food”; non-prepared food items; fruits and vegetables; basic staple foods; usually stocks local food
Vendor Employment	Self-employed	Employed by organization
Funding	Individual business investment	Supported by grants and organizational fundraising efforts
Financial incentives offered	Sometimes SNAP	SNAP, WIC, Farmers Market Coupons, discounts and matching funds for low-income
Management	Individual/Family	Collaboration between community organizations, farmers, state and federal programming
Examples	Green Carts in NYC; mobile street vendors in the Bronx; pushcarts in the <i>Colonias</i> , TX; gourmet food trucks in Chicago; <i>fruterros</i> in Los Angeles and Oakland	GANE Mobile (1976, Nevada), People’s Grocery (2003, West Oakland, CA), Go Fresh (2010-current, Springfield, MA)

5.5 History and Background of Individual/Familial Mobile Food Vending

Historical documentation of Individual/Familial Mobile Food Vending mostly focuses on three main areas: the historical ties to immigrants, policies and legal issues controlling street food vendors, and food sanitation and hygiene issues.

5.5.1 Historical Ties to Immigrants

The ability for individuals and families to make a living through a small mobile food vending enterprise has especially appealed to immigrant communities in the United States (Tester et al., 2010). Low financial overhead, flexibility of hours and locations, support of kinship networks, and having no need for formalized training or education, are qualities of the vending model that have historically attracted immigrant groups (Morales & Kettles, 2009; Rosales, 2013).

Tester et al. (2010) reports that historical records from New York City indicate street vendors having a ubiquitous presence in the late 1690s and that were banned in 1707 to decrease competition with public markets (Wright, 1992). Street vendors catered to poor, foreign-born residents and the neighborhood pushcart business provided an accessible way to earn a living for those with little English-speaking skills (Taylor, Fishell, & Derstine, 2000). Street vending thrived in New York City in the 1880s through the 1920s but was almost completely abolished in the 1930s when the city created more enclosed market buildings in an attempt to “tidy up the streets (Bluestone, 1992). In the 1920s, the bulk of fruit and vegetable pushcart vendors in New York City were Jewish (63%) and Italian immigrants (32%) (French, 1992). (Tester et al., 2010)

In a recent article on fruit vendors in Los Angeles, also known as *fruteros*, Rosales points out that immigrant street vending has been an important coping

mechanism for short-term survival of new immigrants since the 1980s (Rosales, 2013). The history of *fruteros* traces to a migrant who worked as a fruit vendor in the Mexico state of Puebla before moving to LA, whose business model was emulated by many Mexicans (Waldinger, 1994). These *fruteros* make up a Mexican immigrant enclave in LA, and over 1,000 *fruteros* were estimated to operate in 2013 in Los Angeles County (Rosales, 2013).

5.5.2 Policy and Legal Issues

While there are numerous fruit vendors in Los Angeles streets, they are plagued by restrictive city ordinances that prohibit them from selling on public sidewalks and without a valid County Business License, among other restrictions, that create instability in their business (Morales & Kettles, 2009; Rosales, 2013). Rosales notes that government crackdown on undocumented immigrants have destroyed and demoralized many pushcart businesses, contributing to perceptions of their business as risky and inferior, and perpetuating poverty and marginalization among *fruteros*. Thus, fruit vending in LA has had limited financial gains and has not been a route to long-term financial stability and upward mobility (Rosales, 2013).

In another article, Martin writes about how small immigrant-centered mobile vending businesses in Chicago have comingled and collided with the emergence of mobile food truck entrepreneurs (Martin, 2014). She speaks to the differential valuation of gourmet food trucks in Chicago compared to immigrant street vendors. For many years, immigrant street vendors unsuccessfully tried to unionize and change laws that prohibited sales of prepared foods and tightly controlled the time and location of any street carts. In

contrast, within two years, new food truck entrepreneurs gained permission to operate in many locations selling prepared foods(Martin, 2014).

Martin brings up the often-neglected conversation about how racism and cultural stereotypes dictate policy to support urban planning and food systems in ways that have undermined the voices and creative efforts of immigrants and other people of color (Martin, 2014). To counteract discrimination, continued discourse on the social, cultural, and economic value of small scale Individual/Familial Mobile Food Vending is critical.

Morales and Kettles write about street vendors as cornerstones to community health by providing employment, by ameliorating class-related food/health problems through increased food access, as venues for socializing, encouraging healthy eating and physical activity, and as means to establish closer relationships with farmers and producers and to support the preservation of farmland and the economic viability of farms(Morales & Kettles, 2009). They emphasize the need for the law to protect and support street vending. For example, comparing street vending laws in Portland, New York City, and Los Angeles, Portland's laws are relatively relaxed, resulting in a vibrant street food scene that contributes to an enhanced quality of life. In Portland, street vendors are allowed to sell from the sidewalks of any area zoned commercial as long as permission is granted from the neighboring property owner. In New York City, the total number of vending permits is limited to 3,000 and vendors are restricted to certain streets. In Los Angeles, sidewalk vending is prohibited altogether and punishable by up to six months in jail and a \$1,000 dollar fine. (Morales & Kettles, 2009)

5.5.3 Food Safety and Hygiene

There has been extensive research on the topic of food safety and mobile food vending in the U.S. and worldwide, mostly focusing on microbiological hazards and concerns. (Aluko, Ojeremi, Olaleke, & Ajidagba, 2014; Samapundo, Climat, Xhaferi, & Devlieghere, 2015; Sharma & Mazumdar, 2014; Simforian, Nonga, & Ndabikunze, 2015)

In the U.S., inadequate food safety and hygiene have convinced policy makers to curb street food businesses (Rosales, 2013; Tester et al., 2010). In a pilot study of food safety practices among 10 mobile food vendors selling prepared food in Manhattan, NY, researchers found that 67% of vendors contacted served food with bare hands, many vendors used dirty hands and gloves, all vendors during the observational period neglected to wash hands, 40% of vendors contaminated served foods with uncooked meat or poultry, and the majority of vendors handled and stored cooked meats at unsafe temperatures (Burt, Volel, & Finkel, 2003). These findings demonstrate that food safety and hygiene are important issues to consider in the growth and development of mobile food vending, and proper attention is needed to find solutions rather than abolishing street vending altogether.

5.6 History and Background of Organizational Mobile Food Vending

Historical documentation of the Organizational Mobile Food Vending model is scarce and traces back to the 1970s. An article by Montoya and Jensen (1976) describes two of these mobile markets-- the GANE (Groceries and Nutrition Education) Mobile and a Boston mobile market (Montoya & Jensen, 1976).

The GANE Mobile was operated by Nevada's Inter-Tribal Council (ITC) and travelled to ten small remote Native American Indian reservations in Nevada twice a

month. The ITC refitted a used 40-foot trailer into a well-stocked store that supplied 800 food items. Food prices reflected Reno supermarket prices but with very little markup on fruits and vegetables and foods that diabetics and others on special diets require.

Additional benefits included acceptance of food stamps, nutritional advice from the presence of “nutrition aids,” and educational materials provided. To support the local economy, the GANE Mobile also planned to procure food from local sources, such as vegetables grown on the Moapa Reservation and a meat packing plant on the Walker Reservation. (Montoya & Jensen, 1976)

The second mobile market from 1976 described by Montoya and Jensen was a Boston mobile market serving senior citizens over 60 years old. This small grocery store was converted from a 31-foot bookmobile van and supplied 300 supermarket-priced food items, including soups, cereals, canned goods, fresh milk, meat, fruits, vegetables, and a freezer unit of TV dinners, frozen juice, and ice cream. There were weekly stops at 30 locations in Boston, focusing on low-income areas with high senior-residence density, serving approximately 500 seniors. Along with accepting food stamps, the employees of the van paid special attention to the needs of seniors, such as helping customers with failing eyesight and mobility limitations. A variety of organizations were involved in the operation, such as the Department of Parks which paid gas and garage expenses for the van, and the Boston Housing Authority which provided a security guard, responding to older adults’ fears of getting robbed. (Montoya & Jensen, 1976)

The outcome and longevity of these early mobile markets is still a mystery, and no other information was found about the existence of this type of mobile market from the 1970s to 2003. In 2003, the People’s Grocery in West Oakland, CA spearheaded the

resurgence of the mobile market movement(Zepeda et al., 2014). They created a mobile market as a response to grocery store needs while lacking the funding for a brick and mortar store. It was a renovated postal truck that brought mixed food items at affordable prices to low-income residents (Windmoeller, 2012).

Organizational Mobile Food Vending has often been an integral strategy within a larger food justice movement with simultaneous promotion of other projects. For example, the People’s Grocery also piloted the Grub Box and Wholesale Hookup, two other programs to increase food access to West Oakland residents. In 2010, they initiated the process of establishing a for-profit grocery, People’s Community Market, specifically catering to the needs of the West Oakland community (People's Grocery, not dated).

Since the opening of the People’s Grocery market, many more mobile markets have emerged across the country, most of them exclusively selling fruits and vegetables, and offering financial incentives such as the acceptance of SNAP benefits, Senior Farmers Market Coupons, WIC coupons, and other discounts.

5.7 Mobile Produce Markets (MPM)

Examples of the Individual/Familial and Organizational models of food vending show that mobile food vending has historically spanned the sales of a variety of food types, including both healthy and unhealthy food, prepared and non-prepared food. Since fruits and vegetables are the focus of many nutrition interventions, we developed a distinct category of mobile food vending with the concept of Mobile Produce Markets (MPM). MPMs are essentially portable, single unit farmers markets that sell predominantly fresh fruits and vegetables. Creating a distinct MPM label allows us to examine the specific contribution of healthy mobile food vending to food environments.

MPMs exist within both Individual/Familial and Organizational Food Vending models. Individual models include the popular fruit vendors, known as *fruteros*, in Los Angeles and Oakland, and city-sponsored Green Carts in New York City. Vehicles for Individual models of MPM are often push carts or similar small mobile structures. Organizational models of MPMs are typically managed by local organizations that network with local farmers to procure fruits and vegetables and hire marketing staff to drive the market vehicle and sell the produce. Vehicles of organizational models of MPM are usually a retrofitted truck, bus, or other large vehicle. The market usually offers financial incentives like the use of EBT, farmer's market vouchers, and discounted prices. These models are intentionally used as a strategy to improve a community's health. Approximately 40 new organizational models of MPM have started operating in recent years (Zepeda and Reznickova, 2013), although the exact total number currently in operation in the U.S. is uncertain. A few examples of MPM are described below to reflect a variety of operations.

5.7.1 Green Carts, New York City, NY

The Green Carts in New York City are examples of Individual/Familial Mobile Food Vending that fall under the category of MPM. In 2008, the NYC Mayor's Office established 1000 permits to increase produce access in areas of low reported rates of fruit and vegetable consumption, specifically East and Central Harlem, South Bronx, North and Central Brooklyn, and portions of Queens and Staten Island (Fuchs, Holloway, Bayer, & Feathers, 2014; Li et al., 2014). The program hoped to improve health outcomes of target residents and to provide entrepreneurial opportunities to vendors (Fuchs et al., 2014). Unlike most Individual models of MPM, Green Cart vendors

receive city and non-governmental support. NYC's Department of Health and Mental Hygiene (DOHMH) has designated staff to support Green Cart vendors (Fuchs et al., 2014). Vendors also receive start-up and ongoing operational assistance from Karp Resources, which is supported by Illumination Fund, a source of private funding (Fuchs et al., 2014). Although 1000 permits have been issued, an evaluation of Green Carts only found 166 in operation (Fuchs et al., 2014).

5.7.2 The Nashville Mobile Market, Nashville, TN

The Nashville Mobile Market was created by a Vanderbilt medical student in 2009, launched in 2011, and in 2014 became a program of Community Food Advocates, a non-profit organization in Nashville. Its aim has been to provide healthy food access to South, East, and North Nashville communities that had been identified as food deserts. Although primarily a produce market, this MPM also offers staple foods. In addition, it offers cooking classes and other educational activities. The market has successfully grown, and in 2015, it operated a route schedule of 57 stops at 31 partner agencies. (Community Food Advocates, not dated)

The National Mobile Market, a non-profit organization based out of Nashville, TN, grew out of the Nashville Mobile Market and was created in 2012 to provide fiscal, logistical, and structural support for community organizations throughout the country interested in creating a mobile market (The National Mobile Market, 2014). From their website, one can obtain a manual with details about how to set up a mobile market and even structural plans for the vehicle. The National Mobile Market has found that barriers to healthy eating vary considerably between communities in food desert areas, and

emphasize the need for mobile markets to be community-based and tailored to meet localized issues of food access inequality(Langelier, Chiang, & Anderson, non dated).

5.7.3 Garden on the Go, Marion County, Indiana

Indiana University Health launched Garden on the Go in 2011 as part of a comprehensive obesity prevention strategy to increase fruit and vegetable access to underserved communities in Marion County. They implemented a partnership with a private company, Green Bean Delivery, to purchase, deliver, and sell produce. In 2015 they operated 5 days a week, through the winter, and made 15 stops to community partner locations familiar to local residents, staying for 1-1 ½ hours at each stop. While the produce travels in a box truck, they set up indoors at each of their stops. Produce is mostly procured locally, though non-local produce also supplements their supply, especially in the winter. (Indiana University Health, 2016; Lewis & Zollinger, 2012)

5.7.4 Veggie Mobile, Capital Region, NY

The Veggie Mobile was launched in 2007 by the Capital District Community Gardens in Troy, NY. The Veggie Mobile transports fresh produce to low-income neighborhoods in New York State's Capital Region, offering 50-75 varieties of seasonal fruits and vegetables, and selling fruits and vegetables at wholesale cost, on average 48% lower than local supermarket prices (AbuSabha et al., 2011).

The main market vehicle is a box truck that runs on biodiesel fuel and that has solar panels to power the market's refrigerators. They also use a second vehicle called the Veggie Mobile Sprout, which is a smaller retrofitted utility vehicle. "Taste and Take" is a signature experience of the Veggie Mobile, offering taste samples of recipes and a take-home bag of the recipe and ingredients to try making at home. Unlike many seasonal

MPM operations, the Veggie Mobile operates year round. In 2015 it ran 6 days a week and visited more than 30 locations including health centers, childcare centers, senior and low-income housing facilities. Similar to an ice cream truck, they even play music on arrival (Capital Roots, Veggie Mobile, not dated).

Capital Roots, the organization managing the Veggie Mobile, has also developed a Virtual Veggie Mobile. This is an online marketplace of local farm products from ten New York State counties. Wholesale customers like schools, hospitals, restaurants and stores, as well as individual customers can conveniently place an online order and then pick up the order at designated locations. (Capital Roots, Virtual Veggie Mobile, not dated)

5.7.5 Mobile Produce Markets in Massachusetts

In Massachusetts, five MPMs have emerged in the last 6 years. All of these mobile markets sell locally grown fruits and vegetables from approximately June to late October, and travel to various locations throughout the week in the city they serve. Worcester's Regional Environmental Council (REC)'s Mobile Market was the first of these in Massachusetts, launched in 2008, and in 2015 the market reached over 8,000 customers in Worcester (Regional Environmental Council, 2016). The Somerville Mobile Farmers Market in Somerville (Andrews, 2014), the Go Fresh mobile market in Springfield (Live Well Springfield, not dated), the Mill City Grows Mobile Farmer's Market in Lowell (Mill City Grows, not dated), and the Fresh Truck in Boston (Fresh Truck, 2015) soon followed suit. The Somerville Mobile Farmers Market also has a companion Somerville Winter Mobile Market, although the winter market operates out of a single indoor location rather than having a mobile vehicle that transports produce to

multiple locations (Marina, Blum, & Bettisworth, 2014). All of these mobile markets in Massachusetts are managed by local non-profit organizations and accept EBT and SNAP, WIC, and Senior Farmers Market Coupons.

The Go Fresh market in Springfield was piloted in 2011 and 2012 by Enterprise Farm, a local farm in Whately, MA. Market management has since changed hands and in 2015 is managed by multiple organizations in Springfield and is considered a project of Live Well Springfield and Mass in Motion. The market vehicle started as a converted old military transport bus, and in 2015 switched to a remodeled public transit minibus. In 2015, Go Fresh sold affordable local produce four days a week to 11 locations total throughout Springfield July to October. In 2014 and 2015 seasons, Elder Services provided funding to subsidize the cost of produce, allowing produce to be sold at 50% off for all EBT card users.

5.8 Mobile Market Research Methods

The majority of mobile market research is cross sectional, with only four longitudinal studies identified. All four longitudinal studies investigate the effects of a MPM intervention. Quantitative methods are most common in overall mobile market research and include methods such as surveying vendors, customers, and residents, counting the number of vendors in an area, observing the types of food offered, and quantifying transactions. Qualitative methods are rarely used, with only one study implementing focus group interviews and two studies using brief vendor interviews along with a survey.

5.8.1 Research Methods for Longitudinal Studies of Peer Review Articles

AbuSabha and colleagues studied whether participation of The Veggie Mobile, a MPM in Troy, NY increased fruit and vegetable intake among seniors aged 55 and older (AbuSabha et al., 2011). The study was conducted at two low-income senior housing sites-- one in Troy and one in Albany-- both new destinations of The Veggie Mobile. Surveys were conducted at the early stage of intervention for baseline data, and results were compared to survey responses at 3 to 5 months. A modified six-item questionnaire based on the Behavioral Risk Factor Surveillance System (BRFSS) was used to determine fruit and vegetable intake. Also included in the survey were questions about frequency of visits to the supermarkets and amount of money spent there, frequency of visits to the mobile market and amount of money spent there, and satisfaction with the services. Prior to the main intervention study, focus groups were conducted at two senior centers already visited by The Veggie Mobile, asking questions that examined what shoppers liked most about the program, benefits of participating, perceived economic savings, impact of the program on fruit and vegetable consumption, and suggestions for improvement. This information guided the development of survey questions. (AbuSabha et al., 2011)

Another longitudinal study investigated whether a once a week fruit and vegetable stand placed in two underserved urban communities in East Austin, Texas increased fruit and vegetable consumption among residents living within a walkable ½ mile radius of the farm stand (Evans et al., 2012). Researchers approached all houses within a 1/2 mile radius of farm stands to recruit participants, and administered pre- questionnaires before the introduction of the two farm stands and post- intervention questionnaires about 2

months after introduction of the farm stands. The study questionnaire assessed fruit and vegetable intake, awareness and use of farmers' markets/farm stands, attitudes and behaviors related to eating fruits and vegetables, and demographics. Usual fruit and vegetable intake was measured using a short screener based on the 7-item NCI screener, adapted for Latinos. (Evans et al., 2012)

The third longitudinal study aimed to evaluate the effectiveness of The Mobile Food Store, an intervention to increase access to fruits and vegetables in a targeted population in the U.K. (Jennings et al., 2012). Researchers used pre- and post-questionnaires among customers ≥ 16 years old to assess demographics, employment status, weight, usual fruit and vegetable intake, factors affecting use of the market, and perceived benefits of the intervention. Fruit and vegetable intake was measured using a two-item measure (one item for fruit and one item for vegetables) previously validated for those eating less than five portions of fruit and vegetables a day. (Jennings et al., 2012)

In the fourth longitudinal study, Tester and colleagues investigated the impact of introducing a *frutero*, a healthful MPM and Individual/Familial Mobile Food Vending model, outside the entrance of an elementary school campus (Tester, Yen, & Laraia, 2012). In their 19 days of field research (5 baseline days, 14 intervention days), they counted consumers at the *frutero* and at competing vendors within one block of the *frutero*, characterized the race/ethnicity and age of consumers, counted the number of transactions, and characterized the type and cost of each item purchased. (Tester et al., 2012)

5.8.2 Research Methods for Cross-sectional/ Observational Studies of Peer-Review Articles

5.8.2.1 Identifying Vending Types, Locations, and Characteristics of Vendors and Operations

Individual/Familial Mobile Food Vending offers a range of food types, so research on this model of vending attempts to document food types and other characteristics of the operations such as location, hours, and seasons of work.

Tester and colleagues observed the after-school mobile food environment of 6 schools in Oakland, examining the types of food offered and sold by mobile food vendors (Tester, Yen, & Laraia, 2010). These vendors represent Individual/Familial Mobile Food Vending. Researchers recorded 37 hours of observation across 23 days outside 5 elementary and 1 middle school. They documented the number and type of mobile food vendors $\frac{1}{4}$ mile from nine schools, and estimated vending characteristics at 6 schools with regular vendor presence. Around these 6 schools, they estimated consumer demographics, counted the number of transactions and number of items sold, and recorded cost of items per person and cost per transaction. (Tester et al., 2012)

Valdez and colleagues studied characteristics of mobile vendors in the Texas-Mexico border area called the *Colonias* (Valdez, Dean, & Sharkey, 2012). The researchers surveyed a convenient sample of mobile (n=13) and home-based (n=10) food vendors to capture a range of food types sold. The survey included questions about vendor demographics, characteristics of business including food types sold, hours and seasons of vending, income, and effects of weather, as well as perceived relationships

with customers, such as knowledge and connection with customers and perceived importance to customers (Valdez et al., 2012)

Lucan and colleagues piloted a method to assess the nature of mobile food vending in the Bronx (Lucan et al., 2013), in a much larger region than the previously mentioned mobile vending studies. They utilized a mixed method approach of combining direct observations with brief vendor interviews. Investigators traveled in a private vehicle, scanned the streets for mobile vendors during weekday business hours, and approached all mobile vendors who were not in transit. Through direct observations, their cross-sectional assessment tool collected information on the location and time of operations, items sold for each mobile vendor, the presence of licenses or permits, and characteristics of vending location. Short interviews asked how long the businesses had been operating and if weather determines vending (Lucan et al., 2013).

Lucan and colleagues estimated that the study required about 15 person-hours for every square mile area covered, making it labor-intensive research requiring the coordination of multiple teams of data collectors (Lucan et al., 2013). They also indicated many lessons learned and offered strategies to improve efficiency and effectiveness of the research. For example, data entry was tedious and required as much time as 40 consecutive days of data collection, so the authors recommend consideration of hand-held, real-time computerized data collection instruments. To make vendors more comfortable with researchers, they suggested recruiting data collectors from the neighborhoods with appropriate language and cultural familiarity. (Lucan et al., 2013)

To make correlations with neighborhood characteristics, Lucan and colleagues categorized each mobile vendor into one of the following five vending item groups—

fresh produce, ethnic foods, other prepared foods, frozen novelty, and other. Each mobile vehicle was also labeled as “healthier,” “less healthy,” or “mixed” depending on certain criteria for healthfulness (Lucan et al., 2014).

Using the same cross-sectional, mixed method approach, Lucan and colleagues also investigated Green Carts in the Bronx (Lucan, Maroko, Shanker, & Jordan, 2011). Researchers scanned the Bronx streets for Green Carts and used an observational checklist and brief vendor interview guide to identify vending characteristics such as location and permit number, items sold, timing of operations, and additional vending locations. The information was then mapped using ArcGIS and Crimestat III to understand implications for program viability, community nutrition and health in the context of neighborhood characteristics (Lucan et al., 2011).

Another study of Green Carts assessed the food environment around the Green Carts to explore whether they are positioned to reach the intended population (Li et al., 2014). Researchers identified Green Cart locations through a secondary data list of intersections where all NYC Green Carts were expected to be located, obtaining a sample of 265 active Carts. To depict the food environment, researchers gathered information about store and restaurant type from the InfoUSA retail database and Web-based store locator functions. They labeled certain store and restaurant types as “healthy” or “unhealthy,” then validated their measure through store audits in 2 zip codes, where they identified healthy stores as ones selling 4 or more types of fruits and vegetables, and found accuracy in their measure more than 95% of the time. After identifying the number of “healthy” and “unhealthy” stores, researchers used the proportion of healthy stores to total stores to categorized the food environment within $\frac{1}{4}$ mile street network distances

from Green Carts as being food deserts (0 healthy stores), food swamps (≤ 1 in 5 healthy stores), or healthy areas (> 1 in 5 healthy stores). Researchers also identified “candidate” Green Cart sites in census tracts where Carts could have been located but were not, and compared the actual sites to candidate sites (Li et al., 2014).

5.8.2.2 Collecting Consumer Characteristics and Perspectives

Fewer cross sectional studies examined the consumer aspect. Sharkey and colleagues investigated the characteristics and perspectives of consumers who use mobile markets in the *Colonias*, the Texas-Mexico border region (Sharkey, Dean, & Johnson, 2012). They looked at a sample of 610 Mexico-origin women from 44 Colonias who completed The 2009 Colonia Household and Community Food Resource Assessment. This cross-sectional survey collected data on demographics, participation in food and nutrition assistance programs, household food security, mobility, main food store, alternative food sources, and perceptions of community food environment (Sharkey et al., 2012).

Zepeda and colleagues used focus group interviews to understand consumer perspectives on the use and impact of four MPMs in different parts of the country (Zepeda et al., 2014). At each of four sites, researchers conducted one focus group interview with shoppers and one with non-shoppers of the MPM, using a total of 8 focus group interviews. There were approximately 10 participants in each focus group (total $n=82$). Researchers also administered a brief pre-focus group questionnaire to collect information about participant demographics, employment status, chronic disease status, household composition, fruit and vegetable consumption, and shopping habits. Fruit and

vegetable consumption was measured by one question asking about servings consumed in the previous day (Zepeda et al., 2014).

5.8.3 Research Methods for Mobile Produce Market Program Evaluations

Literature on organizational MPMs also exists as white paper program evaluations that assess market impacts and address needed improvements. In these evaluations, impact is often measured by actual or perceived changes in diet, weight, and health, as well as characteristics of consumers or populations reached. Other documented contributions of the markets include number of customers, amount of produce sold, and price comparisons with other local markets. This section describes research methods for three MPM evaluations—Garden on the Go in Indiana, Somerville Winter Mobile Farmers' Market in Somerville, MA, and Green Carts in New York City.

In a 2012 evaluation of Garden on the Go in Indiana, researchers utilized a longitudinal approach (Lewis & Zollinger, 2012). They recruited a total of 120 customers at four of their sites, then gathered data from them at the beginning of market, at mid-point, and 6 months from the baseline data collection. Four different types of information were gathered from participants—1) Dietary and lifestyle behavior, including food consumption, shopping and eating patterns, and exercise and smoking behavior; 2) Health related measures, including weight and height, blood pressure, hemoglobin A1c, and self-reported health status; 3) Program participation measures, including frequency of using the market and types and amounts of food purchased; and 4) Demographic measures, including age, gender, race, household composition, and participation in SNAP. Researchers conducted one-on-one interviews with participants to collect information on demographics, diet and lifestyle behavior, program participation, and self-

reported health. Trained staff measured weight and height and gathered blood specimens to examine health measures (Lewis & Zollinger, 2012).

In a 2014 evaluation of Somerville Winter Mobile Farmers' Market, researchers utilized the Rapid Market Assessment methodology to apply multiple "one day" assessments of market use and customer experience (Marina et al., 2014). Researchers collected a variety of information on the market offerings and operations, customer perceptions, and location, food availability and pricing at the market as well as other markets and food sources in the area. To keep track of market attendance and transactions, researchers counted the number of customers and recorded foods purchased, cost, and method of payment for each transaction. An inventory list kept track of prices and availability of produce at the market. Ethnographic observations captured customer and worker behavior at the market. Dot and other surveys collected customer perceptions. GIS mapping identified the location of food sources around the mobile market. Information about prices, availability of produce, atmosphere and other aspects of markets in the area was collected through market visits using data gathering templates, observations, and interviews with market managers.(Marina et al., 2014)

In a 2014 evaluation of the Green Cart program in New York City, researchers identified Green Cart locations and used survey templates to interview vendors and a sample of customers (Fuchs et al., 2014). To collect an accurate census of operating Green Carts, researchers rode every bus line within the Green Cart licensing zones. Characteristics of vending such as locational characteristics and acceptance of EBT were collected through observations. The vendor survey/interview was designed to identify predictors of vendor success, and included questions about cart ownership, produce

sourcing, cart storage, days, hours, and seasonality of operation, organizational support, and profitability. The customer sample survey/interview collected information on demographics, income, residence, reasons for being in the neighborhood, produce purchasing habits, and perceptions of whether shopping at Green Carts was increasing their consumptions of fruits and vegetables (Fuchs et al., 2014).

5.9 Mobile Market Research Findings

5.9.1 Vendor Characteristics of Mobile Markets

Current literature on Individual/Familial Mobile Food Vending is consistent with historical records that characterize mobile vendors as recent immigrants and representing ethnic groups. In a study of mobile vending surrounding 6 schools in Oakland, all vendors were Latinos (Tester et al., 2010). Mobile vendors in the Mexico-Texas border region were found to be primarily Mexico-born (Valdez et al., 2012). In the Bronx, 75% of vendors interviewed in one study felt most comfortable speaking Spanish (Lucan et al., 2013). A survey of Green Cart vendors in New York (n=142) found that at least 88% of vendors are foreign born, with 54% from Bangladesh, and only 38% speak English (Fuchs et al., 2014).

Mobile vending is characterized by its seasonal and transient nature. In a study of mobile vendors in the Texas-Mexico border area, the majority of mobile vendors (n=13) worked spring and summer months only, many of them returning to Mexico in fall and winter (Valdez et al., 2012). A study of mobile vending in the Bronx found that only 24% of vendors operated year round, and the median start and end month was April and October, respectively (Lucan et al., 2013). This Bronx study also found that a third of the vendors changed locations from day to day or within a given day, and there was great

variation in times (days, hours, and months) in which vendors reported doing business. In addition, 86% of Bronx vendors reported that weather was a deciding factor for doing business (Lucan et al., 2013). An evaluation of Green Carts in New York found that 64% of vendors operate seasonally and 31% of Green Cart vendors operate year round, including winter (Fuchs et al., 2014).

Other characteristics of mobile vendors of the Individual/Familial Mobile Food Vending model have been revealed in recent studies. Two studies that collected information on gender found mobile vendors to be majority male (Fuchs et al., 2014; Valdez et al., 2012). One study found that although mobile vendors were low-wage workers, earnings of mobile vendors in the *Colonias* made up a large proportion of their household income (Valdez et al., 2012). In an evaluation of Green Carts, 80% of vendors described their business as “somewhat profitable” or “very profitable” (Fuchs et al., 2014). In addition, 75% of Green Cart vendors believed their experience running the market would help them operate a larger business (Fuchs et al., 2014). These studies show that mobile vending is an important avenue for financial security, although the financial viability of Green Carts contrasts the lack of financial security found among fruit vendors in Los Angeles (Rosales, 2013), suggesting that profitability may be largely dependent on other factors such as policies and regulations (Morales & Kettles, 2009; Rosales, 2013; Tester et al., 2010) or organizational support (Fuchs et al., 2014).

The aspect of increasing social networks through mobile vending was identified in a study finding that vendors perceived themselves as providing a service to their food insecure community (Valdez et al., 2012), which is consistent with other literature on the social importance of mobile markets (Morales & Kettles, 2009; Rosales, 2013). In

addition, consistent with other types of marketing, mobile vendors respond to customer product desires. A study of Green Carts found that 65% of vendors chose produce offerings based on customer request (Fuchs et al., 2014).

Studies characterize vendors as vulnerable to regulatory authorities. Mobile vendors in the Mexico-Texas border region felt sensitive to government oversight, and noted that county permits limited their sales to a small range of products (Valdez et al., 2012). In the Bronx study, researchers found that many vendors were reluctant to engage with them and expressed concerns about regulatory authority, with 15% of the vendors refusing to answer brief-interview questions (Lucan et al., 2013). Of those who did answer at least some questions, 7% of vendors voiced suspicion, such as expressing concern about health inspectors, the police, and revealing stories of harassment by adjacent storefront businesses (Lucan et al., 2013).

