THE ASSOCIATION BETWEEN THE CONSUMER NUTRITION ENVIRONMENTS AND FREE AND REDUCED SCHOOL LUNCH RATES.

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Title

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The Supervisory Committee certifies that this ***disquisition*** complies with North Dakota State University's regulations and meets the accepted standards for the degree of

DOCTOR OF PHILOSOPHY

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ABSTRACT

This study examined the relationships between neighborhood socioeconomic status (SES), measured by free and reduced school lunch rates, the nutrition environment.

In the first part of this study trained surveyors used the Nutrition Environment Measure Survey-Stores (NEMS-S) to document availability of healthy food items in sixty retail food stores (96% of total community retail food stores) categorized as 'ethnic grocery', 'supermarkets', and 'convenience'. Community neighborhoods were divided by elementary school district, allowing neighborhood SES to be determined by the percentage of free and reduced price lunch provided to students and are thus grouped as high or low SES neighborhoods. Surveyors also used the NEMS-R to document nutritional availability and promotional signage in 187 restaurants categorized as being full service (n= 93) or fast food (n= 94). Restaurant locations were categorized as low SES, moderate SES, or high SES, based on the number of free and reduced lunch served in neighborhoods public elementary schools.

In the second part of this study, Fargo, ND was subdivided by elementary school bounders and free and reduced school lunch rates were collected to categorize schools in to three SES categories. Census block groups were also used to subdivide Fargo and census poverty rates were used to classify SES categories for block groups. To determine access to healthful food choices data from the first part of this study was used to compare between SES indicators (free and reduced lunch rates; census poverty data) and also within groups.

Take together; the results from both parts of this study emphasize the need to improve nutrition quality within all communities. This cannot be accomplished without a combination of government policies, consumer involvement, and a change in the food industry system; all are needed to address nutritional availability and access in communities. Governments can set

policies to promote good nutrition, incentives to locate food outlets in low income areas and improving zoning laws. Most importantly, governments can work with food outlets to promote healthful eating and nutritional choice making, thereby encouraging the consumer to make the best choice possible for their health.

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DEDICATION

This dissertation is dedicated to my mom and dad for their endless support and encouragement during the completion of this project.

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LIST OF ABBREVIATIONS

BE	Built Environment
CB	Census-based poverty rates
C/S Store	Convenience Store
CVD	Cardiovascular heart disease
F & V	Fruits and vegetables
FRSL	Free and reduced school lunch
SES	Socioeconomic status
SEM	Socio-ecological model
S/G Store	Supermarket/grocery store
NEMS	Nutrition environment measure survey
NEMS-R	Nutrition environment measure survey-Restaurants
NEMS-S	Nutrition environment measure survey-Stores

INTRODUCTION

The decades long increase in obesity across the United States has more recently stimulated interest in the nutrition environment's effect on human nutrition behaviors. This interest is paralleled by the need to use ecological frameworks to understand factors influencing health (Davis & Birch, 2001; Lytle, 2009; Swinburn, Egger, & Raza 1999). Despite this interest, measures and evaluation of the nutrition environment are still in their early years (Lytle, 2009), with little consistency across measures. However, understanding the existence of links between the food choices of a community and food-related disease risk undoubtedly makes sense (Lytle, 2009), as health professionals interested in preventing diet-related chronic diseases need to be able to measure characteristics of the nutrition environment that may influence multiple factors of individual and community health.

The socio-ecological model (SEM) hypothesizes that there is a synergy between individuals and environments that may exert influences on individual behavior beyond psychosocial characteristics (Baker, 1968; Kelly, 1990; Sallia & Owen, 1997; Spence & Lee, 2003). Because individuals are interdependent with their environments, indirect environmental influences could limit some behaviors while facilitating others. The SEM of health behaviors (e.g., physical activity and nutrition) hypothesizes that it is more efficient to enhance the environment rather than the individual, as environmental changes can then have an impact on the community at large.