Only one study of an Organizational Mobile Food Vending model described the vendors. This study of a MPM intervention in the UK utilized experienced “Health Trainers” from the community to sell the produce (Jennings et al., 2012). These Health Trainers received basic training in motivating and encouraging positive behavior change and were able to proactively engage with customers to improve lifestyle choices (Jennings et al., 2012). Future mobile market interventions may want to develop this model of integrating community members as vendors and trained health educators. This study also suggests that vendors have the potential to influence consumer purchasing and dietary behavior.

5.9.2 Target Population of Mobile Produce Markets

A range of target populations have been described in MPM intervention studies, including elementary school students (Tester et al., 2012), older adults (AbuSabha et al., 2011; Jennings et al., 2012), areas with high rates of heart attack, stroke and diabetes (Jennings et al., 2012), areas of low fruit and vegetable consumption (Jennings et al., 2012), low income families (Jennings et al., 2012), and predominantly Hispanic and Black neighborhoods (Evans et al., 2012). The intended target population of the Green Cart program in New York is neighborhoods of the city with low produce availability and where consumption of fruits and vegetables is low (Fuchs et al., 2014; Li et al., 2014; Lucan et al., 2011).

Most MPM interventions are in urban areas with a large proportion of non-white residents (Evans et al., 2012; Fuchs et al., 2014; Jennings et al., 2012; Lucan et al., 2011; Tester et al., 2010; Zepeda et al., 2014). However, MPM serving non-urban areas with majority white populations have also existed. For example, Freshmobile operated in the small city of Madison, WI, and Gorge Grown in the rural town of Stevenson, WA (Zepeda et al., 2014).

Demand locations for MPM have also been identified through theoretical modeling of areas with low access to fruits and vegetables. Widener and colleagues developed a model for a mobile produce distribution system in a medium-sized city to increase physical access to fresh fruits and vegetables. They selected demand locations based on an inaccessibility measure for each census block group, calculated by multiplying the number of households without a vehicle by the network distance from residence to grocery store. Then they used spatial optimization modeling to derive

numbers and locations of MPM needed to minimize travel burden. Results indicated that 15-30 MPM placements with the capacity to carry produce for 120-160 households per day is needed to increase access in food deserts of similar size as Buffalo (Widener et al., 2012).

Interestingly, in another study that compared theoretical modeling of 15, 20, 25, and 30 mobile market placements, there was not a large difference in number of households with increased access (Widener et al., 2013). This suggests that there may be a threshold number of markets and locations for each community, beyond which there is little added benefit.

5.9.3 Customer Characteristics and Their Use of Mobile Markets

Only three peer-review articles describe characteristics of mobile market customers. Some of the characteristics described include demographics, neighborhood residence, income, reasons for shopping at the mobile market, and whether customers considered mobile markets as a prime source of fruits and vegetables.

A study by Sharkey and colleagues examined characteristics of consumers who used mobile markets in the Texas-Mexico border region called the *Colonias* (Sharkey et al., 2012). They found that households who purchased food from mobile markets tended to be child food insecure, ($p < 0.001$) and participated in school nutrition programs ($p \leq 0.05$). Almost all (>90%, $n=610$) respondents strongly agreed or agreed that there was little variety in types of foods, few grocery stores or supermarkets, or high food prices in their community. Households who utilized mobile markets also tended to use other alternative food stores (AFS), with 52% households using at least one type of AFS, and

>25% purchasing food from at least 2 of 3 examined sources—mobile vending, flea markets, neighbors and friends (Sharkey et al., 2012).

In the study of The Mobile Food Store intervention in the UK, researchers found that the program reached targeted elderly (35%), families (37%), overweight individuals (42%), unemployed (55%), those whose age when finished full time education \leq 16 years (66%), and those living in areas of high national deprivation (72%) (Jennings et al., 2012). In addition, they found that customers used the MPM as a primary source of fruits and vegetables, with 64% of participants reporting purchasing most of their fruits and vegetables from the MPM (Jennings et al., 2012).

In a study that compared characteristics of shoppers and non-shoppers of four organizational MPM, they found that shoppers of MPM generally shopped more often than those who did not shop at MPM (3.0 vs. 2.4 times in the last two weeks), and shoppers of MPM lived closer to the mobile market than non-shoppers (1.9 miles vs. 5.9 miles) (Zepeda et al., 2014). This suggests that the close-proximity of the MPM to residences may have been an important reason for shopping at the MPM. In addition, the study found more shoppers reporting that they did not like to cook compared to non-shoppers (9% vs. 0%) (Zepeda et al., 2014).

Information about mobile market customers was also found in MPM program evaluations. A customer sample (n=103) of Green Cart customers suggested that Green Cart customers were low-income, with 44% of respondents earning less than \$25,000 a year and 68% of respondents earning less than \$50,000 a year. The majority (56%) of customers lived in the neighborhood of Green Carts, and 29% worked in the

neighborhood. Almost all (92%) survey respondents said location and prices are two main reasons for shopping at Green Carts (Fuchs et al., 2014).

An evaluation of Garden on the Go in Indiana found that customers of the MPM tended to be female (>70%), older (>50% ≥ 55 years old), and black or African American (>50%). Close to 50% of customers were SNAP participants. In addition, customers tended to be the only adult at home (59% at baseline) and did not have children living with them (75%) (Lewis & Zollinger, 2012).

An evaluation of the Somerville Winter Mobile Market in MA revealed 318 customers in the 2014 season. Surveys found that 10-20% of customers utilized the mobile market as their sole source of produce during its season of operation, and over 50% of customers used the mobile market as a consistent supplementary source. The highest response to surveys of what customers liked about the market was its location. The majority (70%) of total customers and all repeat customers were residents of the local housing development where the mobile market was located. Residents of the local housing development were indicated as being majority low-income and non-white, and included many immigrants and elderly (Marina et al., 2014).

5.9.4 Facilitators and Barriers to Participation in Mobile Produce Markets

Examination of customer characteristics revealed that convenient location(Fuchs et al., 2014; Marina et al., 2014; Zepeda et al., 2014) and affordable prices(Fuchs et al., 2014) were important facilitators of MPM use. The presence of food assistance programs, such as Farmers Market WIC and Seniors Farmers Market Vouchers, further encourage MPM participation(Zepeda et al., 2014). Customers have also identified the quality of

produce and social interaction to be benefits of participating in a MPM(Jennings et al., 2012).

Focus group interviews of shoppers and non-shoppers of MPM have also provided insight about barriers to use of MPM. Non-shoppers perceived a lack of affordability at the MPM, which inhibited their participation. Many non-shoppers were also unaware of MPM and their offerings. The lack of awareness among shoppers about what constituted servings of fruits or vegetables and how much they should eat constrained their use of the market. Some market participants lacked cooking skills and many seniors lacked the motivation to cook. While many shoppers found the market to be convenient, others were deterred by the limited hours of operation. The lack of a variety of food types, such as staple foods, made the market less appealing for some MPM shoppers and non-shoppers. In addition, trust was an important issue, as some customers had prior experience of being cheated at mobile markets, which made them hesitant about participating in MPM (Zepeda et al., 2014).

5.9.5 Food Type Contributions of Mobile Vending to the Food Environment

While fruits and vegetables are the primary foods offered by organizational models of mobile markets, contributing healthful food to certain neighborhoods, the healthfulness of food types provided by Individual/Familial Mobile Food Vending is less consistent.

Tester and colleagues observed the after-school mobile food environment of 6 schools in Oakland, CA, and found that the vendors around schools sold a wide range of food types (Tester et al., 2010). Vendors included *paleteros* (ice cream pushcart vendors), *fruteros* (precut and bagged fruits and vegetable vendors), taco trucks, *raspaderos*

(shaved ice vendors), ice cream trucks, hot dog carts, *churro* (fried donut) vendors, fruit stand vendors, and *eloteros* (roasted corn vendors). Research revealed that children were present at the majority of transactions, and 56% of transactions involved children with no adults present. Researchers concluded that mobile food vending is a major contribution of healthy and unhealthy food types to the school food environment and after-school snacking (Tester et al., 2010).

In an assessment of mobile food vending in the Bronx, Lucan and colleagues found that vendors selling “less healthy” items outnumbered fresh produce vendors by more than three to one (Lucan et al., 2014). A majority of vendors (59% of n=372), including 15% of fresh produce vendors, offered processed foods like candies and salty snacks. Researchers also found interesting shifts in mobile vending based on seasonal and weather conditions. There was a greater proportion of “healthier” and “mixed” vending in the winter compared to summer. Rainy days dramatically decreased the number of mobile vendors to 14% of the usual number, with a slightly greater proportion of “healthy” and “mixed” vending on rainy days compared to non-rainy days (Lucan et al., 2014).

In a study of mobile vending in the Texas *Colonias*, all vendors sold popsicles, and other products included hot or prepared foods (30.8%), fruits and vegetables (30.8%), salty/fried snacks (30.8%), sweet snacks (23.1%), and sugar-sweetened beverages (7.7%) (Valdez et al., 2012). This study is consistent with other studies of Individual/Familial Mobile Food Vending, showing a mix of healthy and unhealthy food contributions to food environments.

Individual/Familial Mobile Food Vending models typically specialize in product type, although mixing item types within one vending unit is also common, and there may be great variety within each product type. Approximately 7.5% of mobile vending in the Bronx fell into a “mixed” category of healthfulness, selling both “healthier” and “less healthy” food items(Lucan et al., 2014). An evaluation of Green Carts found that 67% of Carts sold 13 or more varieties of produce (Fuchs et al., 2014). Another study of Green Carts found that of 21 Carts with data on food items sold, 3 sold cookies and/or sugar-sweetened beverages along with produce (Lucan et al., 2011).

5.9.6 Mobile Market Associations with Dietary Outcomes

Three of four peer-reviewed longitudinal studies of mobile markets used the introduction of a Mobile Produce Market as the community intervention, and fruit and vegetable consumption as an outcome measure(AbuSabha et al., 2011; Evans et al., 2012; Jennings et al., 2012).

The study of dietary outcome among seniors who use The Veggie Mobile in Troy, NY found increased vegetable intake among 43 seniors who completed both pre- and post- surveys, from 1.98 ± 1.71 self-reported servings/day to 2.58 ± 1.4 servings/day ($P=0.027$), half of which was potatoes. The proportion of participants reaching the recommended intake of three servings of vegetables/day increased from 33% at baseline to 51% post intervention ($P=0.03$). The change in fruit intake did not reach statistical significance. The proportion of participants who ate the recommended two servings of fruit/day increased from 53% at baseline to 63% post-intervention ($P=0.326$) (AbuSabha et al., 2011).

The study looking at the introduction of a once-a-week produce stand in an urban area in Texas found that of a total of 61 participants who completed both pre- and post-surveys, there were significant increases in the consumption of fruit ($P < 0.001$), fruit juice ($P < 0.001$), tomatoes ($P = 0.006$), green salad ($P = 0.017$), and other vegetables ($P = 0.001$) (Evans et al., 2012). In a UK study, with the introduction of The Mobile Food Store, self-reported fruit and vegetable intake significantly increased by 1.2 self-reported portions per day ($P < 0.001$), with fruit intake increasing by 0.54 portions ($P < 0.001$) and vegetable intake increasing by 0.61 portions ($P < 0.001$) (Jennings et al., 2012).

Two peer reviewed cross-sectional studies examined associations between mobile market use or presence, and consumption of fruits and vegetables. Lucan and colleagues found that “less healthy” vending per capita in the Bronx was associated with decreased consumption of fruits and vegetables, with associations being stronger in the summer than in the winter ($P = 0.104$ in summer; $P = 0.391$ in winter) (Lucan et al., 2014).

In a study that compared shoppers of four different organizational MPM and non-shoppers who lived in the same neighborhoods, researchers found that shoppers ate more servings of fruits and vegetables than non-shoppers (3.5 vs. 2.0 reported servings; $P > 0.001$), and the differences were statistically significant for 3 of 4 markets (Zepeda et al., 2014). While shoppers may not be getting all of their produce from the MPM, this study shows that those who shop at MPM may generally seek out and eat fruits and vegetables more often.

MPM program evaluations also reveal associations between MPM use and outcomes related to fruit and vegetable consumption. In a 2014 evaluation of Somerville Winter Mobile Farmers' Market, 80% of surveyed market customers reported eating

more fruits and vegetables because of the market (Marina et al., 2014). In a 2014 evaluation of Green Carts, 71% of surveyed customers (n=103) reported that their consumption of fruits and vegetables has increased since shopping at Green Carts (Fuchs et al., 2014). The 2012 evaluation of Garden on the Go found a slight increase in number of people reporting consuming 5 or more servings of fruits and vegetables (7.6% baseline, 12.7% final) over six months of market use, but the change was not statistically significant (P=0.635) (Lewis & Zollinger, 2012).

5.9.7 Mobile Market Associations with Fruit and Vegetable Purchasing, Shopping Habits, Health, and Other Outcomes

One longitudinal study examined sales of fruits and vegetables as the outcome measure and indicator of dietary impact (Tester et al., 2012). The intervention study introduced a *frutero*, a mobile fruit vendor, outside a school in Oakland, who sold small bags of precut fruits (e.g., mango) and vegetables (e.g., jicama). The study revealed a significant number of elementary students purchasing fruits and vegetables from the *frutero* despite the presence of competing ice cream and cotton candy vendors. During the observational period (324 minutes across 14 days), the *frutero* had 233 consumers and sold 248 items and averaged sales of 17.7 bags of fruits and vegetables in 26 minutes. The majority (59%) of the consumers were elementary school students. In addition, researchers approximated 1.5 fewer non-nutritious food items sold by competing vendors on each successive day of intervention. Although the study does not indicate whether the *frutero* affected the overall dietary patterns of the children, preferences over time, or attitude shifts, the results implied that the availability of vegetable and fruit options at

school enabled them to eat these healthy options at a time and place which they did not ordinarily have. (Tester et al., 2012)

Another longitudinal study investigating fruit and vegetable purchasing as a result of a MPM intervention found a significant increase in reported purchasing of fruits and vegetables at neighborhood farm stand/market ($P=0.004$), although no information was gathered about fruit and vegetable purchasing from other outlets (Evans et al., 2012). Other significant results in this study included increases in awareness of neighborhood farm stand/market ($P=0.001$) and perceived importance of fruit and vegetable intake ($P=0.021$) (Evans et al., 2012).

In the Garden on the Go MPM evaluation, the majority of customers reported that the program significantly or somewhat (91% baseline, 95% final) increased their ability to buy the types and amounts of fruits and vegetables that they wanted, although there was no remarkable change over time (Lewis & Zollinger, 2012). This study also found a slight increase in purchasing fruit sometimes (39% baseline to 47% final) and vegetables sometimes (31% baseline to 47% final) at places other than Garden on the Go, with an inclination to buy more fresh and less canned and frozen fruits and vegetables (Lewis & Zollinger, 2012).

Two studies examined the extent that customers purchased fruits and vegetables from a MPM compared to other outlets. One study found the majority (64%) of customers using a MPM as their primary source of fruits and vegetables (Jennings et al., 2012) while another study found the majority (>50%) of customers using a MPM as a supplementary source of fruits and vegetables and a smaller number (10-20%) using the MPM as the sole source (Marina et al., 2014).

One longitudinal study assessed the effects of a MPM on the frequency of shopping at supermarkets among seniors and the amount of money spent there, and found that at post-intervention, seniors visited the supermarket less often ($P=0.001$) and spent an average of \$14.92 less during their last visit ($P=0.065$) (AbuSabha et al., 2011). These findings may be a positive indicator of less shopping and financial burden, although no information was gathered about the frequency of visits to the MPM, the amount of produce purchased at the MPM and the money spent there, so it is difficult to understand whether these are indicators of positive impact in relation to MPM use.

A study using agent-based modeling (ABM) showed that introducing 15-30 mobile markets in Buffalo, NY results in the substantial increase of 500 households stocking fruits and vegetables from a baseline of 4,600 households with fruits and vegetables, which is an 11% increase (Widener et al., 2013). This modeling approach, however, assumes that increased availability and access to fruits and vegetables will result in increased purchases, and does not address the plethora of personal, social, and economic barriers to the usage of mobile markets, such as financial limitations and the lack of knowledge and motivation to consume fruits and vegetables.

Associations of mobile markets and health outcomes were examined in two studies. In the Bronx, “less healthy” vending in the summer was associated with increased BMI ($P=0.037$), prevalence of hypertension ($P=0.037$) and hypercholesterolemia ($P=0.037$), for non-white ($P=0.104$), Hispanic ($P=0.104$), and poor ($P=0.104$) neighborhoods, and populations with low proportions of high school graduates ($P=0.104$) (Lucan et al., 2014). Therefore, the abundance of “less healthy” mobile vendors may contribute negatively to the health of residents overall, but in particular to

poor neighborhoods with high Hispanic and non-white populations (Lucan et al., 2014). In a 2012 evaluation of Garden on the Go in Indiana, researchers found no statistically significant improvements in BMI ($P=0.506$), blood pressure ($P=0.815$), blood sugar ($P=0.175$), or perceived health ($P=0.324$) among market MPM customers over a 6-month period (Lewis & Zollinger, 2012).

5.9.8 Seasonal Shifts in Mobile Market Associations

Only one study examined seasonal changes of mobile market contributions to the food environment (Lucan et al., 2014) although others have documented the seasonal characteristic of mobile food vending (Fuchs et al., 2014; Valdez et al., 2012).

Lucan and colleagues compared associations between neighborhood characteristics and mobile vending in the Bronx food environment in winter and summer. In the winter, “less healthy” vending diminished, increasing the overall proportion of “healthy” to “less healthy” vending. Although there was no seasonal difference in the direction of food environment-diet and health correlations, the associations generally became much weaker in the winter. However, correlations with “less-healthy” vending became stronger in the winter in neighborhoods with high Hispanic populations ($P=0.104$ in summer, $P=0.037$ in winter) and high proportion of people below poverty levels ($P=0.104$ in summer, $P=0.037$ in winter) (Lucan et al., 2014).

5.9.9 The Implication of Mobile Produce Market Placement

Target populations have generally driven placement of organizational models of MPM. On the other hand, street vending regulations have determined the areas that individual models of MPM and mobile vending in general have been allowed to operate. Two studies focus on assessing the location and implications of placements of Green

Carts in New York, an Individual/Familial model of MPM (Li et al., 2014; Lucan et al., 2011).

One study focused on Green Carts in the Bronx, identifying 61 Green Carts (Lucan et al., 2011). The average-nearest-neighbor analysis ratio of observed-to-expected distances between Green Carts was 0.54 (<1 = clustered; $P < 0.0001$), showing that the Carts were not evenly distributed. The Carts formed eight clusters; all around medical, academic, transportation, retail, and recreation centers, and only 57% of them covered areas of limited access to fruits and vegetables. Investigators found 3 Carts selling outside of specified boundaries which others also admitting doing (Lucan et al., 2011).

Li and colleagues found that Green Carts tended to be located in areas with greater commercial activity. Few Green Carts were located in food deserts, defined as “no healthy stores within one-quarter mile” (7% compared with 36% candidate sites, $p < .001$), and the majority (78%) of Green Carts were located near 2 or more healthy stores compared to 42% of candidate sites. Only 4 Carts were located in areas with no stores nearby. In addition, Green Carts had significantly higher odds of being near a subway stop, in a more population dense area, and near a large employer. Furthermore, a minority of Carts (16%) accepted EBT (Li et al., 2014).

The two studies of Green Carts come to a similar conclusion that Green Cart vendors tend to locate in areas of higher pedestrian traffic and commercial activity, despite the potential competition of other local markets, and the places where Green Carts congregate often have other healthy stores nearby (Li et al., 2014; Lucan et al., 2011). A 2014 evaluation of Green Carts found that Queens was the only borough where Green Carts clustered within the highly concentrated produce area (Fuchs et al., 2014). While the

evaluation did not find clustering of Green Carts in the Bronx, Manhattan, and Brooklyn, it is evident that markets are still not reaching many areas of need.

Green Carts are absent in many low-income residential areas without food stores nearby, where they are needed the most, and many food desert residents with limited mobility, such as elderly and disabled, are still not accommodated (Li et al., 2014). These studies suggest that program support is needed to enlist vendors to specific food desert locations in order to cover more residential areas of need, as well as to provide support for EBT systems and perhaps added incentives for Green Cart vendors. For the success of the program, community partnerships are also needed to help with marketing and the recruitment of customers and vendors (Li et al., 2014; Lucan et al., 2011).

5.10 The Potential of Policies to Support Mobile Produce Markets

Mobile vending is typically regulated at the local (city or county) level with the creation of municipal codes. There are three important regulatory domains—health and safety, permits and fees, and location. Implementations of an FDA Food Code, use of commissaries, or centralized kitchen facilities, and health inspections before granting permits, have been important steps for some cities to ensure food safety. Furthermore, to prevent vendors from competing with other local businesses and interfering in traffic and pedestrian safety, municipalities have been controlling the number of permits allowed and the locations for mobile vending (Tester et al., 2010).

Tester and colleagues found examples of “healthy vending policies” in four US cities. In New York City, the Green Carts program opened up 1000 reduced-fee permits for vendors selling whole, unprocessed fruits and vegetables in underserved boroughs. In Chicago, vendors selling fruits and vegetables are eligible for a 40% reduction of the

typical permit cost. San Francisco has categorized favorable food products, such as locally grown organic food, and has proposed incentives for mobile vending of these products. In Kansas City, MO, “Healthier” vendors are granted access to one city park, and “Healthiest” vendors are permitted to roam for three city parks. Policy makers can encourage the potential of mobile food vendors to improve nutrition and health outcomes by advocating for the development of supportive privileges for “healthy vendors” and more nutrition incentives for consumers (Tester et al., 2010).

In a study of mobile vending in the school food environment, Tester and colleagues acknowledge the directive role of policy (Tester et al., 2012). While the *frutero* was granted permission to be at the school entrance for the intervention study, mobile vendors are typically prohibited or limited in roaming range near schools and parks. Therefore, to accommodate healthy mobile food vending, policy shifts would need to be actualized. At the same time, it is important to consider the social and cultural contributions of all mobile vending and recognize the economic and social importance within the system of mobile vending, and find ways that policy does not harm the livelihoods of mobile vendors selling options other than “healthy” food.

5.11 Mobile Market Research Limitations

The longitudinal studies of mobile markets had similar limitations. First, none of the studies utilized control groups. Since all the interventions overlapped with natural growing seasons in the areas, there is a great likelihood that increased consumption of fruits and vegetables is linked to greater seasonal availability. Control groups are essential in future longitudinal studies in order to control for confounding and adequately extract dietary impacts due to interventions.

The second common limitation was the lack of generalizability due to characteristics of the samples. The studies in New York (AbuSabha et al., 2011) and Texas (Evans et al., 2012) culminated in small sample sizes of 43 and 61, respectively, and were conducted in urban areas, which limits generalizability. The New York and UK studies (AbuSabha et al., 2011; Jennings et al., 2012) both utilized convenience samples of MPM customers, who may have responded to the questionnaires because of particular commitment to improving health, thereby creating bias in results. The respondents to the Texas study (Evans et al., 2012), while pooled from entire neighborhoods, may have also had particular interests in health.

Attrition of study participants also challenges the validity of research results. In the Texas study, 31 (34%) respondents of the pre-intervention survey did not complete the post-survey, and researchers found significant differences between those who only completed the pre-survey and those who completed both pre-and post-surveys, such as gender, race, and income (Evans et al., 2012). Future studies should analyze and document information about shoppers who dropped out, who may not have been satisfied with the program nor received benefits, or who may have experienced other barriers to participation. Furthermore, all samples were collected from a targeted population and results can't be generalized to other populations and localities.

Third, although the brief dietary screeners used by all three studies had some validation and had the advantage of being quick and low-burden instruments, the results are general and do not provide detail on quantity and types of fruits and vegetables. In addition, they are prone to self-reported recall and social desirability biases. However, the studies used other outcome measures to support dietary outcomes, such as shopping

frequency, perceived benefits of the programs and perceived importance of fruit and vegetable intake, which helps to build the justification of positive impact. Future studies would benefit from adding other validated and standardized outcome measures to dietary screeners so that results can be comparable across studies. Results from short-term intervention studies may be biased by the novelty of its project. Also, since personal changes in diet and health usually require time, measuring impact over longer durations would help to validate impact.

One limitation of studying the number and location of mobile vendors in a specific area is the inaccuracies caused by the mobile nature of vendors, who may change market sites within a given day or week, or whose operations may change depending on weather and season (Lucan et al., 2013). Tester and colleagues noted their difficulty capturing of all mobile vendors or even a rigorous random sample due to the mobile nature of the vendors (Tester et al., 2010). They also reported that the number of competing vendors dwindled through the intervention study period and that the competing vendors may have felt scrutinized, since they were not permitted to sell in front of the school (Tester et al., 2012). Future mobile market research should be transparent about the changing, impermanent nature of mobile markets and implications for impact.

5.12 Summary of Mobile Market Literature

Mobile market type can be categorized as Individual/Familial or Organizational, and identified as a Mobile Produce Market if primarily selling fruits and vegetables. Individual/Familial mobile markets are often operated by immigrants and vary greatly in type of food sold, which varies the contribution to a food environment. Vending of less

healthful food, for example, perpetuates negative health outcomes within many vulnerable populations (Lucan et al., 2014). Policies can play a supportive role to the livelihoods of these Individual/Familial vendors and to the health of communities by creating incentives for vendors to sell and customers to purchase from “healthier” markets such as fruit and vegetable markets. Community organizations can provide additional support by advocating for street vending rights, helping to advertise and recruit customers, promoting safety, and providing business guidance and infrastructure support. Future research investigating vendor experiences and perceptions would broaden understanding of the dynamics of vendor relationships, cooperation and competition, which would inform culturally and socially sensitive approaches to public health interventions.

Organizational models of mobile markets have been gaining popularity in recent years and offer a promising strategy to improve access to healthy food, especially in food desert areas among vulnerable populations such as older adults. Organizational MPM target many low income and senior housing areas, creating convenience to accessing healthy food. In addition, organizational MPM offer their food at competitive prices with added incentives such as discounts for EBT card users, and the ability to use WIC and Seniors Farmers Market Vouchers. They often collaborate with local farms to provide fresh, seasonal farm products, supporting the local food system and economy. In addition, many organizational MPMs offer nutrition education, recipes, and other support for healthy eating.

Although there are several research limitations, both longitudinal and cross sectional studies of mobile markets show that MPM are associated with an increased

consumption of fruits and vegetables and increased purchasing of fruits and vegetables. Future longitudinal research should prioritize the use of control groups. Qualitative research is particularly lacking and may provide depth to understanding the nuances of the impact of a MPM, such as understanding the importance of social interaction or educational activities for customers at a MPM, the role of farmers and the impact on the local economy, the effect of seasonal fluctuations of the market, the market's financial viability and sustainability, and the role of the market in encouraging community networks and social activism.

Research on mobile vending in the school food environments is scarce yet can provide valuable insight into students' food purchasing habits and preferences and offer ideas for encouraging healthy eating among children and adolescents. Future studies should look into mobile food vending around schools in different cities and locations. Researching the experiences and perceptions of students, school staff, and family members, including barriers to healthy eating, perceptions of mobile food vending, and food preferences, would enhance understanding of how mobile food vending can best facilitate healthy eating and be a successful intervention in the school environment.

CHAPTER 6

PURPOSE, OBJECTIVES, AND SIGNIFICANCE OF THE STUDIES

6.1 Research Purpose

The purpose of our current research is to assess mobile produce markets (MPM) as a community-based strategy to increase access to fresh, local fruits and vegetables, particularly among low-income urban residents and the older adult population. Study 1 examines the food environment context of the Go Fresh MPM in Springfield, MA, in particular the availability of fruits and vegetables in stores. Study 2 assesses MPM influences on fruit and vegetable access by examining the perceptions and experiences of Go Fresh shoppers. Study 3 investigates the marketing experiences of regional farmers, including their perspectives on MPM, and examines the facilitators and barriers of their involvement in local food marketing, particularly for improving access among low-income and minority populations.

6.2 Study Objectives

6.2.1 Study 1 Objectives

Objective 1.1: Determine the number of food stores in half-mile radius areas of Go Fresh locations with any availability of fruits and vegetables by form (i.e., fresh, frozen, canned, juiced) and by variety as defined by the 2015 Dietary Guidelines for Americans (i.e., fruit, dark green vegetable, red/orange vegetable, legume, other vegetable, starchy vegetable) (US Department of Health and Human Services and USDA, 2015), and to identify the common types of fruits and vegetables available in stores (e.g. fresh tomatoes)

Go Fresh locations:

2015 confirmed MPM sites (n=10): Linden Towers, Springfield Technical Community College, Saab Court, Caring Health Center, Gentile Apartments, Baystate Place, East Springfield Library, Clodo Concepcion Community Center, Independence House, Court Square

Potential future MPM sites (n=3): Robinson Gardens, Colonial Estates, Outing Park Apartments

Objective 1.2: Describe and compare fruit and vegetable availability and variety by type of food store in half-mile radius study areas

Food store types: supermarket, grocery store, convenience store, gas station convenience store, pharmacy, dollar store, specialty market African, specialty market Italian, small produce business (Ratchford, 2015)

Objective 1.3: Compare fruit and vegetable availability and variety between half-mile radius study areas

6.2.2 Study 2 Objectives

Objective 2.1: Describe demographics of Go Fresh customers, including: age, gender, race/ethnicity, neighborhood residence, living alone or with others

Objective 2.2: Describe shopping behavior of customers at Go Fresh, including: EBT use, distance travelled to market, frequency of shopping at Go Fresh, amount of money spent at the market, primary shopper or not in household, number of people purchasing food for, number of Go Fresh markets shopped, duration shopping at Go Fresh, plans to shop at Go Fresh next year

Objective 2.3: Describe perceptions and experiences of Go Fresh customers, including: aspects liked about Go Fresh, aspects of Go Fresh wanted changed, future

activities most desired, missing fruit and vegetable items most desired, additional comments

Objective 2.4: *Assess five dimensions of access:* availability (i.e., perceptions of produce variety), accessibility (i.e., perceptions of location and distance traveled to market), affordability (i.e., perceptions of produce price), acceptability (i.e., perceptions of produce quality), accommodation (i.e., EBT use, perceptions of hours and market safety)

6.2.3 Study 3 Objectives

Objective 3.1: Describe demographics of sample of farmers from Hampshire, Hampden, and Franklin Counties, including: gender, age, race, county of residence, number of adults and children in household, household income, % household income from farming

Objective 3.2: Describe farming background and marketing experience of sample of farmers, including: number of years farming, amount of land cultivated/used, marketed products, market channels used, seasonal or year-round marketing

Objective 3.3: Identify themes describing farmers' motivations and considerations when choosing to market through farmers markets or CSA

Objective 3.4: Identify themes describing farmers' experiences and perspectives of marketing through farmers market and CSA, including facilitators and barriers

Objective 3.5: Identify themes describing farmers' views of local markets' capacity to improve access of local food to low-income and minority populations

Objective 3.6: Identify themes describing farmers' perspectives of MPM and considerations of MPM participation, including facilitators and barriers

6.3 Study Significance

Many low-income urban residents are at a dietary disadvantage due to the lack of affordable fresh fruits and vegetables in their neighborhoods. Community organizers, policy makers, and funders benefit from understanding the scope of program efforts to mitigate the negative health consequences. By taking a close look at Go Fresh's contribution and influences, our research describes the potential of MPM and provides a model for the development of alternative markets in other regions. Attention to local farmers' experiences and considerations regarding viable marketing options puts a nutrition intervention in the context of a local food system, and emphasizes the need to understand and support the food system in order to sustain the supply of healthy food to a community. To our knowledge, this is the first study to examine MPM from multiple perspectives within the food system—the food environment context and contribution, customer use and experience, and farmer perspectives.

CHAPTER 7

SETTING

7.1 Study Area: Springfield, MA

Springfield is the third largest city in Massachusetts, and in 2014 had an estimated population of 153,991. Springfield is located in western Massachusetts in the Pioneer Valley Region, and is organized into 17 neighborhoods. These neighborhoods correspond considerably but not entirely with census tracts, with many neighborhood boundaries corresponding with census tract boundaries (Springfield Planning Department, 2003). Neighborhoods vary in size with some neighborhoods consisting of multiple census blocks.

The Food Access Research Atlas shows that more than half of Springfield census tracts have a significant low-income population with access to a grocery store more than 1/2 mile away, and for approximately 25% of the city, there is a significant low income population with access to a grocery store more than 1 mile away (Economic Research Service, Food Access Research Atlas, 2015). (See Figure 7.1)

The Pioneer Valley Planning Commission created the Springfield Neighborhood Data Atlas (see Figure 7.2), detailing neighborhood level percentages of population with a different definition for low access to food, defined as access to a supermarket more than 1 mile away and no personal vehicle ownership (Pioneer Valley Planning Commission, 2014). This map shows that in Pine Point and East Forest Park neighborhoods, low food access affects 16.5-33% of the population, and in Sixteen Acres and East Forest Park neighborhoods, low food access affects 7-16.4% of the population (Pioneer Valley Planning Commission, 2014).

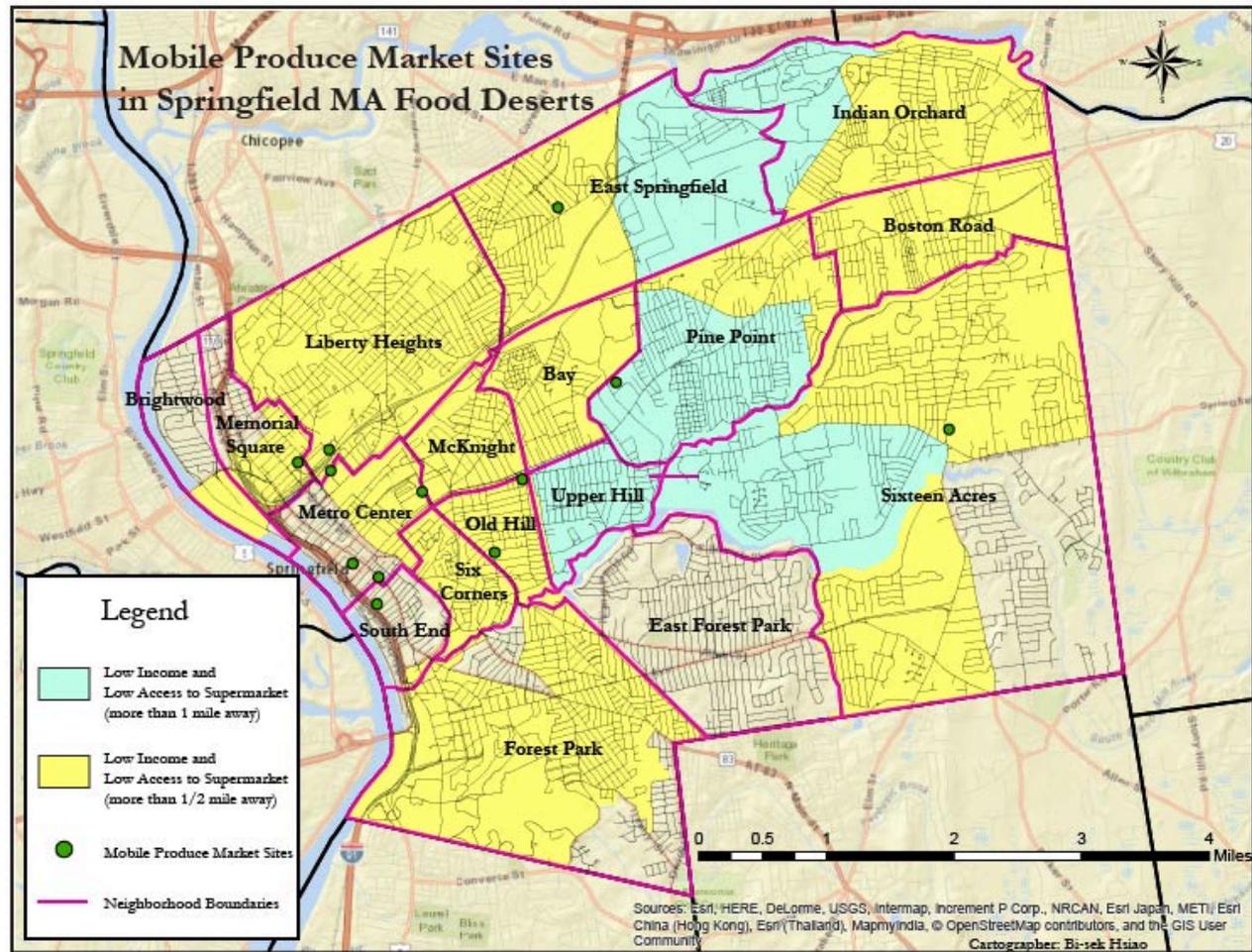


Figure 7.1: Springfield Food Desert Map with 2015 Go Fresh Locations
 Data layer Sources: (City of Springfield, 2015; ERS Food Access Atlas, 2015)

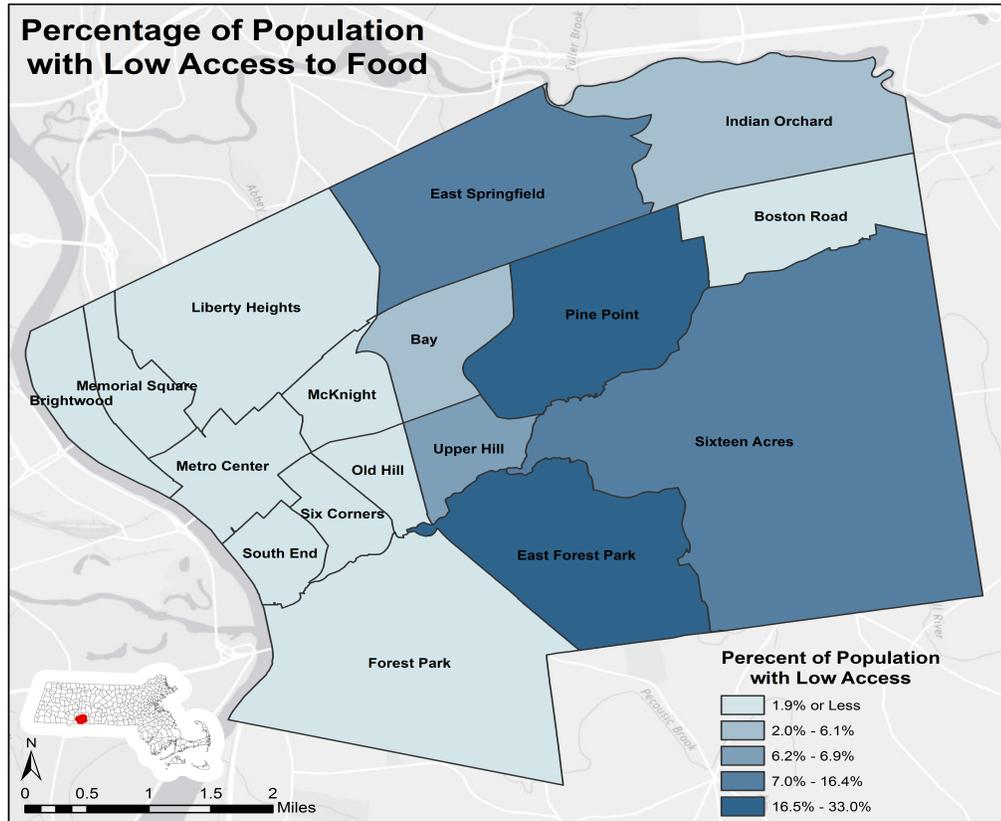


Figure 7.2: Springfield Food Deserts (Pioneer Valley Planning Commission, 2014)

The Springfield *consumer food environment* has not been thoroughly investigated. The Department of Urban Studies and Planning (DUSP) at the Massachusetts Institute of Technology (MIT) assessed the food environment in the North End neighborhood of Springfield by using a census of food stores, Nutrition Environment Measures Survey-Stores (NEMS-S) tool, and qualitative data. They found that there is a very limited availability of healthful food options in the North End. Specific to produce, they found that the majority of vendors did not offer any fruits and vegetables. Their overall food environment assessment results showed that out of a maximum possible NEMS-S score of 50, for healthful food availability, quality and pricing, 0 being least healthful and 50

most healthful, the maximum score found in the North End was 13 with the vast majority of stores having NEMS-S scores under 10. (Creely et al, 2008)

7.2 Study Population: Springfield, MA

Older adults in Springfield are one main group of beneficiaries of the Go Fresh market. Older adults, as already described in Chapter 3, are at increased susceptibility to chronic disease with age; and fruits and vegetables are an essential component of their diet for mitigating chronic disease. The need for fruits and vegetables, however, is not met for the majority of older adults in the US. The case is further complicated for older adults living in urban environments such as Springfield that have a high proportion of food desert neighborhoods.

The US Census statistics from 2010 reveal that the older adult population > 65 years old represent 10.9% of Springfield population and 13.8% of Massachusetts population. These percentages are likely to substantially increase with national population trends within the next twenty years, establishing a significant population sector within Springfield.

There is a complex interplay of multiple factors influencing diet quality of older adults. Among older adults in Springfield, Massachusetts, high rates of chronic disease, disability, overweight and obesity, compounded with high percentages of low socioeconomic status, and large proportions of disadvantaged Hispanic and African American populations, creates an overall vulnerability and need for public health attention and advocacy.

According to the Massachusetts Community Health Information Profile (Mass CHIP, 2014) which presents data from the Behavioral Risk Factor Surveillance System

for the period of 2002-2007, Springfield older adults > 65 years have higher rates of chronic disease than Massachusetts overall (see Table 7.1). In Springfield, an overwhelming 83% of older adults are overweight or obese, almost a quarter are diagnosed with diabetes, about a fifth have heart disease, close to 40% have a disability, over 60% have hypertension, more than half have arthritis, and over a third have self reported fair or poor health. Therefore, it is imperative to identify strategies to prevent and manage chronic diseases, obesity, and related disability.

Table 7.1 Physical Health Indicators for Population >65 Years Old (Mass CHIP, 2014)

Physical Health Indicator	Springfield	Massachusetts
Diabetes	22.5%	14.9%
Heart Disease	19.3%	20.1%
High Blood Pressure	60.5%	56.5%
Disability	38.9%	32.4%
Arthritis	57.9%	55.4%
Self-reported Overall Health Status as Fair or Poor Health	34.1%	24.8%
Overweight	59.1%	57.6%
Obese	24.2%	18.2%

Health disparities among varying racial or ethnic groups has been well documented and reflects unequal access to healthful food options (Black et al, 2014). The US census shows that close to 60% of the population of Springfield are either Hispanic/Latino or Black/African American (see Table 7.2). Percentages of people who have completed a bachelor’s degree or higher in Springfield are less than half of values expressed in Massachusetts overall statistics. Median household income in Springfield is

about 50% of Massachusetts median, and poverty rates are about 3 times higher in Springfield compared to Massachusetts.

Table 7.2 Census Information about Total Population in Springfield and Massachusetts (US Census Bureau, 2014)

Category		Springfield	Massachusetts
Race/Ethnic profile (2010)	White alone, not Hispanic or Latino	36.7%	76.1%
	Black or African American alone	22.3%	6.6%
	Hispanic or Latino	38.8%	9.6%
Educational Level Completed (2008-2012)	Graduated from High School	76.1%	89.1%
	Bachelor's degree or higher	16.6%	39.0%
Income	Median Household income (2008-2012)	\$35,163	\$66,658
	Below Poverty Level	28.7%	11.0%

According to county level data on food security, an average of 11.4% of households in Hampden County, where Springfield resides, experienced food insecurity from 2010-2012 (Economic Research Service, Food Environment Atlas, 2015). Food insecurity was defined by the inability to provide adequate food for one or more household members because the household lacked money and other resources for food. In addition, in Hampden County, close to 25,000 seniors in 2010 had low access to stores. (Economic Research Service, Food Environment Atlas, 2015)

The Behavioral Risk Factor Surveillance System data compares fruit and vegetable intake between different adult age groups and race/ethnic groups in

Massachusetts, combining data for 2002-2003, 2005, and 2007. Comparing different demographic subgroups in Springfield, Hispanics have the lowest proportion of adults eating 5 or more servings of fruits and vegetables per day, at 16.9%. Non-Hispanic Asians have the next lowest proportion of people meeting the fruit and vegetable target, at 20.6%, followed by non-Hispanic blacks at 21.2% and non-Hispanic whites at 25.4%. Fruit and vegetable consumption for Asians is surprisingly low, considering they have the highest Massachusetts overall consumption rate, at 31.3% eating 5 or more servings a day. But the statistic on Asians in Springfield may not be reliable since relative standard error is greater than 30%. Nevertheless, compared to statewide data, all ethnic groups in Springfield have lower proportion of people meeting the target for fruit and vegetable intakes. (Mass CHIP, 2014)

Furthermore, according to the Massachusetts Community Health Information Profile, approximately 30% of adults >65 years in Massachusetts live alone (Mass CHIP, 2014). As described in Chapter 4, living alone, especially for men, is a predictor of poor diet quality.

7.3 Study Population: Farmers

The study population for Study 3 was a convenient sample of 16 farmers residing in Hampden, Hampshire, and Franklin Counties. These counties were chosen due to proximity to Springfield; Springfield is located in Hampden County and the other two counties are in proximity to Springfield in the Western Massachusetts Pioneer Valley region.

Small family farms characterize Massachusetts's agriculture, with 80% of farms being family owned and 95% categorized as "small farms" according to the USDA

definition of sales below \$250,000 (Energy and Environmental Affairs, 2015). Thirty two percent of principal farm operators are female, and the average age of a Massachusetts principal operator is 57.8 years old (Energy and Environmental Affairs, 2015).

Massachusetts has experienced a steady increase in number of farms and acres in farmland in recent years, and ranks 5th in the country for direct market sales, which accounts for 10% of the state’s total agricultural sales. In addition, Massachusetts ranks 6th in the country for number of farms with Community Supported Agriculture (CSA) with a 95% increase since 2007. (Energy and Environmental Affairs, Agricultural Resources Facts and Statistics, 2015)

Table 7.3 Franklin, Hampshire, Hampden Farm Statistics

Massachusetts County	Number of Farms	Acres in Farmland	Total Farm Sales
Franklin	780	80,772	\$55,056,000
Hampshire	799	53,951	\$49,229,000
Hampden	582	38,705	\$23,608,000

7.4 Background on Go Fresh Mobile Market

The Go Fresh mobile produce market in Springfield, MA is the focus of this study and represents an organizational MPM model working to improve access to fruits and vegetables. The Go Fresh mobile market in Springfield has been in operation since 2010, marketing affordable fresh fruits and vegetables to various locations in Springfield during the New England growing season, from approximately June to October, using a converted military transport bus. It was first launched in cooperation between four partners: Springfield Housing Authority, Springfield Elder Affairs, Enterprise Farm, and Partners for a Healthier Community. In the first year, the market had 2 stops/week. The

market expanded in the three subsequent years, with 4, 8, and 12 stops in the second, third, and fourth year, respectively. Some of the market stops have included the City Hall, subsidized housing complexes, senior centers, and various community centers. There was originally a farm-to-preschool component that dissolved after the first year, and older adults became the target population.

In the first year of Go Fresh, the market was predominantly under the leadership of Enterprise Farm, a local farm in Hampshire County that supplied the produce, owned the bus, maintained the bus, managed the operations, and provided employees to drive and sell the produce. Partnerships with Gardening the Community and New Lands Farm, two other local farming organizations, were established in the second year, and by the third year, these two farms supplied much of the produce, although still under the leadership of Enterprise Farm.

In April of 2014, Enterprise Farm decided that they could no longer be the lead farm in the project and needed to focus their energy on the farm. In May, New Lands Farm agreed that they would play the role of lead farm. Enterprise Farm would still supply the bus and maintain it, supply the bulk of the produce, and supply some staffing through the interim period. In transitioning Go Fresh out of the leadership of Enterprise Farm, Partners for a Healthier Community took the lead on fulfilling many needs, including fund raising for 2 staff positions, insurance for the market vehicle, and for other supply and gas needs, hiring new drivers and market staff, and figuring out logistics about parking the vehicle and the market route. Go Fresh was also integrated as a project of Live Well Springfield, a community movement to support healthy eating and active living in Springfield.

In addition, the role of Partners for a Healthier Community (PHC) has been to identify the sites of the market, promote the market, and engage people in the neighborhood by collaborating with community liaisons and points of contact. For example, PHC has conducted educational workshops with the Family Resource Center in Springfield, Caring Health Center, Mason Square Task Force, and Vietnamese American Civic Association (VACA). In these workshops they weave in information about the mobile produce market. PHC also connects nutrition education instructors with members of the community, such as finding a Vietnamese colleague to be present with the nutritionist at the VACA market stop. Some other educational tasks of PHC include providing recipes for the bus and the website, food facts, and food storage tips.

By 2015, the Go Fresh leadership team had evolved to include the Mason Square Task Force, who became the fiscal manager to receive and manage grant funding. Go Fresh is currently a multi-organizational endeavor. In 2015, partners included Concerned Citizens for Mason Square, Partners for a Healthier Community, Department of Elder Affairs for the City of Springfield, Springfield Housing Authority, Gardening the Community, New Lands Farm, Mason Square Health Task Force, and Common Capital. In 2015, they obtained and remodeled a donated vehicle to replace the old bus. At the end of October, 2015, Go Fresh completed their sixth market season.

Throughout the seven years it's been in existence, Go Fresh has been able to offer many financial incentives for Go Fresh customers. All of the produce has been marketed at competitive prices similar to or less than local supermarket prices. Senior Farmers Market Coupons, WIC vouchers, and SNAP dollars have all been accepted at Go Fresh.

In addition, Springfield Elder Affairs provided funding to allow Go Fresh produce to be offered at 50% discount for all SNAP EBT card users in 2014 and 2015 seasons.

In 2014, Go Fresh operated three days a week and served 12 locations (Table 7.4) and in 2015, Go Fresh operated four days a week and served 12 locations again, although four of the sites were new (Table 7.5). Table 7.4 with 2014 Go Fresh locations is a useful reference for Study 2, since customers were recruited from these sites to complete our survey. Table 7.5 with 2015 Go Fresh locations is a useful reference for Study 1, since food environment surveys were conducted around these sites. Market sites from both years with 2010 Environmental Justice Population data are depicted in Figure 7.3.

Table 7.4 Go Fresh 2014 Market Locations and Hours

Go Fresh 2014 Market Sites	Neighborhood	Hours
Saab Court	Metro Center	Wednesdays 10-11am
Clodo Concepcion Community Center	Sixteen Acres	Wednesdays 12:30-1:30pm
Puerto Rican Cultural Center	Six Corners	Wednesdays 2-3pm
Robinson Gardens	Pine Point	Wednesdays 4-5pm
Vietnamese American Civic Association	Forest Park	Thursdays 10-11am
Caring Health Center	Metro Center	Thursdays 12-1pm
Gentile Apartments	South End	Thursdays 2-3pm
Independence House	Pine Point	Thursdays 4-5pm
Linden Towers	Liberty Heights	Fridays 10-11am
Court Square	Metro Center	Fridays 12-1:30pm
New North Citizen's Council	Memorial Square	Fridays 2-3pm
Colonial Estates	Sixteen Acres	Fridays 4-5pm

Table 7.5: Go Fresh 2015 Market Locations and Hours

Go Fresh 2015 Market Site	Neighborhood	Hours
Linden Towers	Liberty Heights	Wednesdays 10:30-11:30 am
Springfield Technical Community College	McKnight	Wednesdays 12:00-3:00 pm
Saab Court	Metro Center	Thursdays 10:30-11:30 am
Caring Health Center	Metro Center	Thursdays 12:15-2:00 pm
Gentile Apartments	South End	Thursdays 2:30-3:30 pm
Gardening the Community Farm Stand	Old Hill	Thursdays 3-6 pm
Baystate Place	Liberty Heights	Thursdays 4:15-5:30 pm
East Springfield Library	East Springfield	Fridays 10:30-11:30 am
Clodo Concepcion Community Center	Sixteen Acres	Fridays 10:30-11:30 am
Independence House	Pine Point	Fridays 2:00-3:30 pm
Court Square	Metro Center	Fridays 4:15-5:30 pm
Concerned Citizens of Mason Square Farmer's Market	Old Hill	Saturdays 10:00-2:00 pm

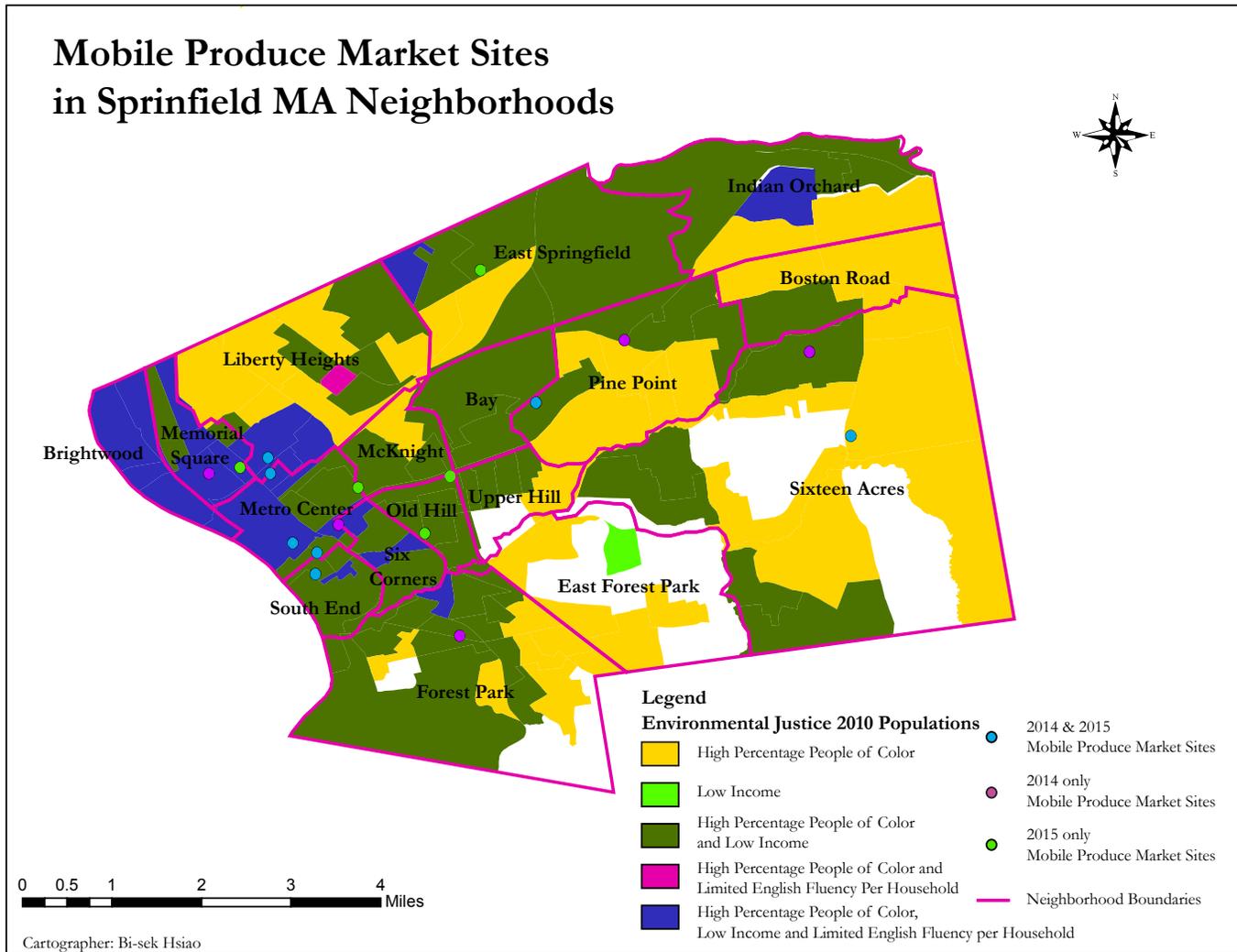


Figure 7.3: Springfield Environmental Justice Data with Go Fresh Sites
 Data layer Sources: (City of Springfield, 2015; Massachusetts Office of Geographic Information, 2012)

CHAPTER 8

THE FOOD ENVIRONMENT CONTEXT OF GO FRESH MOBILE PRODUCE MARKET IN SPRINGFIELD, MA

8.1 Introduction

Fruits and Vegetables are important for the maintenance of healthy weight and the prevention of chronic disease (Boeing et al., 2012; Hung et al., 2004). They are nutrient dense, allowing one to obtain adequate nutrition in the diet without excessive weight gain (Di Noia, 2014), and contain antioxidants and phytochemicals that reduce the inflammatory response involved in many disease states (Nicklett et al., 2012; Liu et al., 2000). While the Center for Disease Control recommends consuming fruit at least 2 times a day and vegetables at least 3 times a day (CDC Morbidity and Mortality Weekly Report, 2010), national data shows the U.S. population to consume fruit only 1.1 times and vegetables only 1.6 times a day (CDC State Indicator Report, 2013). One barrier to adequate consumption is the lack of availability of fruits and vegetables in many neighborhoods of residence, particularly in food desert areas that lack supermarket or grocery stores carrying fruits and vegetables (USDA Report to Congress, 2004). Food environment research has revealed disparities of access to fruits and vegetables, documenting areas with high low-income and minority populations having disproportionately fewer supermarkets and large grocery stores, and greater numbers of fast food restaurants and availability of energy-dense foods (Larson et al., 2009). Interventions involving the introduction of supermarkets, grocery stores, farmers markets, and community gardens have been used to improve community access to fruits and vegetables (USDA ERS Report to Congress, 2009). In recent years, many organizations

have opened or supported operations of Mobile Produce Markets (MPM), portable fruit and vegetable markets, to improve fruit and vegetable access (Zepeda et al., 2014). MPM require less investment compared to brick and mortar stores, and can easily travel to reach areas of greatest need (Widener et al., 2012). Recent literature has documented MPM interventions at schools (Tester et al., 2010) and in low-income residential areas with few stores (Jennings et al., 2012; Evans et al., 2012). The Veggie Mobile in Troy, NY, for example, travels to more than 30 locations a week, including many low-income neighborhoods, and offers 50-75 varieties of seasonal fruits and vegetables at wholesale costs that are on average 48% lower than supermarket prices (AbuSabha et al., 2011). Cities like New York City, Chicago, and San Francisco have supported individual MPM vendors by making available more vending permits, reducing costs for permits, and granting access to more areas to roam like city parks (Tester et al., 2010). MPM studies have shown their potential for increasing fruit and vegetable consumption and purchasing among shoppers (AbuSabha et al., 2011; Evans et al., 2012; Jennings et al., 2012; Zepeda et al., 2014).

The importance of the placement of MPM to reach populations and areas of need has been highlighted in recent studies of Green Carts, MPMs in New York City (Li et al., 2014; Lucan et al., 2011). These studies utilized community food environment data, assessing the number and type of stores in vicinity of MPMs, and found that only 57% of Green Carts covered areas of limited access to fruits and vegetables (Lucan et al., 2011), and that they tended to cluster around areas with greater commercial activity (Li et al., 2014), suggesting a need for more support to distribute vending to more areas of need. To our knowledge, no MPM study has assessed the consumer food environment context—

the amount, type, and variety of food—around MPMs. Food environment researchers have discussed the importance of multi-dimensional approaches to assessing food environment, i.e. simultaneously examining the community and consumer food environment by mapping food stores and measuring food in stores (Rose et al., 2010). The purpose of this study is to examine the food environment context of Go Fresh MPM in Springfield, MA through a multi-dimensional approach of including community and consumer food environment data. The number and type of food stores in half-mile radius areas around Go Fresh has been previously documented (Ratchford, 2015). The objectives of the current study are: 1) To determine the number of food stores in half-mile radius areas with any availability of fruits and vegetables by form (i.e., fresh, frozen, canned, juiced) and variety as defined by the 2010 Dietary Guidelines for Americans (i.e., fruit, dark green vegetable, red/orange vegetable, legume, other vegetable, starchy vegetable) (USDHHS and USDA, 2015), and to identify the common types of fruits and vegetables available in stores (e.g. fresh tomatoes); 2) To describe and compare fruit and vegetable availability and variety by type of food store in half-mile radius study areas; 3) To compare fruit and vegetable availability and variety between half-mile radius study areas. Understanding the context of a MPM or any other nutrition intervention facilitates organizational planning and evaluation of project impact.

8.2 Methods

8.2.1 Setting

Half-mile radius areas around Go Fresh MPM locations in Springfield, MA are the focus of this study. Go Fresh is a not-for-profit multi-organizational collaboration that aims to improve access to locally grown fruits and vegetables, in areas of Springfield

with high percentage low income population, low access to transportation, and limited grocery stores. In 2015 Go Fresh brought an average of 20 types of fresh, local fruits and vegetables four days a week from July 1 to October 31 to 12 locations, including subsidized housing complexes, senior centers, and other sites of congregation such as East Springfield Library. SNAP dollars are accepted at the market, and users receive 50% discount on all produce.

More than half of Springfield is considered a food desert; the Environment Research Service's Food Access Research Atlas shows that more than half of Springfield census tracts have a low-income population living half-mile away from a grocery store, including 25% of areas being > 1 mile away from a grocery store (ERS, 2016). One study of the consumer food environment in the North End neighborhood of Springfield calculated NEMS-S scores (0- least healthful to 50-most healthful) for stores and found that the vast majority of stores had scores under 10, with the maximum being 13, showing overall low healthful food availability (Creely et al., 2008). Behavioral Risk Factor Surveillance System data for Springfield shows that less than 26% of all ethnic groups consume 5 or more fruits and vegetables a day, with Hispanics having the lowest proportion at 16.9% (Mass CHIP, 2014).

8.2.2 Research Design

We conducted in-store food audits using the Community-Nutrition Environment Evaluation Data System (C-NEEDS) tool from April to June, 2015, in half-mile radius areas surrounding 10 confirmed 2015 Go Fresh MPM sites and 3 potential future sites (13 total study areas). We chose half-mile radius areas because the half-mile range of food access is consistent with USDA's criteria for food desert classification in densely

populated urban areas, as it designates walking range of food access for urban dwellers (Economic Research Service, 2009); it also provided a consistent and workable geographical frame in face of variability of Springfield neighborhood sizes from 0.5 square miles to 8 square miles (City-Data, 2013).

8.2.3 Research Instrument: C-NEEDS

C-NEEDS is a validated food environment assessment tool adapted from Nutrition Environment Measures Survey in Stores (NEMS-S) (Glanz, Sallis, Saelens, & Frank, 2007) for the Northeast region of the U.S. to include regionally available food, canned and frozen food, food common to Latino/Hispanic populations, and nutrient data such as type of fat, micronutrients, and fiber for some foods (Olendski et al., 2015; Wedick et al., 2015). C-NEEDS collects information on availability, price, quality, and nutrient content of a variety of types of healthful and less healthful foods and beverages, including milk, fruit, vegetables, beans, grains, meat, poultry, hot dogs, frozen dinners, frozen deserts, baked goods, nuts, juice, soda, chips, bread, cereal, bread, yogurt and cheese.

8.2.4 Dietary Availability: Fruit and Vegetables

The current study focuses only on the fruit and vegetable component of C-NEEDS data, including fresh fruit and vegetables, canned and frozen fruits and vegetables, canned beans, and 100% orange juice (Table 8.1). We added one item of edamame soybeans to our evaluation of vegetables, which was on an addendum to the survey that included alternative protein foods for comprehensive food environment research.