Understanding that most public health changes are quite complex and often difficult to fully understand and address by single-level analyses, the SEM includes a more comprehensive intervention approach integrating multiple levels of influence that impact health and ultimately health outcomes (Robinson, 2008). Barker (1968) proposed that behaviors occur in consistent

patterns in regularly encountered environments called "behavior settings." In behavioral terms, the behavior setting represents a separate stimulus that elicits predictable human behavior (Skinner, 1954). Similarly, SEMs hypothesize that individuals adapt or vary their behaviors and/or characteristics in response to available, changing resources in the environment. For instance, despite individual demographic characteristics (e.g., age, gender, social class, income), simply residing in a more affluent neighborhood is likely to increase physical activity and improve nutritional behaviors due to a feeling of safety and having increased access to fresh fruits and vegetables (Ecob & Macintyre, 2000; Ellaway & Macintre, 1996; Gauvin, Levesque, & Richard, 2001).

To date, approaches to nutritional interventions, which have been mainly educational and behavioral, have met with limited success as evidenced by the continuing rate of obesity, and other chronic disease (Glanz, Sallia, Saelens, & Frank, 2007; Swinburn, Egger, & Raza, 1999). People struggle against environments that continue to promote high energy intake and sedentary behaviors. This could indicate that a more ecological approach needs to be taken to understand the micro and macro levels that influence human nutrition and obesity. Therefore, system-based, environmental interventions and evaluations may increase the rather modest impact of individual and public education programs (Cheadle, Wagner, Koesell, et al, 1992; Gill, 1997; Harris & Wills, 1997; Kikbucsh, 1997; Swinburn, et al, 1999).

One way of conceptualizing the interdependence among individuals, their health, and their environment is through the SEM (Robinson, 2008; Sallis &Owen, 1996; Swinburn et al., 1999), which provides a broader perspective on the health of a community (Robinson, 2008). At the macro-level, associations among availability of healthful foods, neighborhood characteristics, and racial and ethnic disparities are important however, assessing how the nutrition environment

influences consumer choices is paramount to change (Cummins, & Macintyre, 2006; Lytle, 2009).

The built environment (BE) is one critical area believed to apply important influences on individuals' access to affordable, healthful foods. The BE includes man-made design structures, land use and availability of public transportation for a community, as well as the availability of healthful activity options for residents within that community (Booth, Pinkston, & Poston, 2005; Handy, Boarnet, Ewing & Killingsworth, 2002). The unique nature of the BE allows it to both facilitate and deter healthful behaviors, often at the same time (Booth et al., 2005; Giles-Corti, Macintyre, Clarkson, Pikora, & Donovan, 2003; Jackson & Kochtitzky, 2001). The BE differs from the nutritional environment, which is "food resources available in the community that can be taken advantage of to meet recommended daily energy intake" (Glanz, et al, 2005); however, the BE can have an influence on the nutritional environment. Both the BE and the nutrition environment vary greatly from community to community, and this variation creates an important opportunities for public health interventions.

Recent studies have indicated that decreased access to supermarkets/grocery stores and increased access to convenience stores and fast food restaurants could be one of the many barriers to healthy eating in low socioeconomic status (SES) neighborhoods (Glanz et al., 2007). Convenience store and fast-food services are opportune, offering prepackaged items high in fat, sodium, and sugar, with very little choice of fruit and vegetables F&V (Bodor, Rose, Farley et al., 2007; Glanz et al., 2005, 2007). With limited access to supermarkets/grocery stores in low-SES areas, residents could find it difficult to acquire F& V, lean meats, low-fat milk, and other foods that are necessary for maintaining good health. Andreyeva et al (2008), concluded that grocery stores, compared to convenience stores, in any area had the highest volume of healthful

food items, especially fruit and vegetables. Therefore, lack of supermarket/grocery store access has become an important driver of disparities in dietary quality (Andteyeva, Blumenthal, Schwartz, Long, & Brownwell, 2008).