Table 8.1: C-NEEDS fruit and vegetable sections and healthful food items

Fruit and Vegetable Category (C-NEEDS Sections)	C-NEEDS Healthful Fruit and Vegetable Items
Fresh Fruit (Measure #2)	Apples, bananas, cantaloupe, grapes, navel oranges, peaches, berries, raisins, watermelon, pears, avocado
Fresh Vegetables (Measure #3)	Carrots, tomatoes, sweet peppers, broccoli, lettuce, celery, cucumbers, cabbage, dark leafy greens, cauliflower
Canned Fruit (Measure #5)	Any canned fruit in 100% fruit juice
Canned Vegetables (Measure #5)	Corn, green beans, carrots, peas
Frozen Fruit (Measure #7)	Berries (no sugar added), mixed fruit (no sugar added)
Frozen Vegetables (Measure #6)	Corn, corn (with butter), green beans, carrots, peas, broccoli, broccoli (with cheese), spinach (with cream), mixed vegetables
Canned Beans (Measure #4)	Black beans, kidney beans, chickpeas
Juice (Measure #12)	100% orange juice

8.2.5 Data Collection

We mapped study areas onto Google Maps and established all streets and boundaries. Prior to data collection, all researchers were trained to use the C-NEEDS tool and conducted a pilot test outside of the study region to ensure inter-surveyor reliability. The pages of the survey instrument were divided among the two to three surveyors present, with each researcher collecting data from the same section of the survey instrument when possible at each store to ensure consistency of data collection. Two to three researchers worked together and walked all the streets in the study areas to identify all stores carrying food (n=47). Researchers asked permission from the store manager before proceeding with the store audit; data was not collected from a store if the manager refused or could not speak English (n=4), leaving a final sample of 43 stores.

8.2.6 Data Analysis:

As reported previously, food stores were classified according to common definitions of food store types (Table 8.2), and the number and type of food stores were

counted in each ½ mile radius study area (Ratchford, 2015). We identified and counted stores with any availability of fruit and vegetable items listed on the C-NEEDS survey (see Table 1). We classified C-NEEDS fruit and vegetable items into 2015 DGA categories for fruits and vegetables that have been associated with positive health outcomes (USDHHS & USDA, 2015) (see Table 8.3), then identified and counted stores with any availability of items in each group. We created a Fruits and Vegetables Availability Score for each store based on the total number of healthful fruit and vegetable items listed on the C-NEEDS survey (n=43), allocating one point for each item (Max total points=43), and establishing maximum points for each of the six 2015 DGA fruit and vegetable categories (Table 8.3). We determined cumulative scores per half-mile study area to account for the fruit and vegetable contributions from all stores in the area. Scores were used to compare fruit and vegetable availability and variety between store types and between half-mile study areas. Stores where data was not collected (n=4) were excluded from the study.

Table 8.2: Classification of Food Store Types

Food Store Type	Definition
Supermarket	Corporate chain stores; large in size (>20,000 square feet); provide full line of groceries, meat, produce; annual sales ≥ \$2 million (Moorland et al., 2002)
Grocery	Non-corporate owned; smaller than supermarket; sales below \$1 million; provide general line of food (Moorland et al., 2002)
Convenience Store	Small stores with limited selection and variety of food; food items are primarily bread, milk, and snack foods (Sharkey et al., 2010; Whittington, 2013)
Gas Station Convenience Store	Stores at gas stations with limited selection of food.
Pharmacy	Typically a chain store; retail shop selling medicine and other items, and small

	selection of food (Sharkey et al., 2010; Whittington, 2013)
Dollar Store	Small variety store; sells general merchandise and food at low prices (Sharkey et al., 2010; Whittington, 2013)
Specialty Market Italian	Store specializing in ethnic/international food (Liebtag, 2005)
Specialty Market African	Store specializing in ethnic/international food (Liebtag, 2005)
Small Produce Business	Small grocery store mainly selling fruits and vegetables (Whittington, 2013)

Adapted from Ratchford, N. (2015, p 64-65)

Table 8.3: DGA 2015 categories for fruits and vegetables and derivation of Fruits and Vegetables Availability Score

2015 DGA fruit and vegetable categories (Fruits and Vegetables Availability Score points)	C-NEEDS food item
Fruit (Max Points: 15)	Apples, bananas, cantaloupe, grapes, navel oranges, peaches, berries, raisins, watermelon, pears, avocado, any canned fruit in 100% juice, frozen berries (no sugar added), frozen mixed fruit (no sugar added), 100% orange juice.
Dark Green Vegetables (Max Points: 7)	Broccoli (fresh, frozen, frozen with cheese), spinach (fresh, frozen, frozen with cheese), Green leaf lettuce such as romaine.
Red or Orange Vegetables (Max Points: 4)	Tomatoes and carrots (fresh, frozen, and canned).
Legumes (Max Points: 4)	Kidney beans, black beans, chickpeas, edamame.
Other vegetables (Max Points: 8)	Green beans (frozen, canned), pepper, celery, cabbage, cauliflower, cucumbers, mixed vegetables (frozen).
Starchy Vegetables (Max Points: 5)	Corn (canned, frozen, frozen with butter), peas (canned, frozen)

8.3 Results

A total of 43 stores in 13 half-mile radius areas located in 7 of Springfield’s 17 neighborhoods were surveyed. Convenient stores were the most prevalent store type surveyed (n=15), and the least prevalent included a supermarket (n=1), dollar store (n=1), African specialty market (n=1), and small produce business (n=1) (Table 8.4). The number of food stores in each half-mile radius study area ranged from 0 to 17 and reflected a mix of store types. (Ratchford, 2015)

Table 8.4: Number of Store Types in Research Areas (n=43)

Store Type	Frequency (Percent)
Supermarket	1 (2.3%)
Grocery	5 (11.6%)
Convenience Store	15 (34.9%)
Gas Station Convenience Store	12 (27.9%)
Pharmacy	4 (9.3%)
Dollar Store	1 (2.3%)
Specialty Market, Italian	3 (7.0%)
Specialty Market, African	1 (2.3%)
Small Produce Business	1 (2.3%)

Fruit juice (100% orange juice) was the most prevalent form of fruits and vegetables, available in 91% of stores (n=39), followed by canned vegetables (n=34 stores; 79.1%), canned beans (n=32 stores; 74.4%), and canned fruit in 100% juice (n=31 stores; 72.1%); the least number of stores sold frozen fruit (n=3; 7.0%) (Figure 8.1).

Banana was the most common type of fresh fruit, found in all 23 stores with fresh fruit available. Lettuce and tomatoes were the most common types of fresh vegetables, both found in 15 of 16 stores with any fresh vegetables.

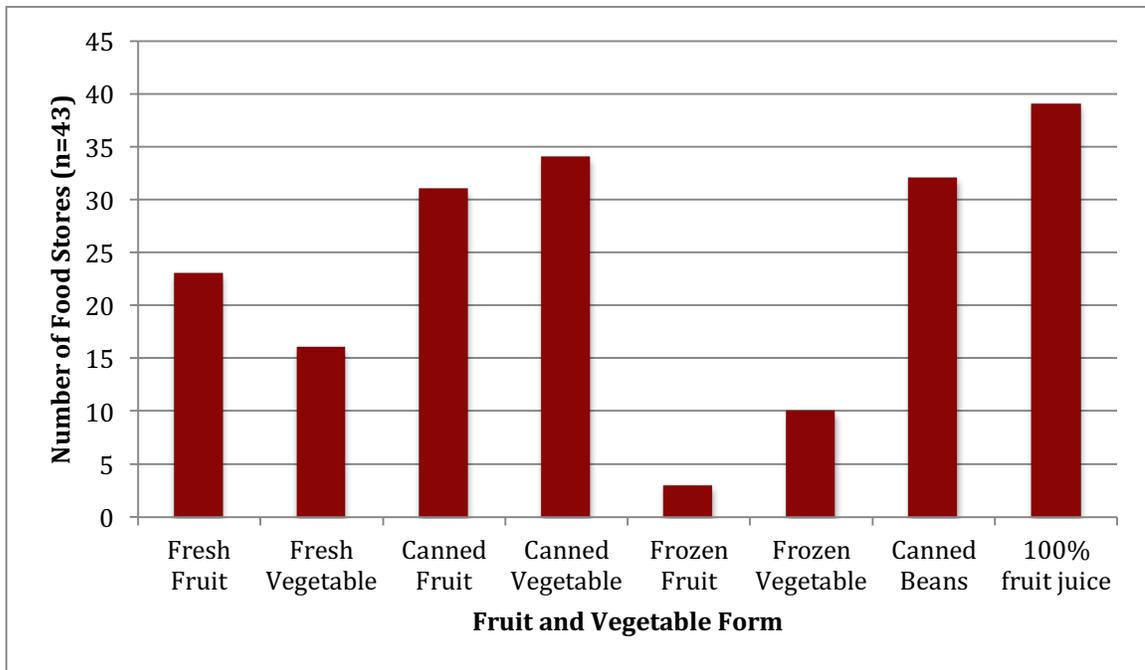


Figure 8.1: Fruit and Vegetable Availability: number of food stores by fruit and vegetable form

Determining availability by 2015 DGA fruit and vegetable groups showed that almost all stores carried an item of fruit (n=42; 98%), and the least number of stores carried any dark green vegetables (n=12; 27.9%) (Figure 8.2). Spinach was the most common type of dark green vegetable, found either frozen or canned in 8 stores. Fresh tomatoes (n=15) and canned carrots (n=14) were the most common types of red/orange vegetables, found in 15 and 14 stores, respectively, of 21 (48.8%) stores with red/orange vegetables. Canned black beans were the most common type of legume, found in 27 of 32 stores with any legumes. Canned green beans were the most common type of other vegetable, available in 27 of 34 stores with other vegetables. Canned corn was available in 29 stores and canned peas in 24 stores, representing the most common types of starchy vegetables of 32 stores with any starchy vegetables.

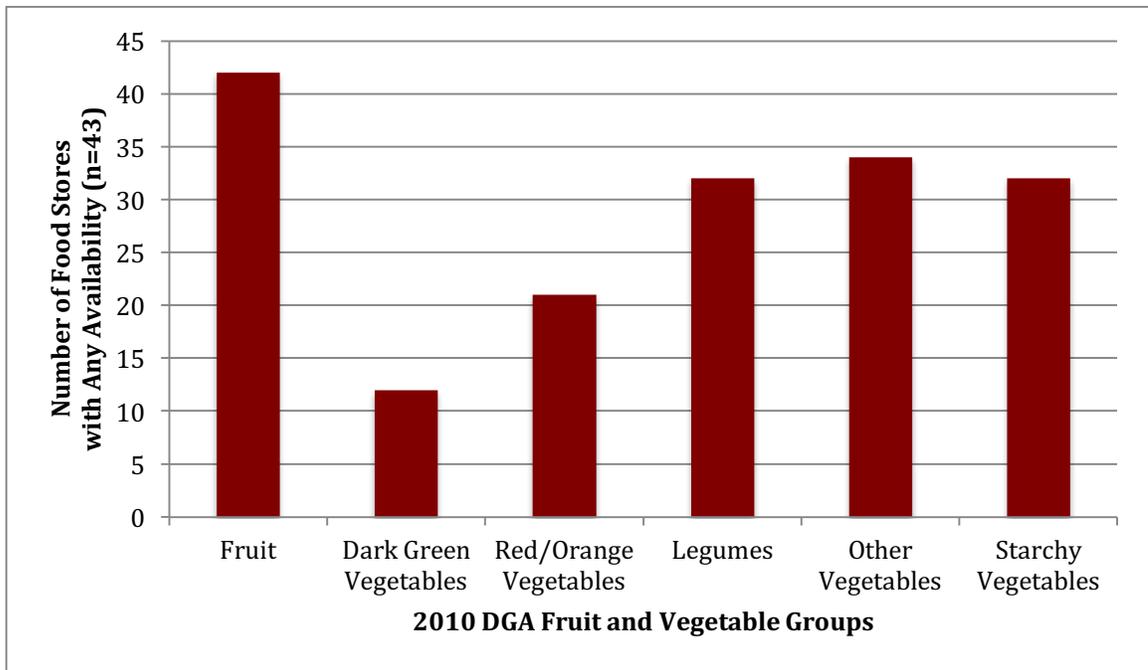


Figure 8.2: Fruit and Vegetable Availability and Variety: number of food stores by 2015 DGA fruit and vegetable categories

Table 8.5 describes proportion of each store type with any availability of fruits and vegetable items by categories. The one supermarket surveyed had the highest availability, having at least one item from all fruit and vegetable categories. Grocery stores had the next highest availability; the greatest void being frozen fruit that was available in only 40% of stores. Convenience stores consistently supplied canned fruit and vegetables, canned beans, and orange juice, but were inconsistent in availability of fresh fruit, fresh vegetables, and frozen vegetables, and altogether lacked frozen fruit; many convenience stores were missing dark green and red/orange varieties of vegetables. All gas station convenience stores supplied some item of fruit and 100% orange juice, but many were lacking in other categories, particularly fresh and dark green vegetables. Pharmacies and dollar stores similarly showed availability of canned vegetables and orange juice, but no fresh or frozen fruits and vegetables, including no dark green

vegetables. Italian specialty markets only consistently carried canned beans/legumes, and 2 of 3 stores carried orange juice/fruit; otherwise no other items of fruits and vegetable were available. The one African specialty market had one item of fruit (plantain) and vegetable (tomato), and some canned beans and vegetables, but no other items on the survey. The small produce business supplied fresh fruits and vegetables, canned beans, and orange juice, but lacked frozen fruits and vegetables, and canned vegetables; it supplied some item of all DGA categories except starchy vegetables.

Comparing average Fruits and Vegetables Availability Scores by store types shows supermarkets receiving the highest score of 43 points, followed by grocery stores (24.8 pts.) and small produce business (24 pts.). Gas station convenience stores, dollar stores, pharmacies, and specialty markets all had average scores (range 3 pts. to 8 pts.) that were less than 20% of the maximum score. (Table 8.6; Figure 8.3).

Table 8.5: Fruit and Vegetable Availability by Food Store Type

Food Store Type	Frequency (Percent) of Each Food Store Type with Any Availability, Categorized by Forms of Fruits and Vegetables								Frequency (Percent) of Each Food Store Type with Any Availability, Categorized by 2015 DGA Categories					
	Fsh F	Fsh V	CF	CV	Fz F	Fz V	CB	OJ	F	DGV	ROV	L	OV	SV
Supermarket (n=1)	1 (100)	1 (100)	1 (100)	1 (100)	1 (100)	1 (100)	1 (100)	1 (100)	1 (100)	1 (100)	1 (100)	1 (100)	1 (100)	1 (100)
Grocery (n=5)	4 (80)	5 (100)	4 (80)	5 (100)	2 (40)	4 (80)	5 (100)	3 (60)	5 (100)	4 (80)	4 (80)	5 (100)	5 (100)	5 (100)
Convenience Store (n=15)	9 (60)	7 (44)	15 (100)	13 (87)	0	5 (33)	15 (100)	15 (100)	15 (100)	5 (33)	9 (60)	15 (100)	13 (87)	13 (87)
Gas Station Convenience Store (n=12)	7 (58)	1 (8)	7 (58)	9 (75)	0	0	4 (33)	12 (100)	12 (100)	1 (8)	4 (33)	4 (33)	8 (67)	8 (67)
Pharmacy (n=4)	0	0	2 (50)	4 (100)	0	0	1 (25)	4 (100)	4 (100)	0	0	1 (25)	4 (100)	4 (100)
Dollar Store (n=1)	0	0	1 (100)	1 (100)	0	0	1 (100)	1 (100)	1 (100)	0	1 (100)	1 (100)	1 (100)	1 (100)
Specialty Market Italian (n=3)	0	0	0	0	0	0	3 (100)	2 (67)	2 (67)	0	0	3 (100)	0	0
Specialty Market African (n=1)	1 (100)	1 (100)	0	1 (100)	0	0	1 (100)	0	1 (100)	0	1 (100)	1 (100)	1 (100)	0
Small Produce Business (n=1)	1 (100)	1 (100)	1 (100)	0	0	0	1 (100)	1 (100)	1 (100)	1 (100)	1 (100)	1 (100)	1 (100)	0

Key:
 Fsh F: Fresh Fruit
 Fsh V: Fresh Vegetables
 CF: Canned Fruit
 CV: Canned Vegetables
 FF: Frozen Fruit
 FV: Frozen Vegetables
 CB: Canned Beans
 OJ: Orange Juice
 F: Fruit
 DGV: Dark Green Vegetables
 ROV: Red/Orange Vegetables
 L: Legumes
 OV: Other Vegetables
 SV: Starchy Vegetables

Table 8.6: Average Fruits and Vegetables Availability Scores by food store types

Food Store Type	Average Fruits and Vegetables Availability Scores						
	Fruit (15 pt. max)	DGV (7 pt. max)	ROV (4 pt. max)	L (4 pt. max)	OV (8 pt. max)	SV (5 pt. max)	Total Score (43 pt. max)
Supermarket (n=1)	15	7	4	4	8	5	43
Grocery (n=5)	8	2.2	2.6	2.8	5.8	3.4	24.8
Convenience Store (n=15)	4.1	0.5	1.1	2.6	2.1	1.6	12
Gas Station Convenience Store (n=12)	3.3	0.2	0.3	0.7	1.1	1	6.5
Pharmacy (n=4)	2.5	0	0	0.3	1	2	5.8
Dollar Store (n=1)	3	0	1	1	1	2	8
Specialty Market Italian (n=3)	0.7	0	0	2.3	0	0	3
Specialty Market African (n=1)	1	0	1	2	2	0	6
Small Produce Business (n=1)	11	3	2	3	5	0	24

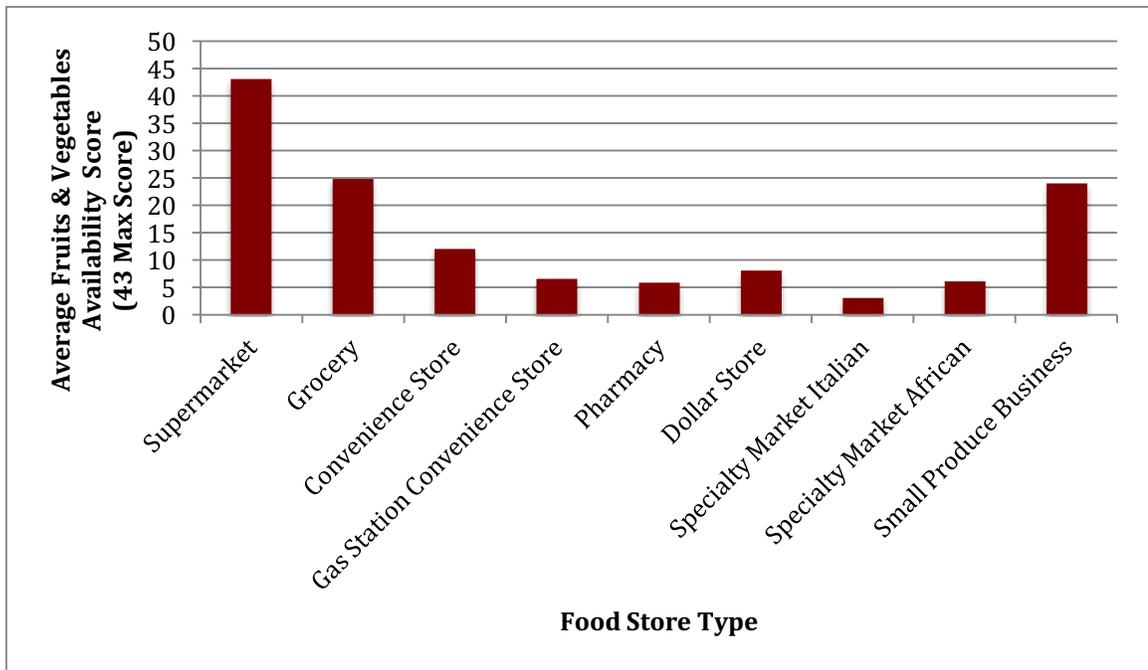


Figure 8.3: Average Fruits and Vegetables Availability Score by Food Store Type

Dark green vegetables contributed the fewest points to the total score in each study area. Cumulative Fruits and Vegetables Availability Scores varied between half-mile radius study areas and ranged from 0 to 148 points (Table 8.7; Figure 8.4). Study areas around Independence House and Colonial Estates had a score of zero due to lack of any food stores. Outing Park Apartments, a potential Go Fresh site, had the highest points and the greatest number of food stores, although there was no supermarket. Scores tended to increase with the number of food stores (Figure 8.5).

Table 8.7: Number and type of food stores, and Fruits and Vegetables Availability Scores for each study area

2015 Go Fresh Sites (1/2 mile Radius Study Areas)	Neighborhood	Number and Type of Stores	Cumulative Fruits and Vegetables Availability Scores for each study area
Linden Towers	Liberty Heights	Total Stores Surveyed: 6 C: 4	Fruit: 22 Dark Green Vegetables: 3 Red/Orange Vegetables: 5

		CGas: 2	Legumes: 13 Other Vegetables: 11 Starchy Vegetables: 6 Total Score: 60
Springfield Technical Community College	McKnight	Total Stores Surveyed: 7 G: 3 C: 1 CGas: 2 Pharm: 1	Fruit: 40 Dark Green Vegetables: 8 Red/Orange Vegetables: 10 Legumes: 12 Other Vegetables: 27 Starchy Vegetables: 19 Total Score: 116
Saab Court	Metro Center	Total Stores Surveyed: 6 G: 1+1* C: 3 CGas: 2	Fruit: 30 Dark Green Vegetables: 5 Red/Orange Vegetables: 8 Legumes: 14 Other Vegetables: 18 Starchy Vegetables: 8 Total Score: 83
Caring Health Center	Metro Center	Total Stores Surveyed: 11 G: 2 C: 2+1* CGas: 2 D: 1* Pharm: 1 SMI: 3 SMA: 1	Fruit: 30 Dark Green Vegetables: 5 Red/Orange Vegetables: 8 Legumes: 21 Other Vegetables: 16 Starchy Vegetables: 12 Total Score: 92
Gentile Apartments	South End	Total Stores Surveyed: 16 G: 2 C: 5 CGas: 4 D: 1* SMI: 3 SMA: 1 SPB: 1	Fruit: 54 Dark Green Vegetables: 8 Red/Orange Vegetables: 10 Legumes: 32 Other Vegetables: 22 Starchy Vegetables: 12 Total Score: 138
Baystate Place	Liberty Heights	Total Stores Surveyed: 7 C: 5 CGas: 2	Fruit: 27 Dark Green Vegetables: 5 Red/Orange Vegetables: 7 Legumes: 16 Other Vegetables: 14 Starchy Vegetables: 8 Total Score: 77
East Springfield Library	East Springfield	Total Stores Surveyed: 2 C: 1	Fruit: 6 Dark Green Vegetables: 1 Red/Orange Vegetables: 2

		CGas: 1	Legumes: 3 Other Vegetables: 5 Starchy Vegetables: 3 Total Score: 20
Clodo Concepcion Community Center	Sixteen Acres	Total Stores Surveyed: 5 S: 1 CGas: 1 Pharm: 2 D: 1	Fruit: 31 Dark Green Vegetables: 7 Red/Orange Vegetables: 7 Legumes: 5 Other Vegetables: 13 Starchy Vegetables: 13 Total Score: 76
Independence House	Pine Point	Total Stores Surveyed: 0	Total Score: 0
Court Square	Metro Center	Total Stores Surveyed: 9 G: 1 C: 2+1* CGas: 1 Pharm: 1 SMI: 3 SMA: 1	Fruit: 23 Dark Green Vegetables: 2 Red/Orange Vegetables: 4 Legumes: 18 Other Vegetables: 11 Starchy Vegetables: 10 Total Score: 68
Concerned Citizens of Mason Square Farmers' Market	Old Hill	Data Not collected	NA
Gardening the Community Farm Stand	Old Hill	Data Not collected	NA
Robinson Gardens (Potential Site)	Pine Point	Total Stores Surveyed: 3 C: 2 CGas: 1	Fruit: 15 Dark Green Vegetables: 2 Red/Orange Vegetables: 4 Legumes: 6 Other Vegetables: 9 Starchy Vegetables: 7 Total Score: 43
Colonial Estates (Potential Site)	Sixteen Acres	Total Stores: 0	Total Score: 0
Outing Park Apartments Community Offices South End (Potential Site)	South End	Total Stores Surveyed: 17 G: 2 C: 5+1* CGas: 5 D: 1*	Fruit: 58 Dark Green Vegetables: 8 Red/Orange Vegetables: 10 Legumes: 35 Other Vegetables: 23 Starchy Vegetables: 14

		SMI: 3 SMA: 1 SPB: 1	Total Score: 148
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* Data was not collected from these food stores

Key:

S= Supermarket

G=Grocery

C= Convenience store

CGas=Gas station convenience store

Pharm= Pharmacy

D= Dollar Store

SMI= Specialty Market, Italian

SMA= Specialty Market, African

SPB= Small Produce Business

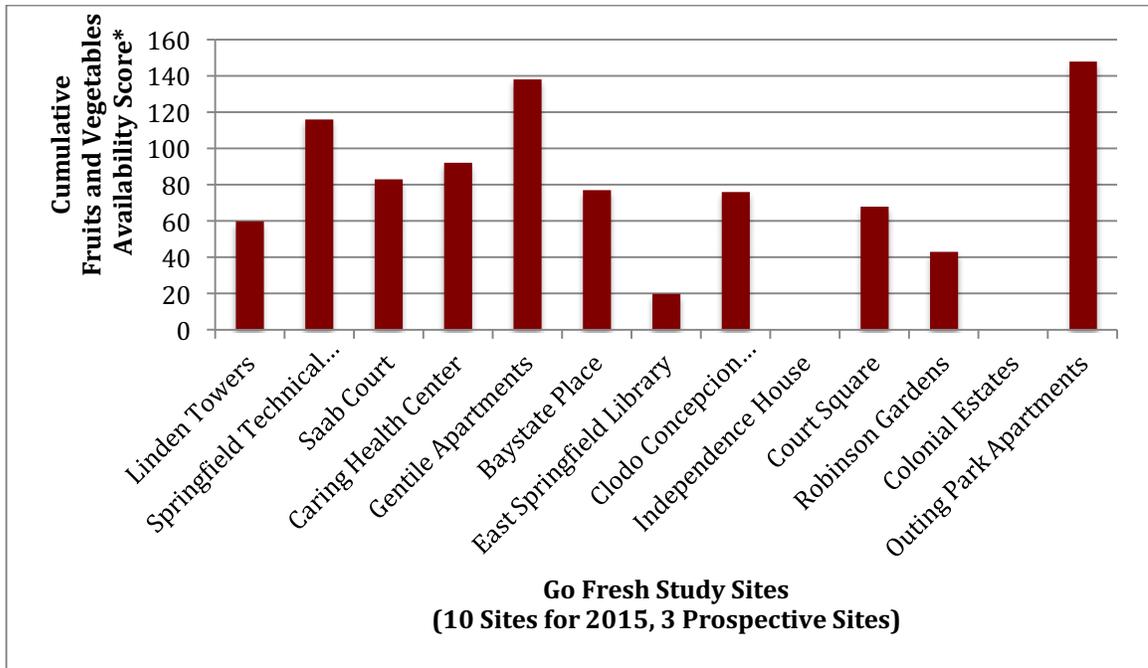


Figure 8.4: Fruits and Vegetables Availability Score by Go Fresh Study Sites

* Cumulative Fruits and Vegetables Availability Score= the sum of all Fruits and Vegetables Availability Scores for all stores in one half-mile radius area

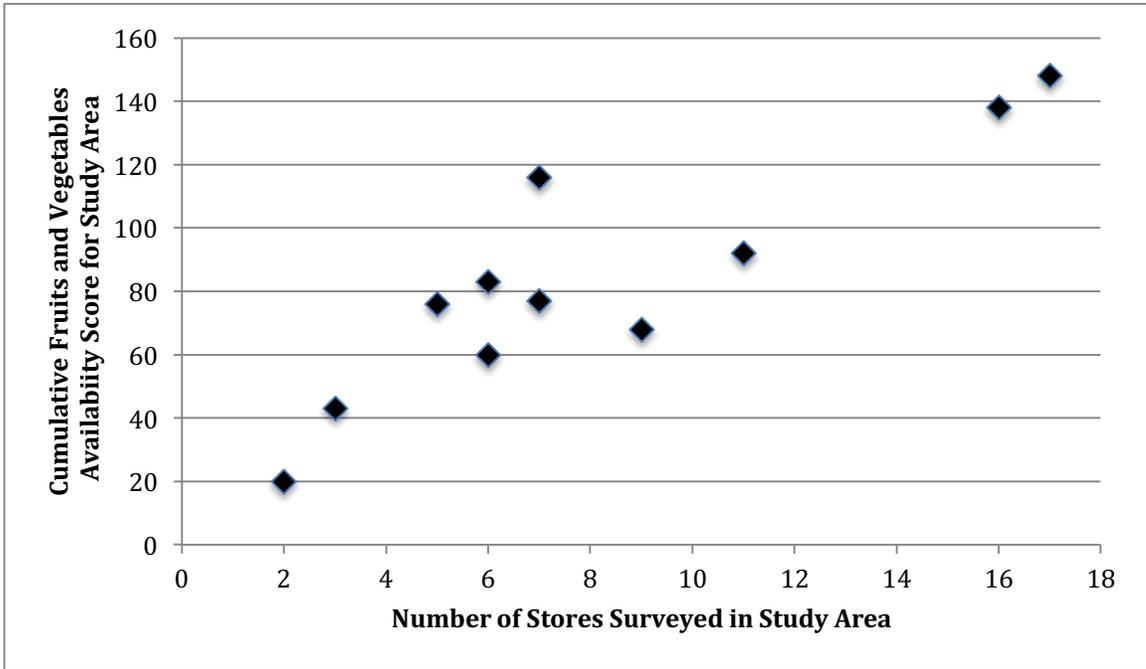


Figure 8.5: Number of Stores in Study Area by Cumulative Fruits and Vegetables Availability Score

8.4 Discussion

Almost all stores in our study areas carried some form of fruit (n=42, 98%), with 100% orange juice (n=39, 91%) and canned fruit (n=31, 71%) being the most common forms. Canned vegetables (n=34, 79.1%) and canned beans (n=32, 74.4%) were most commonly forms of vegetables found in stores, which were most represented by canned green beans, corn, peas, and black beans, and accounted for legumes, other vegetables, and starchy vegetables of the 2015 DGA categories. Fresh fruits and vegetables were not consistently available across store types, and were mostly found in the supermarket, grocery stores, and small produce business. Convenience stores varied in their offerings, for example with Fruits and Vegetables Availability Scores ranging from 4 to 28 among the 15 stores surveyed. The supermarkets scored highest (43 pts.) in the average Fruits and Vegetables Availability Score by food store type, while gas station convenience

stores, dollar stores, pharmacies, and specialty markets all had average scores that were less than 20% of the maximum score. Fruits and vegetable availability, which correlated with the number of stores present, also varied between half-mile study areas, from the absence of any availability or stores in areas around Independence House and Colonial Estates, to the presence of 17 stores and 148 total points (representing number of items) of fruits and vegetables around Outing Park Apartments.

Our finding that the supermarket carried the greatest availability and variety of fruits and vegetables, while smaller stores, which are more common in low-income neighborhoods, carry less availability, is supported by other studies (Bodor et al., 2007; Morris et al., 1992; Rose et al., 2009). Our results on availability of fresh fruits and vegetables by store type and variety of fruits and vegetables are similar to a study of fresh fruit and vegetable shelf space in New Orleans, which found supermarkets to have the greatest availability and variety, followed by grocery stores, convenience stores, and drug stores with the least availability and variety (Rose et al., 2009).

While food store types influenced the availability and variety of fruit and vegetables within a study area, it was not the determining factor; even though a supermarket existed in the area around Clodo Concepcion Community Center, the area had a comparatively low cumulative score of 76 points because it only had 5 total stores, with fruits and vegetables not widely available in the other stores. This signals the importance of combining in-store audits with the mapping of store types in food environment research for a more accurate view of food availability. The limitations of focusing just on supermarket and large grocery store presence has been widely discussed, and include arguments similar to our findings, that smaller groceries and convenient

stores often supply healthful food options that if ignored, would underestimate availability of healthful food (Neckerman et al., 2009; Powell, 2009).

Similar to other studies, which found variability in healthful food availability in neighborhood stores (Neckerman et al., 2009; Rose et al., 2009; Sharkey and Horel, 2009), we found that there was variability in availability of fruits and vegetables in convenient stores and specialty markets. We did not find substantial fruit and vegetable availability in pharmacies and dollar stores, which differs from research in Texas that found non-traditional stores, which included dollar stores and pharmacies, to have more fresh and processed fruits and vegetables compared to convenience stores (Bustillos et al., 2009; Sharkey et al., 2010). The difference may be because these studies were conducted in a rural area in a different region of the country, suggesting cross-area variability of supply of fruits and vegetables in these non-traditional outlets.

We found a high percentage of stores selling canned fruits, vegetables, and beans, which is consistent with other studies of food environments in food stores in urban areas (Zenk et al., 2012; Hillier et al., 2012). Our field notes indicated that many stores had signs for Women Infant Children (WIC) food options, particularly around the canned fruits and vegetables, suggesting that WIC vendor policy encouraged stores to carry fruits and vegetables. In 2009, WIC food packages were changed to include fruits and vegetables, and WIC vendors were also required to stock fruits and vegetables, although the expected form (i.e., fresh, frozen, canned) and number of varieties carried by vendors varied by states (Hillier et al., 2012). Studies examining the changes of fruit and vegetable availability in food stores in low-income urban areas after 2009 WIC food package changes found increases in supply of fresh, frozen, and canned fruits and

vegetables (Zenk et al., Hillier et al., 2012), particularly in small stores and pharmacies that did not previously stock fruits and vegetables (Zenk et al., 2012). Unlike these studies, we did not find many stores that supplied frozen fruits (n=3, 7.0%) or vegetables (n=10, 23.3%). Massachusetts WIC vendor policy does not require frozen fruit and vegetables, requiring vendors to have at least 2 flavors of 100% juice, 2 varieties of canned or dried beans, and one item each of fresh fruit, frozen or canned fruit, fresh vegetables, and frozen or canned vegetables. (USDA Massachusetts WIC Program, not dated). Future in-store audits should collect data on whether stores are WIC approved vendors. In addition, studies using consumer food environment data could include an assessment of population demographics to better understand correlations between the types of food in store and demographics. A study of food stores in racially segregated areas in Brooklyn, NY found that fresh produce was limited to white areas while canned and frozen fruits and vegetables were available in most stores (Morland and Filomena, 2007).

There was a lack of availability of fresh fruits and vegetables, found in 53.5% and 37.2% of stores, respectively, and consisted of mostly bananas for fruit and lettuce and tomatoes for vegetables. Go Fresh MPM can improve the availability and variety of fresh fruits and vegetables. Go Fresh can also fill in the void of dark green vegetables, found in the least number of stores (n=12, 27.9%), and were particularly limited in the areas around Linden Towers, Caring Health Center, Baystate Place, East Springfield Library, Court Square, and Robinson Gardens.

Go Fresh can have the most obvious impact to fruit and vegetable availability in the food environment in half-mile study areas with the lowest Fruits and Vegetables

Availability Score; areas around Independence House (0 pts.), Colonial Estate (0 pts.), East Springfield Library (20 pts.), Robinson Gardens (43 pts.), Linden Towers (60 pts.), and Court Square (68 pts.) had cumulative area scores below the median score of 76 pts. (Clodo Concepcion Community Center).

MPM have the potential to intervene at many levels affecting dietary outcomes. They provide an additional and alternative retail source of fruits and vegetables, bring produce closer to urban residential neighborhoods, provide produce at affordable prices less than or similar to supermarkets, act as provider of federal food access programs such as Supplemental Nutrition Assistance Program, and can intervene in personal, social, and political levels by increasing shoppers' nutrition knowledge, and creating spaces to socialize and network (Zepeda et al., 2014). Go Fresh not only brings in an average of 20 varieties of fresh fruits and vegetables a week from July to October, it offers fruits and vegetables at prices less than or equal to supermarket prices, financial incentives such as 50% discount for all EBT users, and nutrition and cooking information through recipe handouts and dietician visits. Future program planning may examine how to continue market offerings in months other than July-October to create more consistency of fruit and vegetable availability in Springfield neighborhoods throughout the year.

8.5 Strengths and Limitations

The study has several strengths. C-NEEDS is a validated and comprehensive food environment assessment tool specifically adapted to the Northeast, and required on-the-ground surveying of stores, which increases the accuracy of data on availability of fruits and vegetables. All of our surveyors were adequately trained before conducting the study and performed a pilot test of C-NEEDS before data was collected, increasing the

reliability. Our use of both community and consumer food environment data provides a more thorough assessment of the study region.

While C-NEEDS is a comprehensive instrument, some important food items were left out, such as canned tomatoes, tomato sauce and salsa, dried beans and lentils, and other common fresh vegetables such as onions. Having a checklist of items limits the audit to specific foods. In our field notes, we documented the availability of uncommon varieties of fruits and vegetables in some stores, such as yucca and malanga. The problem with exclusion of fruit and vegetable types most commonly consumed by ethnic groups on store audit tools has been previously discussed (McKinnon et al., 2009).

Another limitation is the use of a non-standardized scoring system for fruit and vegetable availability by area, and thus, the lack of a standard protocol for identifying areas with greatest need for MPM that can be applied to other urban neighborhoods.

8.6 Implications and Future Directions

Our study found a limited availability of fresh fruits and vegetables in urban neighborhoods, but a high prevalence of stores selling other forms of fruits and vegetables, including 100% orange juice, and canned fruits, vegetables, and beans. Still, there was limited variety of fruit and vegetables, particularly dark green vegetables and red/orange vegetables. MPM can make an impact in urban neighborhoods by filling in the void of missing fresh fruits and vegetables and by supplying a large variety. While the number and type of stores in study areas influenced the cumulative availability of fruits and vegetables in study areas, we found variability in availability and variety of fruits and vegetables in small grocery stores, convenience stores, and specialty markets, pointing to the importance of assessing both the community and consumer food environments.

Future research may work on improving store-audit tools to allow for uncommon and culture-specific varieties of fruits and vegetables to be included. Seasonality of fruit and vegetable availability, which would require repeated store-audits, has been rarely explored in food environment research, and would provide an interesting perspective on the fluidity of food environments. In addition, future research can work to create standardized neighborhood or regional scoring systems for fruit and vegetable availability, which are currently lacking, that can facilitate identification of areas with greater need for MPM.

CHAPTER 9

MOBILE PRODUCE MARKET FACILITATES ACCESS TO FRUITS AND VEGETABLES IN AN URBAN ENVIRONMENT

9.1 Introduction

Fruits and vegetables are important for the prevention and management of chronic diseases (Nicklett and Kadell, 2013; Boeing et al., 2012), yet U.S. national data show that in 2013, <18% of adults in each state consumed the recommended amount of fruit and <14% consumed the recommended amount of vegetables (Moore and Thompson, 2015). Food environment research indicates that availability of fruits and vegetables in neighborhood stores and living in close proximity to a supermarket are associated with increased fruit and vegetable consumption (Gustafson et al., 2012; Morland et al., 2002), while fast food availability is associated with decreased consumption (Fraser et al., 2010). Research across the U.S. shows that low-income and minority neighborhoods have disproportionately fewer supermarkets and healthful food outlets, while surrounded by a larger presence of fast food restaurants and consequentially greater availability of energy-dense foods (Larson et al., 2009; Hilmers et al., 2012). Deficiencies of healthful food environments among low-income and minority populations contribute to their susceptibility to poor health and health disparities (Black et al., 2014).

Mobile produce markets (MPM), portable single-unit fruit and vegetable markets, have received attention in recent years as a promising public health strategy to increase access to and consumption of fruits and vegetables, particularly among populations with greater health risk (AbuSabha et al., 2011; Evans et al., 2012; Jennings et al., 2012; Tester et al., 2012; Tester et al., 2010; Zepeda et al., 2014). A range of target populations

have been described in MPM intervention studies, including elementary school students (Tester et al., 2012), older adults (AbuSabha et al., 2011; Jennings et al., 2012), low income families (Jennings et al., 2012), predominantly Hispanic and Black neighborhoods (Evans et al., 2012), areas of low fruit and vegetable consumption (Jennings et al., 2012; Fuchs et al., 2014; Lucan et al., 2011; Li et al., 2014), areas of low produce availability (Fuchs et al., 2014; Li et al., 2014; Lucan et al., 2011), and areas with high rates of heart disease, stroke and diabetes (Jennings et al., 2012). Older adults are an important target population for MPM because older adults are at increased vulnerability to the cumulative health impediments of chronic diseases (Center for Disease Control and Prevention, 2015), and face additional barriers to obtaining fruits and vegetables, such as being on a fixed income and having physical limitations that limit their ability to reach and shop at distant market (Keller and McKenzie, 2003; Munoz-Plaza et al., 2013).

MPMs offer a cost-effective means to increase the availability of fresh produce in food deserts (Widener et al., 2012) (i.e., low-income census tracts with low access to a supermarket) (United States Department of Agriculture Economic Research Service, 2015). Vending from mobile structures such as trucks and vans has the advantage of avoiding the high overhead costs involved in marketing from stationary store buildings, and require small structural investments and business starting costs, enabling individuals and families, or local community organizations to initiate healthful food market interventions without a large financial burden (Tester et al., 2010; Zepeda et al., 2014; Widener et al., 2012).

Studies of the food environment-diet relationship most commonly use the availability of healthful food as an indicator of access; either through macro-level measures such as supermarket presence, or micro-level measures such as in-store food audits (Caspi et al., 2012). However, many nuances related to how people access healthful food are often missed, such as perceptions of access, the temporal availability of food outlets (e.g., store hours) (Chen and Kwan, 2015), and the pricing, placement, and promotion of food (Kelly et al., 2011). The *five dimensions of access*, first proposed as a framework for measuring access to health care (Penchansky and Thomas, 1981), has recently been proposed to guide more comprehensive measures of access to healthful food (Caspi et al., 2012). Caspi and colleagues define the *five dimensions of access*—*availability, accessibility, affordability, acceptability, and accommodation*—in relation to food access: *availability* refers to the supply of food, including amount, type, and variety, and the presence of certain store types; *accessibility* refers to the location of the food supply and the convenience of reaching it; *affordability* refers to prices of food or perceptions of cost; *acceptability* refers to the quality of food; *accommodation* refers to the extent that food sources adapt to consumers' need, with attention to store hours and types of payment (Caspi et al., 2012). The current study uses this framework to examine access to fruits and vegetables in the context of a MPM.

The purpose of this study was to assess Mobile Produce Market (MPM) influences on fruit and vegetable access within an urban food environment through the perceptions and experiences of MPM shoppers. To our knowledge, this is the first study to apply the *five dimensions of access* framework to examine fruit and vegetable access in the context of food environment interventions such as MPMs. We compared older (aged

≥ 60 years) to younger (aged 18-59.9 years) adults because older adults may have lower access to fruit and vegetables, and different shopping behavior, perceptions, and experiences related to MPMs.

9.2 Methods

9.2.1 Setting

More than half of Springfield MA census tracts have a low-income population living > ½ mile away from a grocery store, and for approximately 25% of the city, grocery stores are >1 mile away (United States Department of Agriculture Economic Research Service, 2015). The US Census statistics from 2010 reveal that older adults > 65 years represent 10.9% of Springfield population (United States Census Bureau, n.d). Health statistics for Springfield (2002-2007) show that 83% of older adults > 65 years were overweight or obese, 22.5% had diabetes, 19.3% had heart disease, 38.9% had a disability, and 60.5% had hypertension; these rates are higher than Massachusetts overall rates (Executive Office of Health and Human Services, 2016).

9.2.2 Go Fresh Mobile Produce Market

The Go Fresh MPM in Springfield, MA is the focus of the current study. Go Fresh aims to improve access to locally grown fruits and vegetables and is a not for profit multi-organizational collaboration that includes city departments, a public health institute, three farms, a community action organization, and a nonprofit community loan organization. Launched in 2011, Go Fresh sells locally grown fresh fruits and vegetables such as berries, apples, tomatoes, leafy greens, and squash, from June to October in neighborhoods with limited access to fresh, high quality fruits and vegetables. The project has consistently provided 50% discount for all Supplemental Nutrition Assistant

Program (SNAP) participants to assist low-income shoppers to purchase produce. In 2014, Go Fresh operated three days a week and was scheduled for weekly, 1 to 1 ½ hour stops at 12 locations in 8 of Springfield's 17 neighborhoods. For purposes of this study, data were collected at all 12 Go Fresh locations operated during the 2014 season. Go Fresh locations included subsidized housing complexes, senior centers, and other sites of congregation such as the *Caring Health Center*.

9.2.3 Study Participants and Design

Cross-sectional survey data were collected from a convenience sample of Go Fresh shoppers, recruited during the last two weeks of the Go Fresh 2014 season, from October 22 to 31. All shoppers, estimated to be 180, were asked to complete the questionnaire. Questionnaires missing data on age or sex were excluded (n=4, final sample n=143). Participants provided oral consent.

9.2.4 Study Questionnaire

A 20-item questionnaire was self-administered and included information on demographics, shopping behaviors, and perceptions and experiences about Go Fresh. Demographics included age (12-17, 18-24, 25-29, 30-39, 40-49, 50-59, 60-69, >70 years), sex (male/female), race/ethnicity (Hispanic, White, Black, Asian, American Indian, Native Hawaiian or Pacific Islander, other—write in), neighborhood residence, and living alone or with others. Shopping behaviors included EBT use (yes/no), amount of money spent (\$0-5, \$5-10, \$11-20, \$21-30, \$31-40, \$41-50, \$51-75, >\$75), distance travelled (< 1, 1-5, 6-10, 11-25, 26-50 miles), shopping frequency (weekly, twice/month, once/month, once or twice, first time), primary shopper (yes/no), the number of people

purchasing food for (1, 2-3, 4-5, >5), number of Go Fresh locations shopped (1, >1 location), duration (first year, second year, started 2-3 years ago), and plans to shop at Go Fresh next year (yes, no, don't know). Perceptions and experiences included: aspects liked (i.e., location, safety, hours, price, locally grown, variety, activities, other—write in), aspects wanted changed (i.e., location, safety, hours, price, variety, more activities, nothing, other—write in), and future activities that were most desired (e.g., taste sampling, cooking classes, nutritional counseling, SNAP or health care information, not interested, other—write in). There were two open-ended questions: “Are there any vegetables or fruits missing from the Go Fresh mobile market that you wish were available?” and “Please share any other comments you have.” The questionnaire was offered in three languages—English, Spanish, and Vietnamese—to reflect the most common race/ethnicity of shoppers.

9.2.5 Five Dimensions of Access

We assessed the *five dimensions of access* through: *availability*, as indicated by produce variety; *accessibility*, as indicated by location and distance traveled to MPM; *affordability*, as indicated by produce price; *acceptability*, as indicated by produce quality; and *accommodation* as indicated by market hours and safety, and EBT use.

Write-in responses to, “Please share any other comments you have,” also were classified into one of the *five dimensions of access*.

9.2.6 Statistical Analysis

Frequencies were calculated to describe the demographics, shopping behaviors, and perceptions and experiences. Age was collapsed into two categories—older adults (≥ 60 years) and younger adults (18-59.9 years) — younger age categories had relatively

few participants (aged 18-24 (n=7); 25-29 (n=11); 30-39 (n=19); 40-49 (n=18); 50-59 years (n=27)) compared to older adults (n=61). Chi Square analysis was used to identify significant differences between older and younger participants.

Separate logistic regression models were used to predict four shopping behaviors, EBT use (yes/no), amount of money spent at Go Fresh ($\leq \$10$ / $> \$10$), shopping frequency at Go Fresh ($<$ weekly/weekly), and distance travelled to Go Fresh (< 1 mile/ ≥ 1 mile), with the following variables in the models: age (18-59.9 years/ ≥ 60 years), race/ethnicity (non-White/White), sex (male/female), and living situation (living alone/living with others); EBT use (yes/no) was in models predicting money spent, shopping frequency, and distance travelled. Each logistic regression model included only participants with complete data for that model. Statistical significance was set at $P < 0.05$. Statistical analyses were conducted using Stata Statistical Software (Release 14. College Station, TX: StataCorp LP). The Institutional Review Board at [anonymous] approved the study.

9.3 Results

Participants were more likely to be female (69.9%), lived within one of the neighborhoods served by Go Fresh (56.6%), and lived with others (67.9%). Hispanics (35.8%) were the largest ethnic/racial group of shoppers, followed by those who identified as Black (29.1%), White (21.6%), and Asian (12.7%). (Table 9.1)

Table 9.1: Go Fresh Mobile Produce Market Survey Participant Characteristics: Comparison of Younger Adults vs. Older Adults

Characteristics	All Participants	Participants 18-59.9 years (n=82)	Participants ≥ 60 years (n=61)	P^a
Sex				0.81
Female	100 (69.9%)	58 (70.7%)	42 (68.9%)	
Age				
18-59	82 (57.3%)	--	--	
≥ 60	61 (42.7%)	--	--	
Race				0.02
Hispanic	48 (35.8%)	36 (46.2%)	12 (21.4%)	
Black	39 (29.1%)	21 (26.9%)	18 (32.1%)	
White	29 (21.6%)	15 (19.2%)	14 (25.0%)	
Asian	17 (12.7%)	6 (7.7%)	11 (19.6%)	
Pacific Islander/Hawaiian	1 (0.8%)	0 (0%)	1 (1.8%)	
Residence in Go Fresh Neighborhood				0.13
Yes	81 (56.6%)	42 (51.2%)	39 (63.9%)	
No	62 (43.4%)	40 (48.8%)	22 (36.1%)	
Living status				<0.001
Alone	45 (32.1%)	14 (17.5%)	31 (51.7%)	
With others	95 (67.9%)	66 (82.5%)	29 (48.3%)	

^a Chi-square tests were used to assess significance between younger and older adults

Most participants were their households' primary food purchasers (86.6%), and reported purchasing food for 2-3 people (58.5%). Nearly half (44.2%) of the participants shopped at Go Fresh weekly, most (84.2%) shopped only at one Go Fresh location, and travelled <1 mile to the MPM (72.2%). For the majority of participants, 2014 was the first year of shopping at Go Fresh (72.1%), and nearly all participants (92.9%) planned to shop at Go Fresh the following year. The median range of money spent was \$5-10, with 36.6% of participants spending less than \$5, and 25.4% spending more than \$10. The most common means that participants found out about Go Fresh was through a

community organization (41.3%), followed by friends (28.0%), flyers/postcards (19.6%), and passing by the market (14.7%). (Table 9.2)

Chi Square analysis showed that compared to younger shoppers (18-59.9 years), older shoppers (≥ 60 years) were more likely to live alone, ($P < 0.001$), purchase food for one person ($P < 0.001$), be long-term shoppers (for 2-3 years) ($P = 0.002$), and use EBT ($P = 0.012$). Older participants were Black (32.1%), White (25.0%), and Asian (19.6%), while Hispanics represented a larger proportion of younger participants (42.6%), ($P = 0.02$). Older participants shopped more regularly at Go Fresh—weekly and once/twice a month-- compared to younger adults, one third of whom shopped there only once or twice in the season ($P = 0.09$). (Table 9.2)

Table 9.2: Go Fresh Mobile Produce Market Survey Participant Shopping Behavior: Comparison of Younger Adults vs. Older Adults

Shopping Behavior	All Participants Frequency (Percent)	Participants 18-59.9 years Frequency (Percent)	Participants ≥ 60 years Frequency (Percent)	<i>P</i>^a
Primary purchaser of household				0.68
Yes	117 (86.6%)	69 (87.3%)	48 (85.7%)	
No	18 (13.4%)	10 (12.7%)	8 (14.3%)	
Number of people purchasing for				<0.001
1 person	36 (26.7%)	10 (12.7%)	26 (46.4%)	
2-3 people	79 (58.5%)	52 (65.8%)	27 (48.2%)	
≥ 4 people	20 (14.8%)	17 (21.5%)	3 (5.4%)	
Frequency shopping at Go Fresh				0.09
Weekly	61 (44.2%)	34 (43.6%)	27 (45%)	
Once/Twice a month	40 (29.0%)	18 (23.1%)	22 (36.7%)	
Once or twice, or first time	37 (26.8%)	26 (33.3%)	11 (18.3%)	
Number of Go Fresh locations shopped at				0.62
One location	112 (84.2%)	63 (82.9%)	49 (86.0%)	
More than one location	21 (15.8%)	13 (17.1%)	8 (14.0%)	

Duration shopped at Go Fresh				0.002
First year	98 (72.1%)	64 (81.0%)	34 (59.6%)	
Second year	17 (12.5%)	10 (12.7%)	7 (12.3%)	
Started 2-3 years ago	21 (15.4%)	5 (6.3%)	16 (28.1%)	
Distance travelled to Go Fresh				0.22
Less than 1 mile	96 (72.2%)	58 (74.4%)	38 (69.1%)	
1-5 miles	30 (22.6%)	14 (17.9%)	16 (29.1%)	
6-10 miles	4 (3.0%)	3 (3.8%)	1 (1.8%)	
11-25 miles	3 (2.3%)	3 (3.8%)	0 (0%)	
Amount of money spent at Go Fresh				0.53
< \$5	49 (36.6%)	32 (40.5%)	17 (30.9%)	
\$5-10	51 (38.1%)	26 (32.9%)	25 (45.5%)	
\$11-20	24 (17.9%)	14 (17.7%)	10 (18.2%)	
> \$20	10 (7.5%)	7 (8.9%)	3 (5.5%)	
EBT card use at Go Fresh				0.01
Yes	40 (29.9%)	17 (21.5%)	23 (41.8%)	
No	94 (70.1%)	62 (78.5%)	32 (58.2%)	
Means of finding out about Go Fresh^b				
Friends	40 (28.0%)	26 (27.4%)	14 (23.0%)	
Coordinator/Organization	59 (41.3%)	30 (31.6%)	29 (47.5%)	
News/media	6 (4.2%)	3 (3.2%)	3 (4.9%)	
Workshop	2 (1.4%)	1 (1.1%)	1 (1.6%)	
Flyers/Postcards	28 (19.6%)	18 (18.9%)	10 (16.4%)	
Internet/Website	4 (2.8%)	3 (3.2%)	1 (1.6%)	
Passing by	21 (14.7%)	14 (14.7%)	7 (11.5%)	
Plans to shop at Go Fresh next year				0.85
Yes	130 (92.9%)	74 (92.5%)	56 (93.3%)	
No	0 (0%)	0 (0%)	0 (0%)	
Don't know	10 (7.1%)	6 (7.5%)	4 (6.7%)	

^a Chi-square tests were used to assess significance between younger and older adults

^b Respondents were asked to identify all that apply, so total percentages do not add up to 100%, and data is not appropriate for Chi-square test

EBT use was predicted by living alone ($P=0.03$, $OR=2.5$) and being older ($P=0.09$, $OR=2.1$). Weekly shopping at Go Fresh was predicted by living alone ($P=0.03$, $OR=2.5$). Traveling < 1 mile to Go Fresh was predicted by living alone ($P=0.02$, $OR=2.5$) and being non-White ($P=0.09$, $OR=0.9$). (Table 9.3)

Table 9.3: Logistic Regression Models Predicting Participant Shopping Behavior at Go Fresh Mobile Produce Market

Dependent variable	Predictor, independent variable	OR	95% CI	P
EBT use (n=130)	≥ 60 years old	2.1	0.9, 4.8	0.09
	Female	1.4	0.6, 3.3	0.46
	Non-White	1.1	0.4, 2.8	0.89
	Live alone	2.5	1.1, 6.0	0.03
Spend more than \$10 (n=125)	≥ 60 years old	1.0	0.4, 2.5	0.97
	Female	0.8	0.3, 2.0	0.67
	Non-White	2.6	0.8, 8.3	0.11
	Live alone	0.5	0.2, 1.3	0.13
	EBT use	1.4	0.5, 3.5	0.52
Weekly shopping at Go Fresh (n=128)	≥ 60 years old	0.6	0.3, 1.4	0.23
	Female	1.3	0.6, 2.9	0.49
	Non-White	0.9	0.4, 2.1	0.79
	Live alone	2.5	1.1, 5.9	0.03
	EBT use	1.7	0.7, 3.8	0.22
Travelled less than 1 mile to Go Fresh (n=129)	≥ 60 years old	0.6	0.2, 1.4	0.21
	Female	0.8	0.5, 2.9	0.64
	Non-White	0.9	0.1, 1.2	0.09
	Live alone	2.6	1.2, 9.7	0.02
	EBT use	1.4	0.5, 3.7	0.51

Older and younger participants had similar perceptions and experiences with Go Fresh. Location was the characteristic that most participants liked (72.7%), followed by price (47.6%), locally grown produce (46.2%), hours (37.1%), variety (32.2%), safety (30.1%), and activities, such as food demonstrations and visits by nutritionists (10.5%). “Freshness” and “personnel very nice” were provided as write-in responses. Regarding desired changes, wanting more variety was the highest response (39.5%), followed by hours (21.1%) and lower price (17.7%). Write-in responses requested increase in hours and locations, and posting of prices. The three highest responses on desired future activities were taste sampling (44.2%), nutritional counseling (30.6%), and SNAP or health care information (27.9%). (Table 9.4)

Table 9.4: Participant Responses to Questions about Perceptions and Experiences of Go Fresh Mobile Produce Market

Question	All Participant Responses Frequency (Percent)	Responses of Participants 18-59.9 years old Frequency (Percent)	Responses of Participants ≥ 60 years old Frequency (Percent)
What they liked^a			
Location	104 (72.7%)	54 (65.9%)	50 (82.0%)
Safety	43 (30.1%)	24 (29.3%)	19 (31.1%)
Hours	53 (37.1%)	28 (34.1%)	25 (41.0%)
Price	68 (47.6%)	41 (50.0%)	27 (44.3%)
Locally Grown	66 (46.2%)	42 (51.2%)	24 (39.3%)
Variety	46 (32.2%)	34 (41.5%)	12 (19.7%)
Activities ^b	15 (10.5%)	10 (12.2%)	5 (8.2%)
Write-in responses	2 (1.4%)	2 (2.4%)	0 (0%)
What they would like changed^a			
Location	6 (4.8%)	6 (7.3%)	0 (0%)
Safety	4 (2.7%)	2 (2.4%)	2 (3.2%)
Hours	30 (21.1%)	18 (22.0%)	12 (21.0%)
Pricing	26 (17.7%)	11 (13.4%)	15 (24.2%)
More variety	57 (39.5%)	33 (40.2%)	24 (38.7%)
More activities	6 (4.1%)	6 (7.3%)	0 (0%)
Nothing	30 (21.1%)	16 (19.5%)	14 (22.6%)
Write-in responses	5 (3.4%)	2 (2.4%)	3 (4.8%)
What is important, if offered^a			
Taste sampling	65 (44.2%)	43 (52.4%)	22 (35.5%)
Cooking classes	34 (23.8%)	23 (28.0%)	11 (19.4%)
Nutritional counseling	44 (30.6%)	32 (39.0%)	12 (21.0%)
SNAP or health care info	40 (27.9%)	20 (24.4%)	20 (32.3%)
None/not interested	17 (12.2%)	7 (8.5%)	10 (16.1%)
Write-in responses	2 (1.4%)	0 (0%)	2 (3.2%)

^a Respondents were asked to identify all that apply, so total percentages do not add up to 100%

^b Current activities included food demonstrations and visits by WIC nutritionists

In response to the question “Are there any vegetables and fruits missing from the Go Fresh mobile market that you wish were available?” 54 unique food items were provided. These items included 27 vegetables, 15 fruit, and 2 other items being bread and nuts. Hot peppers, bell or sweet peppers, cilantro, green beans, cucumbers, avocados, oranges, peaches, and grapes were mentioned 3-5 times. Tomatoes, bananas, and “fruit” were mentioned at least 6 times. “Fruit” was mentioned most often at 16 times.

Forty-five people wrote in responses to the request, “Please share any other comments you have”. These responses captured all *five dimensions of access*: availability (i.e., enjoying or wanting more variety); accessibility (i.e., enjoying the convenience of the location, or not finding the location convenient, wanting additional locations); affordability (i.e., prices affordable or prices not affordable); acceptability (i.e., enjoying produce freshness and quality); accommodation (i.e. enjoying the market setup, staff, and EBT incentives, and desiring more hours, a winter MPM, and an updated Facebook page). A quarter of the comments provided additional expressions of gratitude and positive experiences. (Table 9.5)

Table 9.5: Selected Responses to Survey Question, “Please share any additional comments” Reflecting Five Dimensions of Access (n=45)

Dimension of access^a	Comment type	Frequency
Availability	Want more variety ^b	2
	Enjoy variety ^b	1
Accessibility	Enjoy convenience ^b	9
	Not convenient ^b	1
	Want more locations ^b	1
Affordability	Affordable ^b	1
	Not affordable ^b	1
Acceptability	Enjoy freshness ^b	9
	Enjoy quality	3
	“Prefer organic”	1
Accommodation	Enjoy “structural set up”	1
	Enjoy staff—“excellent” “friendly” “nice”	10

	“professional” “pleasant”	
	Grateful that SNAP is accepted	2
	Want more hours ^b	4
	Want winter market	1
	Request to keep Facebook page updated	1
General comments	Positive experiences/ expressions of gratitude	14

^a Each written response may have comments that fit into more than one category

^b Write-in response overlaps with discrete response categories from other questions

9.4 Discussion

Similar to other mobile produce markets, Go Fresh shoppers were more likely to be women (Lewis and Zollinger, 2012) and non-White (Marina et al., 2014; Zepeda et al., 2014; Lewis and Zollinger, 2012). Nearly half the participants were older adults (AbuSabha et al., 2011; Jennings et al., 2012; Zepeda et al., 2014), and one third lived alone (Lewis and Zollinger, 2012). Compared to younger participants, older participants had different shopping behaviors; tended to purchase food for one person ($P<0.001$), be long-term shoppers ($P=0.002$), and use EBT ($P=0.012$). Younger and older participants had similar perceptions and experiences. We captured the *five dimensions of access* in this study. The MPM facilitated all dimensions: *Availability*, indicated by satisfaction with the variety of produce for nearly one third of all participants; *accessibility*, indicated by the majority of participants’ travelling < 1 mile (72.2%), and participants indicating appreciation of location (72.7%); *affordability*, indicated by satisfaction with price (47.6%); *acceptability*, indicated by enjoyment of the high quality of produce being fresh and locally grown (46.2%); and *accommodation*, indicated by satisfaction with safety (30.1%), positive experiences shopping at Go Fresh and with the market staff (write-in, 44.4%), and relatively high EBT use among older adults (41.8%).

9.4.1 Availability

Go Fresh provides an average of 20 types of locally grown fruits and vegetables each week, adding a source of produce to neighborhoods and increasing *availability*, defined as the supply of food and presence of stores (Caspi et al., 2012). There was a slightly higher response of wanting to improve variety (39.5%) compared to liking the produce variety (32.2%). Write-in responses indicated that participants desired more of the items that Go Fresh offered, such as cilantro and tomatoes, in addition to items that are not grown locally such as bananas, oranges, and avocados. Another study identified the request for MPMs to include staple food items such as bread and milk for one-stop shopping (Zepeda et al., 2014). While only two participants in our study indicated a desire for non-produce items, our results suggest that sourcing more produce, particularly fruit, may satisfy and draw additional customers; however, procuring the desired variety from local and seasonal options may prove challenging. Taste sampling, which participants indicated as important if offered (44.2%), may also improve shopper satisfaction with the *availability* of produce, particularly if the fruit and vegetables are unfamiliar.