Therefore, the nutritional environment has the potential to predict some of the racial/ethnic and socioeconomic disparities in nutrition outcomes. For instance, fast-food restaurants are excessively available in low SES communities, whereas supermarkets are less common (Block, Scribner, & DeSalvo, 2004). In addition, supermarkets can play a vital role in healthy eating behaviors due to their abundance of fresh, wholesome foods. Ultimately, consumers can only purchase foods that are available and accessible to them, so despite one's level of nutritional knowledge and/or income, food choice is highly dependent upon availability (Bustillos, Sharkey, Anding, & McIntoch, 2009).

Purpose of the Study

The purpose of this study is to examine the relationship among neighborhood SES, retail food stores, food availability, eating promotions, and nutritional availability in Fargo, North Dakota and to compare findings from other nutrition environment assessments that have been conducted and reported since 2006.

Research Questions

1. Are there any differences in the distribution of healthful food items among different SES neighborhoods?
2. Is there a difference in the availability of nutrition information and healthful food promotions among fast-food and full-service restaurants?

3. Is the use of reported free and reduced lunch rates comparable to census block data for determining SES (income) for a community and for assessing availability of healthful food resources?

Justification for Research

The primary justification for this dissertation is that it examines the potential impact of the nutrition environment on food selection and healthful eating promotions among different neighborhoods in Fargo, North Dakota. Public health and nutrition research has examined the neighborhood nutrition environment, determining that access to supermarkets is an influence on healthful food consumption (Diez-Roux, Nieto, Caulfield et al., 1999; French, Story & Jeffery, 2001 Hill & Peters, 1998). Morland, Wing, Diez-Rouz, et al., (2002) discovered that with each additional supermarket in a census tract, fruit and vegetable consumption increased proportionally. Supermarkets were also shown to be a positive predictor of consumption of fruits among Supplemental Nutrition Assistance Program participants (Rose & Richards, 2004).

There is also a growing body of research that has investigated the effect of the in-store environment or the consumer nutrition environment on purchasing behaviors related to healthful foods (Curhan, 1974; Wilkinson, Mason, & Paksoy, 1982). Curhan found that dedicating more floor space to produce resulted in higher sales of fruit and vegetables in supermarkets. There have also been reports showing a correlation between the availability of particular food items in neighborhoods and consumption of such food items (Cheadle et al., 1993; Edmonds, Baranowski, Baranowski, Cullen & Myers, 2001). Therefore, the purpose of this dissertation is to address each of these key areas in regard to the availability of healthful food items and healthful food promotions. For this dissertation, the nutrition environment will be assessed using the Nutrition Environments Measures Survey tools.

Definition of Terms

Built environment: Manmade design structures, land use, and availability of public transportation for a community, as well as the availability of healthful activity options for residents within that community (Booth et al., 2005; Handy et al., 2002).

Nutrition environment: Social, policy, and built environments that influence access to food (Honeycutt, Davis, Clawson, & Glanz, 2010).

Consumer nutrition environment: The environment the consumer experiences within restaurants (Saelens, Glanz, Sallis, & Frank, 2007)

Full service restaurant: A restaurant that offers table service with a wait staff that takes orders at the table and provides wait service throughout the duration of the meal (Glanz, Clawson, Davis, & Carvalho, 2008).

Fast food restaurants: Restaurant that offers minimal service. Food may be supplied quickly after the customer orders order at a counter, or a customer's order may be taken and paid for at a counter, after which the order is delivered to a table (Glanz et al., 2008).

Supermarket: Any large chain retail food store (e.g., Wal-mart, Hornbachers, Sun Mart).

Convenience store: Any retail food outlet that is connected to a gas station, with extended hours, and in a convenient location, with limited household goods and grocery items.

Ethnic/specialty store: Any retail food outlet that sells a majority of goods that originate from a particular country or region outside the United States.

REVIEW OF LITERATURE

The health benefits of a diet high in fruits and vegetables (F & V) are well established; however, a large majority of the U.S. population does not integrate a sufficient amount of F & V into their daily eating habits (Casagrande, Wang, Anderson, & Gary, 2007; Larson, Neumark-Sztainer, Hanna, & Story, 2007; Quaudt, 2007; Vitolins, et al., 2007). Soluble fibers, limited to fruits and vegetables, have been shown to reasonably decrease both total and LDL cholesterol as well as reduce the risk of specific forms of heart disease, cancers and other common chronic diseases (Hu, 2009). There is also compelling evidence that cardiovascular heart disease (CVD) is heavily influenced by diet, and epidemiological data support that dietary patterns rich in fruits, vegetables, whole grains, and nuts can reduce CVD risk (Hu, 2009). Larson et al. (2009) found that individuals who have better access to F & V and limited access to convenience foods (e.g., prepackaged, high-fat, high-sodium foods) tend to have healthier diets and lower levels of obesity (Larson et al., 2009), which may in turn reduce their risk of CVD.

There is a need for research on nutrition environments at the community level as they influence healthful choices. If healthy foods are not readily available for purchase, then calorie-dense, low-nutrient foods become the default selections and risks for obesity and a host of other health problems increase. Supermarkets offer the greatest variety of healthful food choices (Bustillos et al., 2009); however, access to supermarkets alone does not guarantee access to healthy foods. Communities may benefit from understanding the role of the BE, the nutritional environment, has on influencing the risk for health problems. The environmental flux is reflective of resources available within a given community that can help individuals meet their recommended daily nutritional needs (Glanz, et al., 2005). The overarching premise is that

individual nutrition is influenced by the grocery resources' availability and the availability of such resources in the environment, or more specifically in the local community.

Figure 1 proposes a conceptual model that has been adapted from the Story et al (2008) ecological framework depicting the multiple influences on nutritional behaviors.