9.4.2 Accessibility

Accessibility of Go Fresh locations and close proximity to residences was an important reason for shopping at Go Fresh. More than half of participants lived within one of the neighborhoods served by Go Fresh (59.2%) and almost all were Springfield residents (97.7%). In addition, almost all participants travelled ≤ 5 miles to the market (94.8%), with the majority travelling < 1 mile (72.2%). These findings are consistent with other studies of MPMs, which have found customers to live in proximity to MPMs

(Marina et al., 2014; Fuchs et al., 2014; Zepeda et al., 2014). The importance of location was reiterated by the high response to liking the market location (72.7%).

9.4.3 Affordability

Affordability was an important reason for shopping at Go Fresh, which is consistent with findings from a MPM study in New York (Fuchs et al., 2014). Price was the second most favored characteristic of Go Fresh (47.6%). Although the majority of participants did not use EBT (70.1%), previous research shows that SNAP benefits are an important facilitator for purchasing fresh fruits and vegetables among people with low-incomes (Karakus et al., 2014). The same study found that SNAP customers perceived produce cost at farmers markets to be similar to or less than food stores (Karakus et al., 2014), suggesting that perceived affordability in our study was for both EBT users and non-users. Our data reflect contradicting experiences of affordability, with 17.7% of participants identifying the need to improve pricing. Affordability has been identified previously as a barrier to MPM participation, particularly at the end of the month when people ran out of money or SNAP benefits (Zepeda et al., 2014). Our data suggest that SNAP and accompanying discount for EBT users was important for facilitating *affordability* particularly among older adults and those who lived alone.

9.4.4 Acceptability

Nearly half of the participants (46.2%) appreciated the quality of produce being fresh and locally grown, and there was no expression of dissatisfaction with the quality or *acceptability* of the produce in write-in responses. This is consistent with other research findings that low-income customers of farmers market and MPM have enjoyed the fresh quality of produce (AbuSabha et al., 2011; Karakus et al., 2014; Jennings et al., 2012).

9.4.5 Accommodation

EBT use, market staff, hours, and safety illustrate the market's *accommodation* to customer needs. Older participants were more likely to use EBT at Go Fresh (41.8%) compared to younger participants (21.5%, $P=0.01$). Having a high EBT use rate among older participants may indicate Go Fresh's capacity to accommodate low-income older adults despite potential stigma with SNAP participation (Gabor et al., 2002). Our findings that older participants had a longer shopping history at Go Fresh ($P=0.002$) and shopped more frequently ($P=0.09$) compared to younger participants may indicate greater accommodation among older adults, who may need to shop more frequently in small batches to avoid spoilage and the burden of carrying large groceries (Munoz-Plaza et al., 2013).

Our data suggest that Go Fresh accommodated the needs of those living alone, which is promising in light of findings of greater nutritional risk among those living alone (Deierlein et al., 2014; Nicklett and Kadell, 2013). Living alone was a predictor of EBT use ($P=0.03$), shopping weekly ($P=0.03$), and traveling <1 mile ($P=0.02$). Our data show that of those who live alone, 77.8% traveled < 1 mile to the market, 73.3% liked the market location, 47.6% used EBT, and 51.1% liked the produce cost. Those living alone may benefit from the opportunity for social interaction offered by MPMs (Jennings et al., 2012), which could partly explain their weekly commitment to shopping at Go Fresh. Research shows that gathering places like community centers and congregate meals are important for breaking social isolation and lowering the risk of malnutrition, particularly among older adults living alone (Walker and Beuchene, 1991).

The importance of social accommodation was notable. Ten participants wrote-in comments about positive experiences with market staff, indicating social interactions positively influenced shopper experience. Social networks were also important for initiating MPM use, with the highest two responses of finding out about Go Fresh being through coordinator/organizations (41.3%) and friends (28.0%).

Perceptions of market hours were mixed with some participants satisfied with the hours (37.1%) while others were not (21.1%). The desire for additional hours was noted in write-in responses. Nearly a third of participants (30.1%) expressed satisfaction with safety, much higher than expressions of dissatisfaction with safety (2.7%), suggesting safety as an accommodating characteristic. Furthermore, participants showed an interest in the market offering taste sampling, cooking classes, nutritional counseling, and health care information, suggesting that these activities would improve the market's accommodation for some participants.

9.5 Strengths and Limitations

There are several strengths of our study. Translating the questionnaire into Spanish and Vietnamese enabled the inclusion of customers with different language preferences. The questionnaire had closed-ended and open-ended questions; many closed-ended questions had an “other” category that allowed participants to provide additional information. We also included objective and subjective indicators of access to enhance analysis of the *five dimensions of access*, such as the objective measure of distance travelled to MPM as well as perceptions of the MPM locations. Limitations include the use of a convenience sample. However, we had a high response rate, 147 of

180 shoppers (81.6%) participated in the study. Another potential limitation is that the findings capture the perceptions and experiences of shoppers at an urban MPM and therefore may not reflect rural areas.

9.6 Conclusion

We used a novel approach to assess food environment interventions through *five dimensions of access*, demonstrating the framework's applicability for researchers and public health organizations to assess food access. This study suggests that MPM increases fruit and vegetable access in urban neighborhoods with limited fruit and vegetable access and may especially benefit older adults and individuals living alone. Our study found that MPM facilitated access to fruit and vegetables, likely increasing fruit and vegetable intakes among shoppers. Previous research has found that fruit and vegetable purchases (Evans et al., 2012) and consumption increased (AbuSabha et al., 2011; Evans et al., 2012; Jennings et al., 2012) in MPM intervention sites and that shoppers consumed more fruits and vegetables than non-shoppers (Zepeda et al., 2014). Our study sets the foundation for examining how MPMs fit into the broader food environment; previous research has shown that shoppers used MPMs as a primary (Jennings et al., 2012) and supplementary (Marina et al., 2014) source of fruits and vegetables. Our finding that living alone predicted three shopping behaviors sets the foundation for future research about food acquisition behavior related to living alone or household status, and the economic and social importance of food environment interventions. Examination of the social importance of MPMs, including the role of social

interactions in facilitating better nutrition and health outcomes, are lacking in current MPM literature and would provide valuable insight on the impact of MPM.

CHAPTER 10

MITIGATING FOOD ACCESS DISPARITIES: FARMERS' PERSPECTIVES AND EXPERIENCES OF FARMERS MARKETS, COMMUNITY SUPPORTED AGRICULTURE, AND MOBILE PRODUCE MARKETS

10.1 Introduction

Enriching local food systems by supporting the growing, selling, purchasing, and eating of local foods has received attention in recent years as a strategy to improve access and consumption of fruits and vegetables (Johnson, Aussenberg, & Cowan, 2013; CDC Strategies, 2011). U.S. national data shows an increasing trend of locally produced food sales, totaling \$4.8 billion in 2008 (Johnson et al, 2013) and estimated at \$6.1 billion in 2012 (Low et al., 2015). Studies have revealed nutritional, health and economic benefits of local food systems, including: higher nutritional quality in fresh produce (Edwards-Jones, 2010; Favell, 1998); lower incidence of obesity, diabetes, and mortality in areas with greater levels of direct farm sales (Ahern, Brown, & Dukas, 2011; Jillcott, Keyserling, Crawford, McGuirt, & Ammerman, 2011; Salois, 2012); cost savings for consumers (Cooley & Lass, 1998); higher net revenues for producers (King, Hand, DiGiacomo, Clancy, Gomez, Hardesty, Lev, & McLaughlin, 2010); and increased employment and income in communities (Martinez et al., 2010).

A large body of literature has explored the social, political, and environmental importance of local food systems, under concepts such as civic agriculture (DeLind, 2002; DeLind & Bingen, 2008; Lyson, 2000; Lyson & Guptill, 2004), sustainable agriculture (Beus & Dunlap, 1990; Lyson, 2005), alternative food networks/institutions (Goodman & Goodman, 2009; Maye and Kirwan, 2010), and social embeddedness

(Hinrichs, 2000; Sage, 2003). Farmers markets and Community Supported Agriculture (CSAs) are common direct-to-consumer venues for local food sales that have been highlighted in these discussions as spaces in local food systems for small-scale farmers to earn a living, for consumers to become educated about their food source, for beneficial relationships of trust and personal regard to form, and which value environmentally conscious growing practices (Guthman et al., 2006; Hinrichs, 2000; Hunt, 2006; Kirwan, 2006; Sage, 2003).

At the same time, scholars and activists have called into question the capacity of the local food movement to benefit low income and minority populations (Allen, 2009; Guthman et al., 2006; Guthman, 2008a; Guthman, 2008b; Kato & McKinney, 2015; Ramirez, 2014; Slocum, 2007), noting that white middle and upper class customers are the main patrons of farmers markets and CSAs (Guthman, 2006; Guthman, 2008a), alerting us to the need for social justice-focused strategies to improve local food systems.

The purpose of this study is to examine farmers' perspectives and experiences of local food marketing to understand the facilitators and barriers of their involvement, particularly for improving access among low income and minority populations. Our study focuses on three marketing channels: farmers market, CSA, and portable fruit and vegetable markets known as mobile produce markets (MPM); farmers market and CSA have been widely discussed in literature, while MPMs have recently emerged in literature as a strategy to improve accessibility of local produce in areas with limited fruit and vegetable access. MPM have historically served poor, immigrant communities (Tester et al., 2010), and have gained popularity in recent years as an organizational initiative for reaching food desert areas and vulnerable populations (AbuSabha et al., 2011; Evans et

al., 2012; Jennings et al., 2012; Fuchs et al., 2014; Li et al., 2014; Lucan et al., 2011; Tester et al., 2012; Widener, Metcalf, & Bar-Yam, 2012; Zepeda, Reznickova, & Lohr, 2014).

We use civic agriculture as a framework to highlight the importance of collaborative efforts of various community actors (Lyson, 2000; Lyson, 2005), such as farmers, consumers, and community organizations, in mitigating barriers of local food access for low income and minority populations, and to justify our focus on farmers who contribute to the capacity of local food initiatives.

Our study investigates farmers' 1) motivations and considerations when choosing local markets; 2) experiences and perspectives of marketing through farmers markets, CSA, and MPM; and 3) views of local markets' capacity to improve access of local food to low income and minority populations. Research on farmers' perspectives and experiences of local food marketing is limited, and no study has specifically examined MPMs.

10.2 Background

10.2.1 Civic agriculture

The concept of civic agriculture has been used to emphasize the political and social significance of local food systems (DeLind, 2002; Lyson, 2000; Lyson, 2005). Contrary to the commodity-focused, corporation-dominated, and global market-driven industrial agricultural paradigm, which standardizes crops and production systems to maximize productivity, efficiency, and profit (Lyson and Guptill, 2004), civic agriculture considers social and ecological impact of production and marketing practices, emphasizes

quality over yield and profit, encourages the democratic participation of many small farms and the growing of diverse crops, serves local consumers through direct marketing, and depends on communities' investment in local farms (DeLind, 2002; Lyson, 2000; Lyson and Guptill, 2004).

Civic agriculture prioritizes community welfare and environmental health over profit (Lyson, 2005). Lyson writes that sustainable agriculture, a socially responsible agricultural system, which attends to long-term health of ecosystems and natural resources, to farms' economic viability and to farmers' quality of life, is "a logical antecedent to civic agriculture" (Lyson, 2005, pg. 96). Both sustainable agriculture and civic agriculture reflect a community's problem-solving capacity to promote community health and vitality (Lyson, 2005). Civic agriculture goes further to include community food production and consumption activities, such as community kitchens and value-added community food processing businesses, that provide alternative food options to conventional products, and that enable community members to develop a shared identity around food (Lyson, 2000; Lyson, 2005).

Lyson and Guptill (2004) found that civic agriculture farms, defined as farms selling directly to the public with sales <\$250,000/ year, were more likely to be found in the U.S. Northeast compared to the Midwest, South, or West, and in counties where median family income is higher. Although literature construes civic agriculture to be community-supportive, there is limited application of this concept to support low income and minority communities. This study fills the gap by expanding civic agriculture to include discussions of community capacity to support local food marketing that mitigates disparities of healthful food access.

10.2.2 Local Food Marketing: Farmers markets, community-supported agriculture, and mobile produce markets

Farms that participate in local marketing are mostly small and medium-sized (Low and Vogel, 2011). In 2008, 81% of farms that reported local food sales were small farms (annual gross sales <\$50,000), which were more likely to use direct-to-consumer channels (e.g., farmers markets, CSAs, u-pick), and 14% were medium-sized farms (annual gross sales \$50,000-\$250,000), which used only or a mix of direct-to-consumer and intermediate channels (e.g., sales to restaurants, grocery stores, schools and other institutions, and regional food aggregators).

Farmers markets and CSA are often referred to as alternative food networks not only because they create alternative avenues of access beyond industrial infrastructures of grocery store food access; they establish short food supply chains and producer-consumer contact that facilitate awareness and connection to food sources with consideration of social and environmental impacts (Goodman and Goodman, 2009; Maye and Kirwan, 2010).

The number of farmers markets in the US has dramatically increased in the past 10 years. The United States Department of Agriculture's (USDA) National Directory of Farmers Markets listed 1,755 farmers markets in 1994 and a steady rise to 8,268 markets in 2014, which is more than 450% increase over the 10-year period (USDA Agricultural Marketing Service, National Count, 2014). According to the USDA Agricultural Marketing Service's 2014 National Farmers' Market Survey, "fresh fruits and vegetables" was the most popular product category sold at farmers markets in 2013 (USDA Agricultural Marketing Service, 2015). Farmers markets have been a key catalyst

in building local food systems by extending the visibility of local food production into public spaces (Dunning, 2013; Gillespie, Duncan, Hilchey, Hinrichs, & Feenstra, 2007).

Several studies have highlighted the importance of social interaction at farmers markets for consumers and producers (Lyson & Green, 1999; Fehrenbach & Wharton, 2014; Hunt, 2007; Kirwan, 2006; Smithers, Lamarche, & Joseph, 2008). Hunt (2007) found that consumers enjoyed having fun with their families and socializing with community members, and that vendors enjoyed feeling more involved in their community, improving their product visibility, increasing profit and income, and having independence and control of their business. Smithers and colleagues (2008) found that producers perceived social factors to be the primary determinant of attendance at farmers markets, with vendors acknowledging the opportunities for education and increased product availability and diversity generated from strengthened community-farm connections. Kirwan (2006) found that farmers markets provided a human-centered space for building relationships between consumers and producers that improved food quality through the sense of added social value. Fehrenbach and Wharton (2014) acknowledged the educational opportunities at farmers markets and found that consumers and producers were interested in sharing information about pesticide use, flavor, freshness, food safety, animal welfare, nutrition, and environmental impacts.

The numbers of CSAs in operation in the US has grown from 2 in 1986 (Adam, 2006) to more than 2,500 in 2010 (Martinez et al., 2010) and more than 4,000 in 2016 (Local Harvest, 2016); in 2012, 12,617 farms marketing products through a CSA (USDA National Agricultural Library, 2016). Greater concentrations of CSAs exist in the Northeast, areas surrounding the Great Lakes, and western coastal regions (Martinez et

al, 2010). Participation in a CSA usually involves individuals or families purchasing a *farm share* for a season of farm products at the beginning of a season as a show of investment in the farm operation, and collecting their *farm share* once a week either at the farm or some other distribution site (Kelly, Kime, & Harper, 2013). Farmers benefit from the element of shared risk in a CSA model, with the shareholders paying up front and sharing the burdens of unanticipated crop failures (Lizio and Lass, 2005). While CSAs typically offer a variety of fresh produce, the types of products offered have expanded to include other farm products such as eggs, meat, and flowers, and sometimes involve multiple local growers (Woods et al., 2009).

National CSA survey data have provided an abundance of information about the characteristics of CSA farms and farmers. The first comprehensive profile of CSA farms in 1999 revealed CSA farms as smaller than the average U.S. farm with median of 18 acres, and 95% using organic and environmentally regenerative practices (Lass et al., 2003). CSA primary farmers were almost all white and college-educated, ten years younger (average 43.7 years) than average US farmers, and included many more women farmers (40%) compared to the overall U.S. farmers (Lass et al., 2003). Income data shows CSA farms to barely cover the costs of production, with an average net income per CSA farm in 2001 as \$15,535, which does not include the main farmer's labor costs (Lizio and Lass, 2005). Profitability has not been a goal for most CSA farms, which define viability and success based on meeting the costs of production (Lizio and Lass, 2005).

MPMs have been less explored in literature. Two distinct types of MPMs exist—
1) individual/family run businesses that sell from a mobile structure like pushcart, truck,

or farm stand, and 2) organization managed social service initiatives with the intention to improve produce access to targeted neighborhoods. Distinct from the individual/family-run businesses, organization-managed projects emphasize the delivery of local, seasonal farm produce, involve collaboration between local farmers and local organizations, and tend to be supported by private grants and less profit-driven. While some organizational MPMs are farm-operated, such the Arcadia Mobile Market in the Washington D.C. area (Arcadia Mobile Market, 2016), anecdotal evidence suggests that most MPM involve an individual or organizational middle party that sells to customers (The National Mobile Market, 2013; Abusabha et al., 2011; Zepeda et al., 2014). Green Carts in New York City is a unique MPM model of individual vendors operating under a program umbrella. In 2008, the Mayor's Office in New York City established 1000 permits to increase produce access in areas of low reported rates of fruit and vegetable consumption (Fuchs, Holloway, Bayer, & Feathers, 2014; Li et al., 2014), with hopes to improve health outcomes of target residents and to provide entrepreneurial opportunities to vendors (Fuchs et al., 2014). Evaluations of MPM interventions have shown the capacity to increase participants' consumption and purchase of fruits and vegetables (Abusabha et al., 2011; Evans et al., 2012; Jennings et al., 2012). With no study examining MPM from the perspective of farmers or producers, our study adds a new dimension to MPM literature.

10.3 Applied Research Methods

10.3.1 Study Participants and Design

One-on-one key informant interviews were conducted with 16 farmers from April to July, 2015. Participants were self-identified farmers from Hampden, Hampshire, and Franklin Counties in Western Massachusetts and have marketed their farm products locally. Thirteen participants were recruited via email (18 emails sent, 15 responded, 2 had scheduling conflicts), using an email list from a Franklin County farmers market where the researcher was a past vendor, and three participants were recruited in person at two Hampshire County farmers markets (5 invited, 1 refused, 1 had scheduling conflicts); farmers who were not busy interacting with customers during the time of recruitment were invited to participate. Oral consent was granted prior to conducting all interviews. We stopped recruiting when information reached saturation point, as defined by no additional themes were generated in responses.

Interviews averaged 30 minutes in duration. Five interviews were conducted in person and eleven by phone. A Farmer Interview Guide was used for all interviews (Appendix A) and responses to questions were recorded by hand, including direct quotes and responses were transcribed to a computer document within 24 hours of the interview.

10.3.2 Farmer Interview Guide

The Farmer Interview Guide is comprised of three sections. The first section asked about demographics, the farmer's background, and the farm operation. The second section asked about motivations to participate in farmers markets and CSAs, experiences with these markets, strategies implemented to reach low-income customers, and perspectives on their farm's capacity to improve access to fresh produce or their farm

product. The final section asked for farmers' perceptions of the MPM concept, including facilitators and barriers to participation. (Appendix C)

10.3.3 Qualitative Analysis

Inductive thematic analysis, as described by Braun and Clark (2006), was the “bottom up” data-driven method used for qualitative analysis, coding data without trying to fit data into a pre-existing coding frame (Braun and Clark, 2006). Thematic analysis is a systematic method for identifying, analyzing, and reporting patterns within data (Braun and Clark, 2006), and is a widely used and acceptable approach to health science research (Braun, 2014).

We followed the six phases of thematic analysis described by Braun and Clark (2006) : 1) familiarizing yourself with your data; 2) generating initial codes; 3) searching for themes; 4) reviewing themes; 5) defining and naming themes; and 6) producing the report. Data familiarization came through transcription of data and combining data into tables organized by sections of the interviews. We used NVivo for Mac software (Version 11.1.1) to code the transcripts, map and review coded data, and search for and identify themes. The researcher first examined the transcripts according to questions in the Farmer Interview Guide, generated initial codes, and then organized initial codes into four areas of analysis: motivations and considerations when choosing to market through farmers market or CSA; farmers market and CSA marketing experience; perspectives on access; and perspectives on MPM. The researcher then searched for themes within these four areas of analysis. The Institutional Review Board at the University of Massachusetts Amherst approved the study.

10.4 Results

10.4.1 Participant Demographics and Background

Most of the participants were female (69%), and all identified as White or Caucasian. No participants were younger than 30 years, and 44% were ≥ 50 years. There was a large range in number of years farming, from 9 years to more than 50 years. Income data considering household size showed the majority of farmers (63%) lived with an income of less than \$20,000 per person in the household, including 25% with less than \$10,000 per person. (Table 10.1)

Table 10.1: Participant Demographics (n=16)

Farmer Characteristics	Frequency (n)	Percent (%)
Gender		
Male	5	31
Female	11	69
Age (years)		
<30	0	0
30-39	5	31
40-49	4	25
50-59	4	25
>60	3	19
Race		
White	16	100
Non-White	0	0
County of Residence and Farm		
Hampshire	8	50
Hampden	2	12.5
Franklin	6	37.5
Number of adults and children <18 years old in household		
1 adult	3	19
2 adults	4	25
2 adults, 1 child	2	12
2 adults, 2 children	7	44
Household income		
\$10,000-19,999	2	13
\$20,000-29,999	4	25
\$30,000-39,999	1	6
\$40,000-49,999	4	25

>\$50,000	4	25
No data	1	6
Income/ person (Household income/ # members in household)		
<\$10,000	4	25
\$10,000-19,999	6	38
\$20,000-29,999	3	19
>\$30,000	2	12
% Household income from farm		
<25%	3	19
25-49%	2	12
50-74%	3	19
75-100%	7	44
No data	1	6

Most participants (81%) worked on a small farm with less than 20 acres. The amount of land cultivated or used by each participant ranged from 2 acres to 225 acres, the smallest being a small orchard and the largest being a dairy. Most participants currently work on diversified farms with a mix of products, including mixed vegetables, fruit, herbs, and animal products. In some cases, participants also generate non-food products for market such as hay, Christmas trees, firewood, animal breeding stock, seeds, seedlings, wool, and herbal medicine. In addition, many participants have shifted their main marketed items at least once in their career as farmers. For example, one farmer grew and marketed mixed vegetables for 30 years, then switched to berries as the main marketed crop in more recent years. Six categories of farm products were represented in our sample according to the main farm product that each farmer marketed or were most known for: mixed vegetables; berries; orchard fruit; meat, poultry, and eggs; dairy; and specialty crops. Close to half of the participants' main farm product was mixed vegetables (44%). (Table 10.2)

Table 10.2: Participant Farming and Marketing Experience (n=16)

Experience	Frequency (n)	Percent (%)
Years Farming		
<10	1	7
10-19	5	33
20-29	3	20
30-39	3	20
40-49	1	7
≥50	2	13
Amount of land cultivated/used (acres)		
<10	5	31
10-19	8	50
20-29	1	6
>30	2	13
Main marketed farm product		
Mixed vegetables	7	44
Berries (blueberries, raspberries, strawberries)	2	12.5
Orchard fruit (apples, peaches, pears, plums)	2	12.5
Meat, poultry and eggs (Beef, pork, lamb, goat, chicken, and chicken eggs)	2	12.5
Dairy (cow and goat's milk, yogurt, and cheeses)	2	12.5
Specialty crops (Christmas trees, specialty garlic)	1	6
Marketing venue ^a		
Farmers market	16	100
CSA	10	63
Wholesale	10	63
On-farm store or farm stand	10	63
Pick-your-own	4	25
Seasonal marketing		
Only market during main growing and harvest season (late spring through fall)	4	25
Market outside of growing season (winter through early spring)	12	75

^a = farmers market and CSA reflect current and past experience; Wholesale, on-farm store or farm stand, and pick-your own reflect current avenue of sales; all farmers utilize more than one marketing stream

All participants have been vendors at farmers markets, and 63% have marketed through a CSA. Currently, 63% of participants wholesaled their products either sporadically when there is excess or as a main avenue of sales, usually selling to grocery stores and restaurants. Two thirds of participants marketed their farm products outside of the main growing season; they used various means to extend their markets beyond the main growing season, including selling storage (e.g. root vegetables, frozen berries, refrigerated meat) and processed products (e.g. hard cider), and growing in greenhouses (n=4).

10.4.2 Motivations and Considerations in Choosing Farmers Markets or CSAs

10.4.2.1 Efficiency and Profit

Participants considered distance to a market, the time commitment, and effort required, and compared these factors to the profit potential and predictability of sales when considering their form of marketing and specific markets. Participants chose farmers markets for the income potential:

“Farmers market is a good place to sell stuff and make an income.”

“At farmers market, there is the ability to sell a lot in a small amount of time and to get a large customer base in a small area.”

Participants were cognizant of the need for cost effective marketing:

“We need to make \$400 at market to break even. It needs to be cost-effective.”

One farmer traveled over 50 miles away to markets with better profit potential:

“I travel to Boston for the right markets where my stuff sells in large volume.”

Despite recognized limitations in income and profit, CSAs appealed to farmers because they allowed farmers to stay on the farm, and the security of having guaranteed sales and up-front membership payments to defray the season's start-up costs:

10.4.2.2 Being in Community, Supporting Community and Being Supported By Community

Participants viewed farmers markets as an ideal venue to get known in the community: meet new people, recruit and establish connections with potential customers, and advertise their products:

“We chose to go to farmers market to get known in the community and attract more people to the farm.”

“We do farmers markets for outreach mainly.”

Participants who marketed through CSA and farmers markets both wanted to have a strong presence in community and viewed these marketing channels as means to build deeper connections with their community. One fruit grower explained his motivation:

“[Marketing at farmers market is] a way of being in community and providing a healthy alternative to standard conventional fruit growing that is heavily sprayed.”

A participant that marketed through CSA said:

“I wanted to provide real food to our local community.”

CSA farmers were drawn to the philosophy of having community members sharing the risks of crop failures:

“With a CSA, the farm is supported regardless of harvest.”

“With CSAs, people are more at the mercy of the swings of the season. They are still going to get produce, just stuff that does well, and every year is different.”

10.4.2.3 Flexibility

Farmers sought out flexibility in their marketing arrangements. CSA farmers appreciated the ability to distribute produce that wasn't in perfect condition and surplus produce:

“CSAs give flexibility to control sales, to sell stuff that might not have been able to sell in other ways.”

“Seconds can go to CSA, and can distribute leftovers from farmers market.”

Some participants felt that CSAs were not flexible enough, tying them into obligations to supply a certain amount of produce each week and a large variety, which they weren't sure they could provide consistently:

“I don't want to be restricted and want to be more fluid. I don't want to worry about having the right amount of stuff available.”

“CSAs are too constricting. I wanted to grow more niche products than variety needed for CSA. I had a personal preference of crops that I wanted to grow.”

Farmers markets provided a venue for those looking for a niche market for rare and specialty varieties of crops, and for farm products that had more narrow windows of harvest, such as berries and fruit.

10.4.2.4 Familiarity

Some farmers described the impetus for choosing farmers markets or CSAs based on familiarity through past internships or earlier work experiences. One farmer spoke of following the lead of her husband:

“My husband started going to farmers market in college as a way to move product to an urban environment.”

Other participants interned with farms before running their own, and wanted to continue with farmers markets or CSA models based on positive past experiences:

“I had experience doing farmers market as an intern in the past and really liked it.”

“CSA was a model that I had experience and was familiar with in past internships.”

10.4.3 Farmers Market and CSA Marketing Experience

10.4.3.1 Connection with Community

The enjoyment of connecting with community was the most prominent theme that was described by all participants in their experiences with farmers market and CSA.

Farmers markets and CSAs allowed farmers to create a sense of identity within community, with one farmer describing the marketing “as a way of being in community.”

Participants described the importance of interacting directly with customers to receive feedback about their products. They liked hearing stories about how customers use their products, and getting to know their customer base:

“It’s important to interact with the community, see where the farm goods are going and the status in the community.”

One participant described not needing to get Organic certification for their family farm because interacting with people through CSA and farmers market allowed them to get to know their values, their approach to farming, and their organic growing methods. One CSA farmer talked about the intimate connections made with CSA members:

“Watching many kids grow up is special, and knowing that our food was their first food.”

Participants described farmers markets as festive and fun social atmospheres, where farmers would get a chance to connect with people in the neighborhood, to build clientele and social networks. One participant described farmers markets as “an easy place to communicate with people” where he could do networking for his other business. Participants also highlighted the sense of community among the vendors at farmers market. They enjoyed building relationships with other vendors at the market and trading food at the end of market.

“I like interacting with community and other farmers; seeing friends and spending time with them at market.”

“Nice sense of community among customers and vendors.”

Participants described CSA farms and farmers markets as important spaces for gathering and building community:

“I like the community aspect [of CSA] and creating a community institution; people come to the farm to pick up shares and see our operations.”

“Farmers market is a place where community gathers. It’s accessible to the public and builds community.”

“Farmers markets allow a sense of working together in community to benefit each other.”

One participant nicely summarized the sentiments of cooperation and support at farmers market:

Once I gave away soup on a 42° rainy day and some customers were surprised, but that's just how it goes at market—we are doing it together to benefit each other. Vendors can sell the same things and it doesn't matter. It's the flip side of a free market because we are working together for each other.

Likewise, CSAs provided a venue for farmers to collaborate with other farms and community members, with many CSAs offering farm products from other farms and utilizing volunteer support for their distribution.

10.4.3.2 Appreciation, Value, and Pride

Farmers spoke of the satisfaction of receiving appreciation and compliments from customers who acknowledged the value of their hard work, and exuded pride when speaking about interactions with customers. Interacting with customers who appreciated the farmers' organic practices was a highlight for one participant, who spoke of the high demand of his products:

““I was the only organic grower in Pittsfield for many years. We got so many compliments... I could never produce enough to satisfy them. My produce was often gone about 1 ½ hours before the market closed.”

A participant who marketed through a senior farm share program spoke particularly about the great appreciation they received from seniors. Another participant spoke about the CSA model fitting with Rudolph Steiner's concept that farmers fulfill the community's spiritual needs through food, and that customers' payment to the farmers felt like a way of valuing the farmers' spiritual contribution to the community.

Participants shared great pride in the food they grow. A fruit grower described the care and attention needed to grow fruit without pesticides and herbicides, and valued the environmental consciousness of his work:

“There’s a feeling of being part of an orchard movement.”

Several participants spoke about the pride in setting up a beautiful display at the market. The combination of being proud of the harvests and receiving gratitude from customers was uplifting for them:

“I like growing beautiful food and presenting it in a beautiful way and getting appreciation.”

10.4.3.3 Education

Farmers acknowledged the educational experience of farmers markets and CSAs. A few farmers spoke about farmers markets as a family activity where their children could learn about commerce. Also, customers learn about the seasonality of crops and new ways to prepare and eat food:

“People are getting what’s in season, learning how to cook new things. CSA is a good way to educate about draught and the challenges of farming, and have a human connection to the farmer.”

Farmers also recognized education being essential to their marketing success. One CSA farmer highlighted education as an important precursor to members making an effort to commit to the farm and told the story of three low-income members who drove weekly from a distant urban center to the farm:

“They drive all the way out here because they can get things cheaper in bulk at the farm. But they have motivation, cooking knowledge, and education about healthy food. Other steps come before someone may take that initiative.”

Education was understood as an essential pre-requisite for accessing local farm products, while marketing furthered the educational experience of learning about food:

“Education is key. If people were educated, there would be high demand for fresh organic fruits and vegetables, and farmers would be able to sell and make a living.”