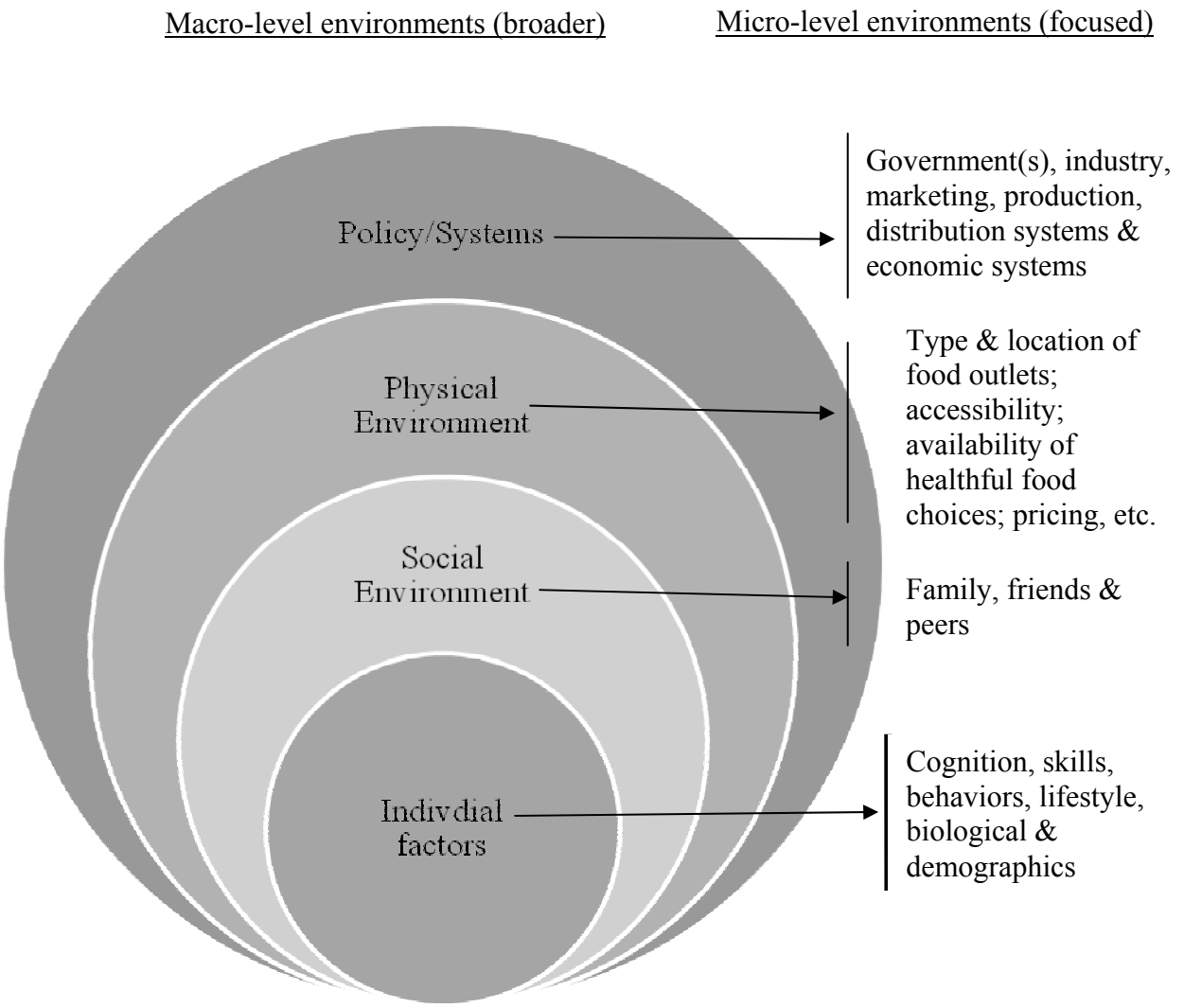

Figure 1. A conceptual model of nutrition environments. Modeled after "Creating Healthy Food and Eating Environments: Policy and Environmental Approaches", by M. Story, K.M. Kaphingst, R. Robinson-O'Brien, and K. Glanz, 2008, Annual Review of Public Health*, 29,* 253-272.

The Story et al model suggests that the outer rings are the broader macro level of the ecological framework of their SEM approach to nutrition and that each ring affects the next. However, the proposed model suggestions that each ring breaks down into macro-, meso-, and micro-level environments. To understand the broader environment, each micro-level environment must be investigated to formulate a broader understanding of a community's nutrition access and availability before the meso- and macro-environment can be addressed. Just investigating availability and access to supermarkets is a small piece of the broader picture. However, which resources are available and accessible within a supermarket need to be understood. For example, a community can have two retail food outlets within its area, but if healthful resources are not available within those structures then the community's access to healthful food could be limited.

A macroenvironmental setting is one that includes the food industry, either globally or nationally and everything that it entails (e.g., manufacturing, marketing, etc.). The proposed model breaks down the macro into microenvironments (i.e., community and consumer environments) and investigates what is available within a community and what the consumer experiences, (i.e., items such as in-store marketing [e.g. signage/promotions], availability of information [e.g. nutritional information] and if healthful food items are available and accessible). The microenvironment is essentially beyond the influence of individuals; individuals cannot control what marketing or promotional strategies are used within the consumer environment (Glanz, Sallis, Saelens, & Frank, 2007; Story, Kaphingst, O'Brien, & Glanz 2008).

The model regards the population level of eating behaviors as a "settling point"—the net result of multiple influences that impact what choices and influences of information are within a community and available to an individual (Robinson, 2008; Stokols, 1996). Therefore, improving the health of at risk populations could require an intervention that investigates and

targets multiple levels of environmental influence, in multiple settings, and utilizes multiple intervention strategies (Green, Richard, & Potvin, 1996; Robinson, 2008; Stokols, 1996).

The BE, for example, can pose a challenge to healthy eating by encouraging or allowing an increase in the density of high-fat food options and concentrated media marketing of these products (Hinkle, 2003). Previous research shows that poor neighborhoods have 3 times fewer supermarkets than wealthier neighborhoods yet contain more fast-food restaurants and convenience stores (Block, Scribner & DeSalvo, 2004; Lewis, Sloane, Nacimention, Diamanl et al., 2004; Morland, Wing, Diez-Roux, & Pool, 2002). This constitutes an unhealthy distribution of eating choices that, limits healthful food options (Block, Scribner & DeSalvo, 2004; Lewis, Sloane, Nacimention, Diamanl et al., 2004; Morland, Wing, Diez-Roux, & Pool, 2002).

With the built environment always changing, it becomes more difficult to assess the nutritional environment and its role in health outcomes. Poor eating patterns, which are an established risk of chronic diseases, have been linked to neighborhood deprivation and low area population density. Therefore, the neighborhood differences in access to F & V may influence the poor eating habits of neighborhood residents (Larson, Story, & Nelson, 2009).

Neighborhoods, yet another aspect of the environment, are generally defined by census boundaries (i.e., block groups) that have been linked to residents' health outcomes (Lee & Cubbin, 2002). Census boundaries are small geographic areas that are designed to average 4,000 residents but vary widely depending on region. Census data are combined to represent the exposure to the neighborhood environment that may independently affect human behavior, unique from measures of individual attributes (Lee et al., 2002). Thus, the physical environment can influence the health of individuals beyond individual health risk factors (Feldman & Steptoe,

2004). Therefore, evidence is emerging that the nutritional environment may be associated with disease risk (Liese, Weis, Pluto, Smith, & Lawson, 2007).

Neighborhoods with high poverty rates usually have fewer healthful resources than lower poverty rate areas (Algert et al., 2006; Morland, Wing, & Roux, 2002), which could lead to residents possibly not meeting the recommended daily intake of fruit and vegetables. Neighborhoods that report more access to supermarkets also reported more consumption of F & V (Glanz, Sallis, Saelens, & Frank, 2005; Morland, Wing, Diex-Roux, et al., 2002). The proximity of these resources, supermarkets and fresh F & V, is important because people are more likely to use nearby resources (Saelens, Sallis, & Frank, 2003).

Nutrition Environments

The nutritional environment has the potential to predict some socioeconomic disparities in nutrition and health outcomes. For instance, fast-food restaurants are excessively available in lower SES communities, whereas supermarkets are less common (Block, et al., 2004). In addition, supermarkets can play a vital role in healthy eating behaviors due to their abundance of fresh and whole foods. Therefore, evidence is emerging that the nutritional environment may be associated with disease risk (Liese, et al., 2007).

The issue of access and availability appeared to be the motivation for targeting components of the physical environment and of current literature topics (Glanz et al., 2007; Robinson, 2008; Saelens et al, 2007). Zenk et al. (2005) found that women who had access to supermarkets consumed more F & V on average that those who did not have access. James (2004) reported similar findings from a focus group analysis. Women stated that certain products and produce were not always accessible and available in their communities and that

they would have to drive "*way across town"* to purchase more healthful food items (James, 2004).

Higher rates of heart disease and diabetes suggest that low SES communities are at greater risk compared to higher SES communities. A diet rich in F & V may help reduce the risk of acquiring these two diseases. However, studies have suggested that compared high SES neighborhoods, low SES neighborhoods have significantly fewer supermarkets (Algert et al., 2006; Morland, Wing, & Roux, 2002) that could provide an abundant selection of fresh produce. Low SES neighborhoods have commonly reported limited access to fresh produce, which could inhibit F & V intake. Supermarkets tend to be the best source of fresh foods, including F & V, and limited access to these foods may decrease their intake. Therefore this may support correlations of limited supermarket access and the risk of developing chronic diseases (Susser & Susser, 1996).

Morland, Wing, and Roux (2002) found that neighborhoods that reported increased intake of fruit and vegetables when there was one supermarket in their neighborhood compared to neighborhoods with no supermarkets in the area. The increase in F & V intake that has been noted with an increase in supermarket availability is important when noting the effect the food environment has on individual consumption pattern (Glanz et al., 2005).

Consumer Environment

The consumer environment, which is the environment consumers experience within retail food outlets, differs considerably among establishments, and is likely to influence consumer eating choices and patterns (Glanz et al, 2005; Saelens et al., 2007). The environment within restaurants may differ in the availability of healthier food options, nutrition information and

promotional tools regarding specific items or eating in general. However, research on the consumer environment within restaurants is limited (Saelens et al., 2007).