10.4.3.4 Competition

Farmers identified friendly competition between vendors at farmers markets. One farmer talked about wanting to grow the best strawberries at market. Another talked about wanting to have the most beautiful display. And one wanted the earliest carrots. Therefore, competition was a jovial push to provide excellent products.

Participants also acknowledged non-favorable competition. One challenge involves price competition with large farms that may be receiving subsidies to offset their costs:

“To make a living as a farmer, we need monetary support to be able to be adequately compensated and to provide produce at low cost. We can’t compete with large farms that pay workers low wages.”

Farmers also expressed concern about the increased saturation of farmers markets and CSAs, making it difficult to get into some farmers markets, to acquire enough CSA members, and to set reasonable prices to make ends meet.

“There are so many CSA farms in the area, it’s hard to sell as many shares as we’d like. We feel a price pressure on shares, and we’re not getting enough money per pound of produce per share.”

“Some of the better markets are hard to get into. There is almost a saturation of farmers markets, which creates competition and fluctuation in sales.”

A few CSA farmers expressed the sentiment that the vision of supporting the farmer has been diluted through CSA competition:

“People wait until last minute to buy shares—the initial vision of supporting farmers has been lost.”

One participant spoke about difficulties with town politics, being accused of out-competing sales of older farmers at the market. Also mentioned was the challenge of competing with the Food Bank, who gives away free produce, driving customer mentalities of entitlement to cheaper prices on food.

10.4.3.5 Time and Labor-Consuming

Many participants expressed challenge regarding the large amount of labor and time involved in marketing, and finding themselves overwhelmed:

“We are stretched to the limit with manpower and time.”

They described setting up for farmers market or CSA distribution as a “hustle,” a “marathon,” “exhausting,” “energetically draining,” and a “heavy work load.” For one participant, the time and labor expenses of going to farmers market were too high to make the trip worthwhile:

“It took hours just to harvest and get the food ready for market. Then to drive over 30 minutes to market, spend time at the market, to discover that people found that my products cost too much. I didn’t sell enough to make it worthwhile.”

A participant who sold dairy and meat mentioned the extra work required for setting up refrigeration at farmers markets:

“It’s lots of work. The set up and time is consuming. We need refrigeration, electricity, coolers and ice, lots of equipment.”

Participants reiterated their experience of farm work as time and labor intensive; the investments of time, labor, and resources in marketing further intensified their workload:

“A day away from the farm is a day’s lost labor. It must be balanced with worthwhile sales.”

10.4.3.6 Weather

Poor weather conditions created stress for many participants; some discussed crop failures due to unpredictable weather conditions:

“It’s stressful in a hard season with crop failures and bad weather.”

“Sometimes things are beyond our control, like hurricane Sandy that wiped out our crops. Mostly people understand but we still feel bad.”

Poor weather was a deterrent for customers at farmers markets and CSAs, making sales unpredictable, and generating undesirable waste:

“Sales [at farmers markets] are not guaranteed, especially with rainy weather.”

“Pick-your-own [with CSA] drove me nuts. People didn’t want to pick when the weather was bad, and a lot went to waste.”

Participants also expressed the physical discomforts of being exposed to the elements in bad weather:

“Rainy days are challenging-- standing out there in rain or freezing temperatures.”

Thus, poor weather provided an element of discomfort, risk and unpredictability in farmers’ harvests and sales.

10.4.4 Perspectives on Access

10.4.4.1 Access to Quality: Local, Fresh, and Organic

Several participants perceived their participation in CSAs and farmers markets to increase customers’ access to higher quality food that was local, fresh, and organic, and to a wider range of produce including non-conventional varieties.

“I was the only organic grower in Pittsfield for many years.”

“Certainly we increase access to fresh, organic produce; probably not access to produce in general.”

Participants recognized that improvements of access through farmers markets and CSAs was more significant for those who don’t normally shop at stores that supply local food:

“Some customers might already shop at the Co-op where they can find the same blueberries. Others might not shop at places where blueberries are sold.”

One participant noted that organic quality may not be a major consideration for low-income customers:

“Certified organic is often a price point for farmers that might not be important for low income [customers].”

One CSA farmer discussed their influence on increasing customers' consumption of fresh produce through the abundance that they provided for their shareholders, more than they would normally purchase:

“We get people to eat more vegetables because they have to fill their bag with vegetables and don't want them to go to waste. Especially with eating greens—some weeks in early June, all we have is greens.”

10.4.4.2 Affordability and Financial Incentives

Farmers acknowledged that many farmers markets offered the opportunity for customers to utilize federal nutrition program assistance such as SNAP, WIC, and Senior Farmers Market Coupons to facilitate affordability of local food. One participant emphasized the importance of finding ways to double the coupons for low-income customers rather than to devalue the farm products. Many CSA farms or on-farm stores were not yet equipped to receive SNAP benefits; yet participants still spoke of the importance of these programs to improve access. One participant related the importance to the rising prices of food and climate change:

“We would like to hook up our farm to be able to receive food stamps. Lowering the cost of produce is huge for increasing access. Price of produce is going to increase, especially with climate change, like the water crisis in California. To make a living as a farmer, we need support from policy and organizations to provide funding needed to be able to decrease consumer cost while still receiving adequate income.”

While federal incentives existed, some participants noted that SNAP customers did not contribute to large portions of sales at farmers market. Also, some participants described

the trouble of filing paperwork for SNAP benefits or using the system at market. Some reliance on the cooperation and good will of farmers was essential in some cases to make SNAP work for customers:

“The hard thing was not being able to give cash back [to SNAP customers], since the farmers market used a token system. We would always take the hit and give them something [extra]. There is always some finagling to make it work for them.”

Participants mentioned other personal investments in facilitating affordability for low-income customers at farmers markets:

“I will give away fruit or adjust the price if I know someone doesn’t have a lot of money.”

Many CSA farms offered discounted shares for those receiving SNAP or those with low-income.

“Subsidized CSA shares make very low-cost shares available, so blueberries are much cheaper than purchasing elsewhere.”

These discounts required community involvement to procure needed funds such as grants and CSA sponsorships. One participant explained that although the farm paid for discounted shares for many years, it didn’t financially make sense since the farmer himself earned a low income. Then he found that recruiting sponsors from CSA members was a more reasonable arrangement for subsidizing the discounted shares. Participants recognized the financial advantage of CSA shares even without discounts:

“[CSA is a] more economical way. They get a lot of produce. If you consume everything, it is a great value.”

10.4.4.3 Location and Access

A few farmers explained that the locations of their CSA or farmers markets were often in areas that improved the neighborhood's access to food. One participant even described their motivation to market in certain urban farmers market locations related to the potential to reach more low-income customers.

“Some people may not go to farmers market but live in the neighborhood and receive CSA shares.”

“Not everyone can get to the farm, but farmers markets are usually in urban centers that are easier to get to for urban folks.”

“People can walk to the farmers market.”

One CSA farmer described his farm as mitigating the lack of food stores in the vicinity and the lack of transportation options:

“We're technically in a food desert. It's hard to get to a store without a car from here.”

10.4.4.5 Access to Information and Community: The Human Connection

As already described in a previous section on the educational advantage of farmer to customer interactions, the human connection of local marketing systems allows customers to access information about seasons of crop production, how to pick certain “you-pick” crops, weather and environmental impacts on farm productivity, and ways to prepare food. One CSA farmer described the support that some shareholders provided for others:

“One shareholder got others to the farm who otherwise wouldn’t and held their hand through the process—[people] who didn’t know what to do with produce, [who found] you-pick unfamiliar and eating raw food out of normal.”

Access to local food thus overlapped with access to information and access to community members facilitated by human connections that were enabled in local food marketing.

10.4.4.6 Cultural Accessibility and Lack of Diversity

Participants acknowledged the lack of diversity of their customer base, with farmers markets and CSAs attracting mostly white, middle and upper class customers.

“CSAs usually have self-selecting people who would sign up anyway.”

“Farmers Markets and CSA appeal to people who have financial means, also motivation and education, and have many options, so these markets don’t necessarily increase access for low-income people.”

Most participants expressed the desire to broaden and diversify their customer base; although solutions to reach more customers of diverse cultural and economic backgrounds were unclear. One participant who was involved in managing a farmers market hired a Food Access Intern to network with local organizations to recruit more diverse customers; they piloted another market in a more diverse neighborhood, but found that it was still difficult to diversify their customers.

“We found that people didn’t buy that much food. Other non-low-income people showed up and paid less.”

While this participant did not provide answers to the dilemma of lack of diversity, she reiterated that the issue was not just about the cost of food, and emphasized the importance of continuing to explore the issue.

10.4.4.7 Donating, Bartering, and Other Strategies for Increasing Access

Many participants donated surplus produce to local food pantries, another way of facilitating food access. They spoke of organizations that picked up leftover produce at the end of farmers market or CSA distribution and brought it to food pantries.

Participants sought out places to donate produce when they had excess and identified the need for more networking and organizing to make the process of donating food more efficient.

“Sometimes it seems that the local donation center has too much stuff, and we’re not sure where to take it. It would be good to know who needs it and where would be the best place to distribute surplus to those in need.”

A few farmers utilized bartering as a form of facilitating access to their farm products, and recommended this model for increasing access for people with low-income, with farmers benefiting from the farm help.

“Work exchange for food could be a potential exchange for low-income people.” Participants expressed not liking to waste food, and preferred finding ways for people who needed food to access it. One participant suggested a system of having a group of volunteer harvesters who could be called onto farms to harvest and distribute the food to those who needed it.

“It would be great if young people or older, whoever is not tied to a busy schedule and who has the energy, to pre-arrange harvesting for people who grow a lot of food and sometimes have surplus... For example, if I have a lot of green beans, I could tell this group of pickers and distributors to come get my green beans and take them to distribute.”

10.4.5 Perspectives on Mobile Produce Markets

10.4.5.1 Profit and Cost-Effectiveness

Most farmers wanted to have a clearer sense of the potential for profit with MPM and were concerned about getting adequate compensation for their harvests.

“Getting a fair price for goods [is important].”

“[I would participate] if it was economically feasible.”

“[MPM needs a] customer base, ability to move crops in high volume to make a profit... so that the farmer gets sufficient income from the value of produce.”

Participants were concerned about the time commitment required in a MPM operation; they expressed having limited time and energy, and feeling saturated with current markets and responsibilities.

“A mobile produce market sounds like a big logistical thing, with a large amount of effort to load up, set up display, unload, etc. It would be important to know the economic deal.”

One farmer emphasized the need for the project to be a profitable business that does not just rely on grants:

“These markets don’t work in the long term. They are not profitable. It’s all about scale and volume. They need to look at it as a business... Organizations don’t know how to make a business and rely on grants. They waste time and crops, and can’t move enough volume.”

10.4.5.2 Risk and Predictability of Sales

Participants were aware of the risk involved in participating in unfamiliar markets and selling to unfamiliar communities. The perishability of produce increased the risk,

with farmers worried about the unpredictability of sales and wasting their precious harvests.

“[There are] chances of financial loss with perishable farm products”

Having information about the target community’s shopping habits and desires would allow farmers to make more informed choices about the amounts and types of produce to provide.

“[We] would need some research about customer desires and prospective sales.”

Yet, there was concern that the needs of the community would require major changes in their farm system:

“We like to stick with what works. Trying something new would mean taking a risk. We would need to do some research about things people would buy, which may mean growing different things and changing systems at the farm, which may be challenging.”

Participants expressed the potential for MPM involvement if there were guaranteed sales and a simple compensation system:

“If I give them a box of produce and get a check.”

“[If I could get] paid up front with wholesale price rather than waiting to see what sells.”

10.4.5.3 Community Investment

Participants expressed the importance of having the community itself involved in running the MPM in order to best serve the community.

“It’s important to have people within the communities involved in the mobile produce market—they know the people, the challenges, what food they want. Just putting the market into farmers’ hands doesn’t make sense.”

For another participant, education was key to engaging the community.

“[I would participate] if there was an educational component. If people know the value and appreciate the food for its quality and value”

Having a strong customer base was mentioned by several farmers as essential for the market’s success, which would come with strong community investment.

10.4.5.4 Organizational Support and Logistics

Participants indicated the importance of having an effective organization to manage and support the MPM. Most participants preferred to have someone else sell their farm goods because of their lack of time.

“[We would want] help getting products to market—not requiring personal time to transport and sell products.”

Several participants expressed the need for an organization in charge of the operation to be trustworthy, educated about the value of their products, and with good management skills and careful about handling their products:

“I worry about those who are trucking and selling my products not taking good care of it. I would need to trust the infrastructure so that the food that I value and spend lots of time growing and harvesting does not go to waste and gets to the people in the city, not just the vendor’s mouth.”

“[I would be] worried about who is selling my stuff and want to make sure it’s in good hands.”

“[We need] good organization around sales, and people selling farm produce knowing the value and taking good care of it.”

“We need to make sure the cold chain is in place from farm to customer which requires infrastructure and ensuring someone is paying attention.”

“Good management would make it or break it—need a good team or one person in charge.”

Having a convenient system for acquiring and distributing their products was essential:

“Having a stress-free, flexible arrangement is important—provide what I have and not have a strict expectation. [I would want to] drop off the produce at a convenient place that is already in our weekly rhythm of traveling (not extra traveling), and an organizational infrastructure that is trustworthy.”

“It would be good to have a pre-determined plan of what the farmer can provide and what customers want. For example, if [the farmer] knew that the market would sell roots from a certain time to a certain time, the farmer can plan ahead and plant certain crops just for the market.”

Participants noted the importance of effective communication:

“Communication needs to be clear within distribution business. Support and coordination by local organizations [is important].”

“[We would need] help in the communication and marketing end of things so we could focus on harvesting and delivering.”

“[One barrier would be] lack of communication about what customers want and what farmers can provide”

10.4.5.5 Travel and Distance to Distribution

In general, participants liked to stay close to home or the farm, but were willing to participate in distribution of their farm goods if they didn't have to travel far and spend a lot of time in the process. Only 2 participants said they would be willing to sell their own products in MPM.

“I prefer staying closer to home. There would need to be a major financial incentive for going to a distant market.”

“I generally like to stay close to home, where I have a sense of place. Maybe if it was part of a routine trip to town [I would participate].”

When asked about specific distances willing to travel, answers ranged from 10 to 50 miles. Farmers expressed a willingness to travel farther if there was a great volume of produce or a large financial incentive. Two participants noted that there would need to be a minimum of \$300 in sales to travel more than 20 miles.

10.4.5.6 Ideas for Mobile Produce Markets

Participants generated ideas for MPMs. One participant suggested purchasing produce from an aggregate source like a Growers Association, where one could purchase produce at very low cost and where it's a “one-stop shop”; since prices are significantly less, food waste may not be as much of a concern. One participant suggested focusing on a few basic crops that would sell well rather than trying to have a large variety. Since most participants had established markets, one participant suggested that a MPM might be a good marketing option for a farmer who is just getting started and looking to establish a market. One participant suggested having volunteers come to the farms to harvest the produce to save farmers' time. Another idea was to create multiple uses for

the market vehicle to disperse vehicle maintenance costs. One participant indicated having success with community-based fundraising in the past and suggested this strategy to sustain a mobile market project.

Table 10.3: Themes Generated from Interviews (n=16)

Research Question	Themes	Number of Participants with Responses that Correspond with Theme
Motivations and Considerations in Choosing Farmers Markets or CSAs	Efficiency and Profit	11
	Being in Community	14
	Flexibility	7
	Familiarity	5
Farmers Market and CSA Marketing Experience	Connection with Community	15
	Appreciation, Value, and Pride	9
	Education	6
	Competition	6
	Time and Labor-Consuming	14
	Weather	6
Perspectives on Access	Access to Quality: Local, Fresh, and Organic	12
	Affordability and Financial Incentives	9
	Location and Access	12
	Access to Information and Community: the Human Connection	6
	Cultural Accessibility and Lack of Diversity	2
	Donating, Bartering, and Other Strategies for Increasing Access	7
Perspectives on MPMs	Profit and Cost-Effectiveness	15
	Risk and Predictability of Sales	12
	Community Investment	6
	Organizational Support and Logistics	15
	Travel and Distance to Distribution (Willing to sell their own n=2; Don't want to travel far/spend time selling n=14)	16
	Ideas for MPM	7

10.5 Discussion

Most farmers in our study work on small, diversified farms and have marketed their products through multiple channels including farmers markets (100%), CSA (63%), wholesale (63%), and on-farm stores (63%). Participants were all White, and 63% earned an income below \$20,000/person in household. Their profile is similar to existing literature showing direct-to-consumer local farmers to work on small, diversified farms (Lass et al., 2003; Low and Vogel, 2011), utilize multiple marketing channels (Martinez et al., 2010), be mostly White (Lass et al., 2003), and earn a low income (Lizio and Lass, 2005; Low and Vogel, 2011).

Desires to support community by providing high quality food, and to be appreciated and supported by community patronage were important motivations to market through farmers markets and CSA. Participants also considered the profit potential, particularly in choosing farmers markets, and time and labor needs when choosing markets. Connecting with community was the most prominent theme in participant experiences with farmers markets and CSAs, which included enjoyment of spending time with customers and other vendors, networking, and sharing information about food. Challenges to markets included the large time and labor needs, unpredictability of sales, particularly with bad weather, and competition with other farms. Participants viewed their marketing efforts to increase general access to high quality, local, fresh, organic food in the vicinity, as well as access to information about food and supportive community members; the use of SNAP benefits, CSA sponsors, and bartering improved the affordability. They acknowledged the lack of diversity of their customer base, and the need to find ways to expand their reach to more low income and minority

populations. Participants took interest in MPM for improving access to local produce, yet were concerned about profit and cost-effectiveness, unpredictability of sales, level of community investment, travel distance, and time requirement, including dealing with the logistics of operating a vehicle and coordinating with other community members.

Our findings that participants sought out social connection in their market channels, enjoyed community connection at farmers markets and CSA, and utilized community resources such as CSA sponsors to make food more affordable, resonates with literature highlighting the benefits of social connection through direct-to-consumer marketing (Fehrenbach and Wharton, 2014; Hinrichs, 2000; Hunt, 2007; Kirwan, 2006; Smithers et al., 2008). Scholars have applied the concept of social embeddedness, “the idea that economic behavior is embedded in, and mediated by a complex web of social relations” (Maye and Kirwan, 2010, pp. 4), to direct agricultural marketing to recognize social connection, reciprocity, and trust as motivators and facilitators of economic transactions (Hinrichs, 2000). Participants also considered profit and cost-effectiveness of marketing channels; Hinrichs (2000) discusses the appropriateness of marketness (i.e., price priorities) and instrumentalism (i.e., self-interest) to compliment social embeddedness in securing small farm viability.

While participants paid attention to the economic sustainability of their marketing practices, they did not make a large income from farming, and their work was largely driven by the altruistic motivation to provide environmentally conscious food to their community. Similarly, literature reports that profit has not been a priority for small farmers (Galt, 2013), particularly CSA farmers who consider viability based on meeting production costs, without necessarily profiting (Lizio and Lass, 2005). Civic agriculture

is epitomized by this non-exploitative, socially and environmentally conscious production and marketing practices (DeLind, 2002; Lyson, 2000; Lyson and Guptill, 2004). The sustainability of this economic model, however, has been questioned: CSA surveys show that farmers often compromise their labor costs to meet production costs (Lizio and Lass, 2005); one study in California found the practice of “self-exploitation” among CSA farmers, who often prioritized obligations to CSA members over their own income needs, and stressed the need to consider farmers’ economic welfare for the success of local food systems (Galt, 2013). Similar to literature findings, some of our participants felt that the spirit of community investment and support, and strong member-farmer relationships that formed the essence of the vision of CSAs had been eroded, as competition for customers had come to the foreground (Galt et al., 2015). The conundrum of small farmers competing with large farms is evident in the current local food landscape; although large farms (annual gross sales \geq \$250,000) represented only 5% of farms participating in local marketing, they accounted for 93% of the value of local food sales marketed through intermediated channels, obtaining a higher percentage of local food revenue compared to small farms (Low and Vogel, 2011).

Guthman (2006) discusses the dilemma of providing viable incomes for small, sustainable farmers while making local food affordable for low-income people, and finds farm and food security incompatible, with farm security taking precedence. Their study found that low participation of low income customers in CSA and farmers markets was not due to lack of manager interest; in fact, CSA and farmers market managers placed great importance in attending to issues of food security (Guthman, 2006). Similarly, we found that participants had been implementing strategies to reach low-income people,

such as procuring funds through grants, CSA sponsors, and farmer's personal investments, accepting SNAP benefits, and bartering food for work to make food more affordable; and they were open to more tactics. Still, there was a lack of diversity in their customer base. Our findings suggest ideas similar to Guthman's (2006), that CSA and farmers markets structures alone are not able to provide needs of low income and must rely on the support of public food assistance, and the redistribution of public and private money (Guthman, 2006). Guthman (2008a) suggests that ways different from trying to "bring others to the table" are needed to reach low income and diverse populations, including engagement in a process of redefining the local food rhetoric, spaces, and projects that are currently dominated by "whiteness".

While social connection was an important leverage for successful farmers market and CSA experiences, we found that participants were hesitant to take on a role of direct marketing when asked about participation in MPM. This could have been due to the hypothetical nature of our inquiries about MPM participation, without a real sense of the target market population, the demand, location, and profitability. Nevertheless, participants were daunted by the MPM model being one that seemed to require a large time and labor commitment, substantial infrastructure needs, diligent planning, customer demand, and fluid collaboration between various parties for its success. Participants were deterred by the need to travel a lot with MPM if they took on the role of vending, as they preferred to stay close to home. At the same time, they appreciated the concept of MPM for improving local food access. Many participants seemed open to becoming involved in a MPM project if there was financial return, efficiency in the distribution, proper organizational management, and community investment.

Civic agriculture advocates for the participation of multiple actors in a community, to tap into local resources and to create local circuits of food to benefit community welfare (Lyson, 2005). MPM operations offer opportunities for various community members to become involved in improving local food access.

Since direct farmer-to-consumer marketing seemed less feasible with the MPM model, our study participants acknowledged the importance of organizational collaboration for running a successful MPM. In a recent study that compared markets that are vendor-led, community-led, and that are sub-entities of organizations, researchers found that markets that are sub-entities of organizations often have greater access to financial and managerial resources, but poor links to vendors (Gantla and Lev, 2015). Having access to financial and managerial resources can alleviate farmers from the work of community outreach, marketing and sales, and can provide more financial security for farmers. At the same time, our study highlights the importance of preserving a sense of farmer-consumer relationship for positive farmer and consumer experiences. Therefore, it is imperative for organizationally-run MPM to find ways to build strong connections with producers to encourage motivation for continued participation, and to leverage community engagement by highlighting the value of local farmers' products and contributions to environmental and community health.

Based on our data and other study findings, we identified some roles for community organizations to play in operating a mobile produce market: 1. *Organize fundraising efforts to secure financial incentives for low-income customers, and set up infrastructure to process food assistance programs such as SNAP benefits and farmers market coupons.* We found that farmers were excited about reaching more low-income

customers, but needed support to ensure sales and profitability. Other studies have found that providing adequate pay for market managers (Ward, Slawson, Wu, & Pitts, 2015) and having financial incentives and means to process EBT using the receipt method preferably over tokens or scripts (Hasin, Smith, & Stieren, 2014), can support market reach to low-income people and producer participation. 2. *Establish a flexible but reliable purchasing arrangement with farms, with a plan for reselling or distributing leftover produce.* We found that farmers desired predictable compensation for their produce, and wanted to make sure that leftovers were not wasted. 3. *Coordinate pickup and delivery of produce from farmers to where it is needed, and manage sales.* We found that farmers were concerned about time requirements and cost-effectiveness of their marketing strategy, needed a convenient distribution system, and preferred to stay close to the farm. 4. *Establish educational opportunities so that customers could become more informed and hopefully more motivated to buy local produce.* We found that farmers desired an appreciative and informed customer base. Education should include topics about nutrition, cooking, and the importance of food growing practices for environmental and community health. 5. *Create opportunities for farmers and consumers to interact.* We found that farmer-consumer social interactions facilitated market enjoyment and commitment. When farmers are not involved in the process of vending, we recommend opportunities for consumers to meet the farmers and possibly visit their farms. Establishing social media opportunities, such as Facebook, as a platform for consumers and farmers to interact, can also facilitate farmer and consumer investment in the market (Cui, 2014). 6. *Improve cultural accessibility of markets by creating space for people of color to express their community needs, to design, create, and manage their market*

spaces, and by acting as a liaison between customers, vendors, and farmers to communicate needs. Scholars have suggested that it is essential to be transparent and reflective of the whiteness of alternative food networks (Guthman 2008a), for whites to be attentive to the cultural politics in order to be more effective allies in the food justice movement (Guthman, 2008b), and to integrate more racially and economically diverse actors in the food system (Lyson, 2014). *7. Advocate for policy shifts needed to support individual and family operated models of MPM, and act as a support network for willing vendors and local farmers.* Individual and family operated MPM models have historically served and been serviced by minority and immigrant populations (Tester et al., 2010), and offer a way for minorities to have more direct participation in the marketing system.

10.6 Conclusion

Farmers in our study sought out community connection and economic security in their marketing. Overall, farmers' ideas for MPM focused on the involvement of organizations to support the financial security and efficiency of the operation, without adding burden to farmers, and community initiation and involvement in order to communicate community food needs and to establish a strong customer base of people who value the market and use it regularly. The collaborative efforts needed by various actors, including farmers, consumers, organizations, and policy makers, reflect the essence of the problem-solving capacity of civic agriculture. MPM offer a promising strategy for serving low income and minority populations—to be organized and managed by the communities themselves, to bring food directly to neighborhoods, and to be patronized by low income and minority populations.

CHAPTER 11

DISCUSSION

This thesis provides a unique assessment of the role of MPM for increasing access to fruits and vegetables from three angles: the food environment context (Study 1), consumer perceptions and experiences (Study 2), and farmer perspectives (Study 3). Examining these three angles allows us to examine different factors affecting food access, including food availability in stores, consumer shopping habits, and food production and marketing. Combining our three studies suggests that MPM have the capacity to improve fruit and vegetable access to low income populations in urban environments by increasing availability of fruits and vegetables in the food environment, making fresh produce more accessible (i.e. closer to urban residences), providing fresh and high quality produce with high acceptability, and accommodating to consumer needs (e.g. providing safety, supporting EBT transactions).

Our investigation of the food environment in 13 half-mile radius areas around Go Fresh MPM locations showed variability in the number (range of 0 to 17 stores) and type of stores, and in the availability and variety of fruits and vegetables in each area, from two areas with zero stores and availability, to an area scoring highest at 148 points using a measure of fruit and vegetable type and variety, which indicated 148 cumulative items of fruits and vegetables. Although the majority of stores sold 100% fruit juice and canned fruit, vegetables, and beans, there was a limited supply of fresh fruits and vegetables in stores, pointing to the potential of Go Fresh MPM to impact neighborhood access to fruits and vegetables through improving the availability and variety of fruits and vegetables with their average weekly supply of 20 varieties of fresh, local produce from

July to October. Go Fresh may consider how to extend the length of their operations or collaborate with local businesses in order to continue the supply of fresh fruits and vegetables throughout the year. The Veggie Mobile MPM in Albany, NY, serves communities year-round (Capital Roots, not dated) and may offer ideas about closing the off-season gap in the Northeast region.

Our study of Go Fresh MPM shoppers (n=143) found that the MPM facilitated *five dimensions of access*, with participants indicating positive experiences with availability (variety), accessibility (location), affordability (price), acceptability (quality), and accommodation (safety, market staff interactions, and EBT use). Our findings that older shoppers (≥ 60 years) were more likely to live alone ($P < 0.001$), purchase food for one person ($P < 0.001$), be long-term shoppers (for 2-3 years) ($P = 0.002$), and use EBT ($P = 0.012$), and that living alone was a predictor of EBT use ($P = 0.03$), shopping weekly ($P = 0.03$), and traveling < 1 mile to Go Fresh ($P = 0.02$), suggest that Go Fresh may especially benefit older adults and those living alone, and may have social importance for shoppers.

Our study of farmers' perspectives and experiences of local marketing found that community connection and earning an income were most common motivations for choosing their marketing channels. Social connection, which came through direct marketing, was an important leverage for successful farmers market and CSA experiences, yet farmers were hesitant to take on a role of direct marketing when asked about participation in MPM. Farmers were concerned about the profitability and cost-effectiveness of MPM, the predictability of sales, community investment, the logistics of running a MPM (e.g. vehicle maintenance), and the anticipated long travel distance and

time commitment involved. Our findings highlighted organizational support as essential for facilitating farmer participation in MPM and decreasing the burden on farmers. Organizations can support MPM by securing financial incentives for customers, pre-purchasing produce from farmers, coordinating pickup and delivery of produce to market, managing sales, establishing educational opportunities for customers to learn about the value of local food and opportunities for farmers and customers to interact. Other studies have suggested the importance of improving the cultural accessibility of local markets and alternative food networks by being transparent and reflective of the whiteness of these spaces (Guthman 2008a), attentive to cultural politics (Guthman, 2008b), and to integrate more racially and economically diverse actors in the food system by creating spaces for people of color to express their communities' needs and to create and manage their market spaces (Lyson, 2014). The needed collaboration of consumers, farmers, market managers, and community organizers reflect the socially conscious, community-supportive, problem-solving capacity of civic agriculture (Lyson, 2005).

Our studies set the stage for further exploration of MPM in the context of supporting food sovereignty and food justice movements. Health equity requires long-term socio-political restructuring processes (Weiler et al., 2015) that are supported by both movements' attempts to dismantle structural and systemic racism and to counteract the neoliberal free market economy that undermines small farmers, erodes environmental integrity, and exploits marginalized groups for corporate profit (Holt-Gimenez, 2010; Cadieux & Slocum, 2015). Food access disparities are not an accidental outcome of mismanaged food marketing and distribution, but are the repercussions of a long history of structural injustices (Allen, 2010; Levy and Sidel, 2013) such as segregation and

racism in the U.S. that have marginalize populations of color from sources of healthful food through policies such as ones that have displaced people from land, and favored industrial control of the food supply (Cadieux & Slocum, 2015; Holt-Gimenez, 2010; Levy and Sidel, 2013).

MPM can be seen as a social justice strategy to change the predicament of food access disparities from various theoretical perspectives. MPM, through its targeting of low-income and minority populations, or other vulnerable populations such as older adults, can be a form of distributive justice by intentional redistribution of healthful food to areas and people who have limited access. Distributive justice recognizes that inequities of wealth and resources are a result of societal structures that favor some over others and advocates for governments and organizations to redistribute wealth to those who are disadvantaged (Levy and Sidel, 2013).

MPM can be viewed as a social justice strategy through the capabilities approach to social justice (Sen, 1993; Nausbaum, 2003) by encouraging opportunity to purchase healthful food and enabling individuals to become more capable of maximizing dietary quality and wellbeing. In Study 2, we found that almost all Go Fresh shoppers travelled \leq 5 miles to the market (94.8%), including the majority travelling $<$ 1 mile (72.2%), and 72.7% liked the market location, indicating MPM accessibility. Shoppers indicated satisfaction with price (47.6%) and there was relatively high EBT use among older adults (41.8%) despite low national SNAP enrollment rates for eligible older adults (Barber, 2012), indicating MPM facilitating affordability and accommodation. Shoppers also desired potential future Go Fresh activities such as taste sampling (44.2%), nutritional

counseling (30.6%), and cooking classes (23.8%), which would support nutrition and cooking knowledge and encourage agency to prepare healthful food.

Organizational models of MPM can encourage collaborative efforts of consumers, farmers, community organizers, and policy makers, making a process akin to communitarian social justice, which fosters the idea that justice begins with building relationships in community through realization of shared values/ethics, interdependent identities, and cooperative behavior (Novak, 2009). In Study 3, we found that farmers took pride in providing sustainably grown food, and enjoyed building relationships with consumers and other farmers based on shared values around environmentally and socially-conscious food growing. At the same time, the problem of the lack of diversity and cultural accessibility at farmers markets and CSAs was noted. And when asked about MPM participation, farmers expressed being stretched with time and labor, and were hesitant to embrace MPM marketing even though they admired the concept, suggesting more attention and efforts needed to build community connections and cooperation across racial, class, and urban to rural boundaries.

MPM have the potential to provide the space and venue for community members to take charge of marketing produce within their community, and small farmers to have control of production, counteracting the conventional paradigm of corporate food production and marketing. Farmers expressed the importance of community investment in a successful MPM, with one farmer saying:

“It’s important to have people within the communities involved in the mobile produce market—they know the people, the challenges, what food they want. Just putting the market into farmers’ hands doesn’t make sense.”

This perspective resonates with Young's (1990) feminist theory of justice that recognizes oppression and domination as the roots of injustice, and advocates for the equalizing of power and democratic participation of disadvantaged individuals and groups to develop the potential for wellbeing. Go Fresh is a not-for-profit, multi-organizational collaboration with a team-based leadership structure that includes city departments, a public health institute, three farms, a community action organization, and a nonprofit community loan organization, thus illustrating some of the community investment and power dispersion necessary for implementing food justice programming. Cadieux & Slocum (2015) advocate for food interventions within food sovereignty and food justice movements to affect systemic change by questioning and redefining power and control of the food system, rather than reproducing the dominant, corporate-driven paradigm. MPM have the potential to be this type of food intervention, yet would require greater transparency of the power structures that currently exist in local food systems.

Our research has focused on Go Fresh and organizational models of MPM, similar to recently published MPM research (AbuSabha et al., 2011; Evans et al., 2012; Jennings et al., 2012; Zepeda et al., 2014). Different from individual or family operated models of MPM, such as pushcarts and *fruteros* (see Chapter 5), which are often autonomous home-based businesses, organizational MPM models tend to be funded by grants and are sometimes sponsored by city or state programming, giving them more status and legitimacy (Martin, 2014; Morales & Kettles, 2009). Individual or family operated models of MPM offer a way for minorities to have more direct participation in marketing, with history of serving and being serviced by minority and immigrant populations in the U.S. (Rosales, 2013; Tester et al., 2010). Tester and colleagues (2010)

highlight the potential for these small businesses to support disparities in healthful food access and advocates for healthy food vending policies to support them (Tester et al., 2010). Research on the potential for individual or family MPM to mitigate disparities of healthful food access is scarce, and would provide an interesting contribution to the discussion of power structures in the food system and the challenges around more inclusive, diverse participation. In addition, research on the status of MPM in international settings, including their economic importance and their influences on food access and consumer behavior, would broaden our understandings of the roles and potential of MPM for improving food systems and public health.

APPENDIX A



COMMUNITY NUTRITION ENVIRONMENT EVALUATION

Community-Nutrition Environment Evaluation Data

Healthier Choices for Better and Longer Life

Health Geography Lab, Preventive and Behavioral Medicine
55 Lake Avenue North, Worcester, MA 01655
Contact: Wenjun Li, PhD (508-856-6574) Barbara Olendzki, RD (508-856-5195)

DATA

Store ID: _____ Business Name: _____

Street Address: _____

Town / City: _____ Telephone: _____

Surveyor ID: _____ Date (MM/DD/YY): ____/____/____

Time (MM: HH): Start ____:____ End: ____:____ # of
surveyors: _____

Store type: Grocery Convenience Wholesale Super store (Target, Wal-Mart)

Discount Store Fruit/Veggie Market Farmer's Market Other _____

Membership required: Yes No Card needed for discount: Yes
No

Does the store have a nutrition scoring system (NuVal, Guiding Star, ANDI): Yes
No

If Yes, list : _____

Comments:

(if space is not enough, please write on the back of this survey)

By signing here, I certify that the information recorded on this survey was collected by me or at my presence, at the time specified. The information was collected truthfully and to my best ability.

Surveyor Signature: _____

Rater ID _____ Store ID _____ Date _____ Measure Complete
N/A

**Community Nutrition Environment Evaluation Data(C-NEED)
Measure #1: MILK**

Availability and Price
Brand: Store (not organic) Other _____

1. Is skim (fat free) available?	Yes No
2. Is 1% (reduced fat) available?	Yes No
3. Is 2% (reduced fat) available?	Yes No
4. Is whole milk available?	Yes No

Shelf Space

Do skim and 1% take up **greater than or equal to 50%** of shelf space? Yes No

Pricing

Are all types of milk priced the same? Yes No

If Yes, collect price of Skim only, If No collect price of all types of Milk.

	PRICE	ON SALE?	PRICE	ON SALE?
	Half Gallon		Gallon	
1. Skim		Yes No		Yes No
2. 1%		Yes No		Yes No
3. 2%		Yes No		Yes No
4. Whole		Yes No		Yes No

Comments:

Rater ID _____ Store ID _____ Date _____ Measure Complete
 N/A

Community Nutrition Environment Evaluation Data(C-NEED)
Measure #2: FRESH FRUIT

Availability and Price

ITEM (Non-Organic)	Available	Price	Per pound	Per Unit	Per each	On Sale	Acceptable Quality?
1. Apples Red delicious Other: _____	Yes No					Yes No	Yes No
2. Bananas	Yes No					Yes No	Yes No
3. Cantaloupe	Yes No					Yes No	Yes No
3. Grapes Red Seedless Other: _____	Yes No					Yes No	Yes No
4. Oranges Navel Other: _____	Yes No					Yes No	Yes No
5. Peaches	Yes No					Yes No	Yes No
6. Berries Strawberries Other: _____	Yes No					Yes No	Yes No
7. Raisins Sunmaid 15oz oz	Yes No					Yes No	Yes No
8. Watermelon Seedless Other: _____	Yes No					Yes No	Yes No
9. Pears Anjou Other: _____	Yes No					Yes No	Yes No
10. Avocads Hass Other: _____	Yes No					Yes No	Yes No

Comments:

Rater ID _____ Store ID _____ Date _____ Measure Complete

N/A

**Community Nutrition Environment Evaluation Data(C-NEED)
Measure #3: FRESH VEGETABLES**

Availability and Price

ITEM (Non-Organic)	Available	Price	Per pound	Per unit	Per each	On Sale?	Acceptable Quality?
1. Carrots 1 lb bag Other: _____	Yes No					Yes No	Yes No
2. Tomatoes Roma Other: _____	Yes No					Yes No	Yes No
3. Sweet Peppers Green bell Other: _____	Yes No					Yes No	Yes No
4. Broccoli Bunch Other: _____	Yes No					Yes No	Yes No
5. Lettuce Green leaf Other: _____	Yes No					Yes No	Yes No
6. Celery Other: _____	Yes No					Yes No	Yes No
7. Cucumbers Regular Other: _____	Yes No					Yes No	Yes No
8. Cabbage Head Other: _____	Yes No					Yes No	Yes No
9. Dark leafy greens Spinach Other: _____	Yes No					Yes No	Yes No
10. Cauliflower Head Other: _____	Yes No					Yes No	Yes No

Comments:

Rater ID _____ Store ID _____ Date _____ Measure Complete
 N/A

Community Nutrition Environment Evaluation Data(C-NEED)

Measure #4: CANNED BEANS, RICE, SPAGHETTI

Availability and Price

Brand: Goya **Other:** _____

ITEM Closest to 16oz	Available	Price	On Sale?	Low Sodium	Price	On sale?
1. Black beans	Yes No		Yes No	Yes No		Yes No
2. Kidney beans	Yes No		Yes No	Yes No		Yes No
3. Chick Peas	Yes No		Yes No	Yes No		Yes No

of varieties of low sodium Beans 0 1 2 3 4 5 6+

Comments:

RICE

Measure

Complete N/A

Brand: Carolina **Other:** _____

ITEM Closest to 32oz	Available	Price	On Sale?	Ounces (If not 32 oz)
Brown Rice	Yes No		Yes No	
White Rice	Yes No		Yes No	

Comments:

SPAGHETTI

Measure

Complete N/A

Brand: Store **Other:** _____

ITEM Closest to 16oz	Available	Price	On Sale?	Ounces (If not 16 oz)
Whole grain Spaghetti (5g dietary fiber or more)	Yes No		Yes No	
Regular Spaghetti	Yes No		Yes No	

of varieties of whole grain pasta 0 1 2 3 4 5 6+

Comments:

Rater ID _____ Store ID _____ Date _____ Measure Complete N/A

Community Nutrition Environment Evaluation Data(C-NEED)

Measure #5: CANNED VEGETABLES / FRUIT

CANNED VEGETABLES

Brand: Store _____ Other _____

Measure Complete

N/A

ITEM (Non-Organic) 14 to 16 oz	Available	Price	On Sale?	Low Sodium	Price	On Sale?
1. Corn (Whole kernel)	Yes No		Yes No	Yes No		Yes No
2. Green beans	Yes No		Yes No	Yes No		Yes No
3. Carrots	Yes No		Yes No	Yes No		Yes No
4. Peas	Yes No		Yes No	Yes No		Yes No

of varieties of low sodium Veggies 0 1 2 3 4 5 6+

CANNED FRUITS

Brand: Store _____ Other _____

Measure Complete

N/A

ITEM (Non-Organic) 14 to 16 oz	Available	Price	On Sale?
1. Any Canned Fruit (In 100% fruit juice)	Yes No		Yes No
2. Any Canned Fruit (In heavy syrup)	Yes No		Yes No

of varieties of Canned fruit on 100% fruit juice 0 1 2 3 4
5 6+

Rater ID _____ Store ID _____ Date _____ Measure Complete

N/A

Community Nutrition Environment Evaluation Data(C-NEED)

Measure #6: FROZEN VEGETABLES

Availability and Price

Brand : Store

Other: _____

ITEM 1 pound bag (16 ounces)	Available	Price per bag	On Sale	Ounces (if not 16oz bag)
1. Corn	Yes No		Yes No	
2. Corn(with butter) Brand: _____	Yes No		Yes No	
3. Green beans	Yes No		Yes No	
4. Carrots	Yes No		Yes No	
5. Peas	Yes No		Yes No	
6. Broccoli	Yes No		Yes No	
7. Broccoli (with cheese) Brand: _____	Yes No		Yes No	
8. Spinach	Yes No		Yes No	
9. Spinach (with Cream) Brand: _____	Yes No		Yes No	
10. Mixed Vegetables	Yes No		Yes No	

If no store brand, use the least expensive brand, Use least expensive style (whole, cut...).

Comments:

Rater ID _____ Store ID _____ Date _____ Measure Complete
 ID _/A

Community Nutrition Environment Evaluation Data(C-NEED)

Measure #7 ICE CREAMS & FROZEN FRUITS

ICE CREAM

If fat free and regular available for both, choose least expensive brand.

Brand: _____

ITEM Hood or Friendly's Preferred (48 Oz)	Available	Price	On Sale	Ounces (if not 48)
1. Fat Free Frozen Yogurt 100 kcal 0 grams fat	Yes No		Yes No	
2. Other Brand Fat Free Frozen Yogurt (0 grams fat) Brand: _____	Yes No		Yes No	
3. Light Ice Cream 110 kcal less than or equal to 3g fat	Yes No		Yes No	
4. Regular Ice Cream Greater than or equal to- 140 kcal & 7 grams fat	Yes No		Yes No	
5. Other Regular Ice Cream Greater than or equal to- 140 kcal & 7 grams fat Brand: _____	Yes No		Yes No	

Number of Fat Free Yogurt: 0 1 2 3 4 5 6+

FROZEN FRUIT

Measure

Complete N/A

ITEM 16 oz bag preferred	Available	Price	On Sale?	Ounces (if not 16)
1. Berries (No sugar added) Strawberries Other _____	Yes No		Yes No	
2. Berries (Added sugar) Strawberries Other _____	Yes No		Yes No	
3. Mixed Fruit (No sugar added)	Yes No		Yes No	
4. Mixed Fruit (Added sugar)	Yes No		Yes No	

Comments:

Rater ID _____ Store ID _____ Date _____ Measure Complete
 N/A

**Community Nutrition Environment Evaluation Data(C-NEED)
Measure #8: GROUND BEEF, CHICKEN, & TURKEY**

Availability and Price

ITEM	Available	Price Per Pound	On Sale?	%Lean /% Fat (Use most lean available) Circle One
1. Lean Ground Beef (less than or equal to 10% fat) Brand: Store. Other _____	Yes No		Yes No	96/04 93/07 90/10 _____ Other
2. Regular Ground Beef Brand: Store Other: _____	Yes No		Yes No	80/20 _____ Other
3. Ground Chicken (Lean meat/breast) Brand: Purdue. Other _____	Yes No		Yes No	_____ g of fat
4. Ground Chicken Brand: Purdue Other: _____	Yes No		Yes No	_____ g of fat
5. Ground Turkey (extra lean breast of turkey) Brand: Store. Other: _____	Yes No		Yes No	_____ g of fat
6. Ground Turkey Brand: Store Other: _____	Yes No		Yes No	_____ g of fat

Circle One:
of varieties of lean ground beef less than or equal to 10% fat 0 1 2 3 4 5
6+

Comments:

Rater ID _____ Store ID _____ Date _____ Measure Complete

N/A

Community Nutrition Environment Evaluation Data(C-NEED)

Measure #9: HOT DOG

Availability and Price

ITEM	Available	Price	On Sale?	Sodium (mg per serving)
Oscar Mayer preferred brand				
1. Oscar Mayer Fat-free Wieners(turkey/beef) 0g fat	Yes No		Yes No	
Alternates: (less than or equal to 9 g Fat)				
2. Fat-free other brand 0g fat Brand: _____	Yes No		Yes No	
3. Turkey/chicken Wieners (98% fat free) Brand: _____	Yes No		Yes No	
4. Light Wieners (turkey/Pork)	Yes No		Yes No	
5. Light beef franks (about 1/3 less calories 50% less fat)	Yes No		Yes No	
6. Other: _____	Yes No		Yes No	
7. Oscar Mayer Wieners (turkey/pork/chicken) 12g fat	Yes No		Yes No	
Alternate: (greater than or equal to 10g fat)				
8. Beef Franks 13g fat	Yes No		Yes No	
9. Other _____	Yes No		Yes No	

Comments:

Rater ID _____ Store ID _____ Date _____ Measure Complete
 N/A

**Community Nutrition Environment Evaluation Data(C-NEED)
 Measure #10: SINGLE SERVING FROZEN DINNERS**

Availability and Price

Brand: Lean Cuisine (Alternate Brand: Smart Ones)

ITEM	Available	Price	On Sale?	Sodium (mg/serving)
Lean Cuisine preferred brand Less than or equal to 3 g sat fat				
1. Lean Cuisine Kind: _____	Yes No		Yes No	
2. Alternate: (reduced fat dinners less than or equal to 3g sat fat) Brand/kind _____	Yes No		Yes No	
3. Stouffers Kind: _____	Yes No		Yes No	
4. Alternate: (regular fat dinners less than or equal to 3g sat fat) Brand/kind _____	Yes No		Yes No	

of varieties low fat meals less than or equal to 3 grams saturated fat (any brand)

0 1 2 3 4 5 6+

Shelf Space

Do reduced fat single serving entrées take up **greater than or equal to 50%** of shelf space?

Yes **No**

Comments:

Rater ID _____ Store ID _____ Date _____ Measure Complete
N/A

Community Nutrition Environment Evaluation Data(C-NEED)

Measure #11: BAKED GOODS & NUTS

BAKED GOODS

ITEM (Non-Organic)	Available	Price per unit	On Sale
1. Low- fat muffin (Less than or equal to 3g fat/serving)	Yes No		Yes No
2. Alternate: (less than or equal to 3g fat) Brand _____	Yes No		Yes No
3. Regular muffin	Yes No		Yes No
4. Alternate: (less than or equal to 3g fat) Brand _____	Yes No		Yes No
5. Angel Food Cake Oz: _____	Yes No		Yes No
6. Alternate: Cake (less than or equal to 3g fat) Oz: _____	Yes No		Yes No
7. Chocolate cake Oz: _____	Yes No		Yes No
8. Alternate: Vanilla cake Oz: _____	Yes No		Yes No

Baked goods = foods in the bakery section: cakes, donuts, Danish (not cookies)
(Angel food cake is reduced fat) (Less than or equal to 3g fat/serving)

Number of varieties of low fat baked goods 0 1 2 3 4 5 6+

Number of varieties of regular baked goods 0 1 2 3 4 5 6+

NUTS

Measure Complete N/A

ITEM 16 Oz preferred	Available	Price	On Sale?	Ounces (if not 16)
1. Almonds (Unsalted)	Yes No		Yes No	
2. Almonds (Salted)	Yes No		Yes No	
3. Peanuts (Unsalted)	Yes No		Yes No	
4. Peanuts (Salted)	Yes No		Yes No	

Comments:

Rater ID _____ Store ID _____ Date _____ Measure
Complete N/A

Community Nutrition Environment Evaluation Data(C-NEED)

Measure #12 BEVERAGES

JUICES

ITEM (59 ounces preferred for juice)	Available	Price	On Sale?	Ounces (if not 59)
1. 100% Juice (Orange) Tropicana	Yes No		Yes No	
2. 100% Juice (Orange) Minute Maid Other: _____	Yes No		Yes No	
3. Juice Drink Tropicana	Yes No		Yes No	
4. Juice Drink Minute Maid Other: _____	Yes No		Yes No	

SODA, SPORTS & ENERGY DRINKS

Measure Complete N/A

ITEM	Available	Price	On Sale?	Ounces (If not as listed)
Soda: same brand for diet and regular circle least expensive				
5. Diet Soda (2L) Store Coke Pepsi	Yes No		Yes No	
6. Regular Soda (2L) Store Coke Pepsi	Yes No		Yes No	
7. Sugar Free or Unsweetened Iced Tea(16 oz) Snapple Other: _____	Yes No		Yes No	
8. Sweetened Iced Tea (16 oz) Snapple Other: _____	Yes No		Yes No	
9. Sugar Free Sports Drink (32 oz) Brand: Powerade Other: _____	Yes No		Yes No	
10. Sweetened Sports Drink(32oz) Brand: Powerade Other: _____	Yes No		Yes No	
11. Sugar free Energy Drinks (16oz) Brand: Red Bull Other: _____	Yes No		Yes No	
12. Sweetened Energy drink (16oz) Brand: Red Bull Other: _____	Yes No		Yes No	

Comments:

Rater ID _____ Store ID _____ Date _____ Measure Complete N/A

**Community Nutrition Environment Evaluation Data(C-NEED)
Measure #13: CHIPS**

CHIPS

ITEM	Available	Price	On Sale?	Ounces Per Package
1. Baked Potato Chips Lays Preferred	Yes No		Yes No	
2. Classic Potato Chips Lays Preferred	Yes No		Yes No	
3. Baked tortilla Chips Tostitos Preferred	Yes No		Yes No	
4. Tortilla Chips Tostitos Preferred	Yes No		Yes No	

I. # of varieties of low fat potato chips less than or equal to 3 g fat per serving (any brand)

0 1 2 3 4 5 6+

II. # of varieties of low sodium potato chips (less than 140 mg Sodium/ serving)

0 1 2 3 4 5 6+

III. # of varieties of low fat tortilla chips less than or equal to 3g fat per serving (any brand)

0 1 2 3 4 5 6+

IV. # of varieties of low sodium tortilla chips (less than 140 mg Sodium/ serving)

0 1 2 3 4 5 6+

Comments:

Rater ID _____ Store ID _____ Date _____ Measure
 Complete N/A

Community Nutrition Environment Evaluation Data(C-NEED)

Measure #14: BREAD

Availability & Price

Brand: Store (not organic) **Other** _____

ITEM (Non-Organic)	Available	Price per loaf	On Sale?	Ounces per loaf
1. Whole Grain bread (100% whole wheat bread & whole grain bread)	Yes No		Yes No	
2. White Bread (enriched flour)	Yes No		Yes No	

I. # of varieties of 100% whole grain breads (all brands)

0 1 2 3 4 5 6+

Comments:

Rater ID _____ Store ID _____ Date _____ Measure
 Complete N/A

**Community Nutrition Environment Evaluation Data(C-NEED)
 Measure #15: CEREAL**

Availability & Price:

ITEM (Non-Organic)	Available	Price	Sale Price?	Ounces
1. Kashi Heart to Heart Honey Toasted Oats	Yes No		Yes No	
2. Other cereal (less than 7g sugar and greater than or equal to 5 g of fiber) Brand: _____	Yes No		Yes No	
3. Cheerios Plain	Yes No		Yes No	
4. Sweetened Cheerios (with more than 7g sugar)	Yes No		Yes No	
5. Other Sweetened Cereal (with more than 7g sugar) Brand: _____	Yes No		Yes No	

I. # varieties of cereals with greater than or equal to **5 g fiber** / serving
 0 1 2 3 4 5 6+

Comments:

Rater ID _____ Store ID _____ Date _____ Measure
 Complete N/A

Community Nutrition Environment Evaluation Data(C-NEEDS)
Measure #16: Yogurt and Cheese

YOGURT

Brand : Store. Other: _____

Yogurt (32 Oz preferred)	Available	Price	On Sale	Ounces
Plain Yogurt –				
1. Non fat	Yes No		Yes No	
2. Reduced fat	Yes No		Yes No	
3. Full Fat	Yes No		Yes No	
Flavored Yogurt –Vanilla				
1. Non fat	Yes No		Yes No	
2. Reduced fat	Yes No		Yes No	
3. Full Fat	Yes No		Yes No	

CHEESE

Measure

Complete N/A

Cottage Cheese Brand: Store Other:	Available	Price	On Sale?	Low Sodium	Price	On Sale?
1. Fat free	Yes No		Yes No	Yes No		Yes No
2. Reduced fat	Yes No		Yes No	Yes No		Yes No
3. Whole	Yes No		Yes No	Yes No		Yes No
Cheddar Cheese Cabot or Kraft						
1.Fat free						
Block Oz _____	Yes No		Yes No	Yes No		Yes No
Other Oz _____	Yes No		Yes No	Yes No		Yes No
2.Reduced fat						
Block Oz _____	Yes No		Yes No	Yes No		Yes No
Other Oz _____	Yes No		Yes No	Yes No		Yes No
3.Full Fat						
Block Oz _____	Yes No		Yes No	Yes No		Yes No
Other Oz _____	Yes No		Yes No	Yes No		Yes No

Comments:

APPENDIX B

GO FRESH SATISFACTION SURVEY 2014

Mobile Produce Market Satisfaction Survey Interviewer Introduction and Instructions

Instructions

What to bring:

Clip Boards

Pens (to complete survey, participants may keep this after completing the survey)

Large manila envelope(s) to store completed surveys

What to do:

1. Introduce yourself and Ask shoppers to participate:

Hello, my name is (insert your name). I'm with Live Well Springfield, working to promote healthy eating and active living in Springfield. and we'd like to get some idea of how the mobile produce market is working. This survey has 20 questions about how you use the mobile market, and whether there are changes you'd like to see. It will take less than 10 minutes to fill out. Would you be willing to fill out this survey to help us improve the mobile market?

If no: "OK, no problem. Enjoy the all the fresh produce"

If yes: "Thank You"; hand them the clipboard with survey and a pen; Please answer all the questions by circling the answers that best apply to you. If you have any questions, I'd be happy to answer them.

Return of Survey

Thank the participant. Add the following information to the top of the survey:

Date survey was completed;

Location of market;

Your initials

check survey to be sure you can read survey, if you can't read it go to person and ask for clarification

store completed survey in manila envelope

Return all surveys to Partners for a Healthier Community main office

Date: _____ Market location: _____ Initials: _____

**Mobile Produce Market Survey
October 2014**

Thank you for your time to answer these questions about the Go Fresh Mobile Farmer's market. We'd like to know more about your experience to help us to better understand how people are using the Go Fresh Mobile Market and how the market may best serve the needs of the community. The survey will take less than 10 minutes to complete. **All answers that you provide are completely confidential.**

Please read each question and circle the answer that best describes your situation or experience. You will sometimes be asked to circle all responses that apply to you.

1. Gender:

- Male₁
- Female₂

2. What is your age?

- 12-17₁ 18-24₂ 25-29₃ 30-39₄ 40-49₅ 50-59₆ 60-69₇
70 plus₈

3a. Are you Hispanic or Latino?

- Yes₁
- No₂

3b. What ethnicity do you consider yourself to be? (Select one or more of the following)

- White or Caucasian₁
- Black or African American₂
- Asian₃
- American Indian or Native Alaskan₄
- Native Hawaiian or other Pacific Islander₅
- Other, please specify _____

4. What Springfield neighborhood do you live in?

- | | | |
|-------------------------------|--------------------------------|-----------------------------|
| Bay ₁ | Six Corners ₇ | North End ₁₄ |
| East Springfield ₂ | South End ₈ | Pine Point ₁₅ |
| Indian Orchard ₃ | Boston Rd ₉ | Sixteen Acres ₁₆ |
| McKnight ₄ | East Forest Park ₁₀ | Upper Hill ₁₇ |
| Metro Center ₅ | Forest Park ₁₁ | (Between AIC & |
| Old Hill/ Springfield | Liberty Heights ₁₂ | Springfield College) |
| College ₆ | Memorial Square ₁₃ | Other: _____ |

I do not live in Springfield.

Please specify where you live: _____

5. How often have you shopped at the Go Fresh Mobile Market this year?

- Weekly₁
- Twice/Month₂
- Once/Month₃
- Once or Twice₄
- This is my first time₅

6. How did you find out about the Go Fresh Mobile Market? (Please circle all that apply)

- Friends₁
- Coordinator of my building/organization₂
- News/media₃
- Workshop or information session₄
- Flyers/postcards₅
- Internet/ website₆
- I saw it as I passed by₇

7. Do you shop at other locations/stops of the Go Fresh Mobile Market or just this one?

- I only shop at this Go Fresh market location₁
- I shop at other Go Fresh location(s)₂: (Please circle all that apply)

Saab Court₁

Greenleaf Senior Center₂

Puerto Rican Cultural Center₃

Robinson Gardens₄

Vietnamese American Civic Assoc.₅

Caring Health Center₆

Gentile Apt.₇

Independence House₈

Linden Towers₉

Court Square₁₀

New North Citizen's Council₁₁

Colonial Estates₁₂

8. Is this your first year shopping at the Go Fresh Mobile Market or have you shopped at this mobile produce market in past years?

- This is my first year₁
- I started shopping at the Go Fresh Mobile Market last year₂
- I started shopping at the Go Fresh Mobile Market 2-3 years ago₃

9. How far did you travel to get to the Go Fresh Mobile Market today?

- less than 1 mile₁
- 1-5 miles₂
- 6-10 miles₃
- 11-25 miles₄
- 26-50 miles₅

10. How much did you spend at the Go Fresh Mobile Market today? (Please round up to the nearest dollar)

- \$ 0-5₁
- \$ 5-10₂
- \$ 11-20₃
- \$ 21-30₄
- \$ 31-40₅
- \$ 41-50₆
- \$ 51-75₇
- over \$ 75₈

11. Have you ever used an EBT card to purchase your produce at the Go Fresh Mobile Market?

- Yes₁
- No₂

12. Are you the primary purchaser of food for your household?

- Yes₁
- No₂
- I am purchasing food for someone not in my household₃

13. How many people are you purchasing food for?

- 1₁
- 2-3₂
- 4-5₃
- More than 5₄

14. What do you like about the Go Fresh Mobile Market? (Please circle all that apply)

- Location₁
- Safety of location₂
- Hours of operation₃
- Cost of produce₄
- Produce is locally grown₅
- Variety of produce₆
- Activities led by community organizations like food demonstrations and a visit by a WIC nutritionist₇
- Other: _____ (please specify)

15. What would you like to see changed about the Go Fresh Mobile Market for next year? (Please circle all that apply)

- Location₁
- Safety of location₂
- Hours at my market location₃
- Pricing₄
- More variety of products₅
- More activities by community agencies₆
- Nothing- it's perfect!₇
- Other: _____ (please specify)

16. Are there any vegetables or fruits missing from the Go Fresh Mobile Market that you wish were available at the mobile market?

Please list: _____

17. If offered at the Go Fresh Mobile Market, which of these activities are most important to you? (Please circle all that apply)

- Taste sampling₁
- Cooking classes₂
- Nutritional counseling₃
- SNAP or health care benefit information₄
- None of these, I am not interested₅
- Other: _____ (Please specify)

18a. Do you live alone or with others?

- Alone₁
- With Others₂

18b. If you live with others, who do you live with? (Circle all that apply)

- I live alone₁
- Partner or spouse₂
- Parents₃
- Children₄
- Other relatives₅
- Non-family members₆

19. Do you plan to shop at the Go Fresh Mobile Market next year?

· Yes₁

· No₂

20. Please share any other comments you have: _____

APPENDIX C

FARMER INTERVIEW GUIDE

Section 1: Demographics and Background
1. Study ID number:
2. Farmer gender:
3. Farmer age: <20 years; 20-29; 30-39; 40-49; 50-59; 60 plus
4. Farmer race/ethnicity (check all that apply): Hawaiian or Pacific Islander; Asian or Asian American; Black or African American; Hispanic or Latino; Caucasian; American Indian or Alaskan Native
5. Role on Farm (owner, manager, etc.)
6. Years on Farm/Farming:
7. Can you briefly explain how and why you got into farming?
8. What crops do you typically grow in a season?
9. How much land do you cultivate?
10. How do you sell your products, or get your products out into the marketplace? (Prompt) What ways do you sell you products? E.g. direct market, CSAs, Farmer's Market, restaurants, farm stand, supermarket chain?
11. Do you sell your goods year round? If so, how does the way you sell change during the year?
12. Is farming your sole source of income? / Do you have other sources of income other than farming? a. Does anyone else in the family work off the farm? b. What is your household income? a. Under \$10,000 b. \$10,000-19,999 c. \$20,000-29,999 d. \$30,000-39,999 e. \$40,000-49,999 f. \$>50,000 c. What % of your household income is from the farm? d. How many people (adults and children) are in your household?
Section 2: Experiences with farmers market and CSA
13. Have you or your farm ever been a vendor at a farmer's market? If yes: a. What was the motivation for doing so? b. Do you feel that participation affected those consumers' access to fresh produce? c. Was there /is there anything you enjoyed about participating? d. Was there /is there anything you found difficult or challenging about participating? e. Is there anything else you'd like to share about those experiences? If no:

<ul style="list-style-type: none"> a. Have you ever considered it? b. What were your reasons for not participating? / barriers to participate?
<p>14. Does your farm offer a CSA or has it in the past? Or, have you ever been a farmer for a CSA distribution system?</p> <p>If yes:</p> <ul style="list-style-type: none"> a. What was your motivation for doing so? b. Do you feel that participation affected those consumers' access to fresh produce? c. Was there /is there anything you enjoyed about participating? d. Was there /is there anything you found difficult or challenging about participating? e. Is there anything else you'd like to share about those experiences? <p>If no:</p> <ul style="list-style-type: none"> a. Have you ever considered it? b. What was your reason for not participating? (barriers to participation?)
<p>15. Can you tell me about strategies you or your farm has implemented in the past to reach low-income people?</p>
<p>Section 3: Perceptions of MPM</p>
<p>16. Would your farm ever consider leading or participating in a mobile market project?</p> <ul style="list-style-type: none"> a. What challenges might you face in participating in a mobile market project? <p>(Prompt) What might you find difficult, confusing, costly or challenging?</p> <ul style="list-style-type: none"> b. What would help you in participating in a mobile market project? <p>(Prompt) What would help, organization wise, financially, structurally?</p> <ul style="list-style-type: none"> c. Would you be willing to deliver or aid in a distribution system for a mobile market project? d. How far would you be willing to travel either in leading a mobile market project or to deliver your produce to be a part of a mobile market project?
<p>17. Would you like to share anything else at this time regarding the mobile market's concept?</p>

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