Assessment of the consumer environment within restaurants has proven to be challenging. Current studies have found that only a few chain restaurants provide nutritional information at the point of purchase or on menus (Saelens et al., 2007; Wootan & Osborn, 2006; Wooten, Osborn, & Malloy, 2006). Lewis et al. (2005) found, that in Los Angeles, less healthful food promotions and fewer healthy food choices were available in restaurants in predominantly in African American ZIP codes. Two other studies (Cheadle et al., Kristal, 1994; Mayer, West, Houseman, Jupka, & Orenstein, 2001), have found low availability of low-fat menu items in restaurants in general.

Nutrition Environment and Obesity

A number of characteristics associated with the nutrition environment have been reported to differ significantly according to neighborhood SES. These differences parallel trends in which low SRS are associated with high prevalence of obesity (Ford & Dzewaltowski, 2011; Robert & Reither, 2004; Schulz, Zenk, Odoms-Young, et al, 2005). Cerin, et al (2011) found that neighborhood design characteristics, accessibility of retail food outlets, and availability of healthful food choices, all have been shown to contribute to neighborhood weight status and walking behaviors. These findings could highlight the complexity of the multilevel network of environmental interacting influences that shape people's weight status (Cerin et al, 2011). However, An & Sturm (2012) found no evidence that improved access to supermarkets, or less accessibility to fast food restaurants or convenience stores improves diet quality or reduced BMI is California youths.

Simple measures are important for surveillance and tracking on a large scale where feasibility is vital. This is reflective of the recommendation by the Centers for Disease Control and Prevention to use the number of supermarkets as one community measure in efforts to prevent obesity (Au et al, 2012; Khan, Sobush, Keener, et al 2009). However, just having a supermarket within your neighborhood does not guarantee access to fresh and healthful foods. Understanding the consumer environment, or is available and accessible within the store may be just as important to understand.

Nutrition Environment Measures Survey (NEMS)

Before environmental interventions are undertaken, the nutrition environment must first be quantitatively assessed in order to identify the major areas on which to focus interventions. The Nutrition Environment Measures Survey was developed to achieve this goal and can be used to assess the nutrition environment of grocery stores, convenience stores, and restaurants (Glanz et al., 2007; Saelens, 2007). When assessing the nutrition environment of restaurants, researchers have looked at the following factors: facilitators of healthful eating (i.e., nutritional information on menus), barriers to healthy eating (i.e., menus discouraging special requests), pricing and signage (i.e., highlighting healthy options) (Saelens et al, 2007). This application of NEMS to restaurants revealed that 21% of the sit-down restaurants and 36% of the fast-food restaurants assessed had healthy main dishes; however, of all the main dishes assessed in the creation of NEMS, less than 9% were considered healthy, signifying that diners have limited, if any, healthy main dish choices when eating out (Saelens et al., 2007).

NEMS Tools

Nutritional Environment Measures Survey—Retail Food Stores

There has been growing evidence that the nutritional environment may influence nutritional behaviors and health outcomes. Commonly defined as those food resources available in the community that can be taken advantage of to meet recommended daily energy intake, the nutritional environment is important to consider in public health endeavors. Several recent studies indicated that limited availability of supermarkets/grocery stores is one of the many barriers to healthy eating in low SES neighborhoods (Glanz, et al., 2007; Liese, Weis, Pluto, Smith, & Lawson, 2007). With poor availability of supermarkets/grocery stores in low SES areas, residents could find it more difficult to meet the recommended guidelines for fruit and vegetables, lean meats, low-fat milk, and so on to maintain good health. Therefore, limited grocery-store access has become a more important driver of disparities in diet quality (Andteyeva, et al., 2008).

Glanz et al. (2005) suggested that nutritional environments might explain some of the racial/ethnic and socioeconomic disparities in nutrition and health outcomes. Fast-food restaurants and convenience stores, which provide high-calorie, low-nutrient-dense foods, are more prevalent in low SES neighborhoods, whereas supermarkets are less prevalent. The presence of at least one supermarket has been shown to be associated with an 11% increase in meeting dietary requirements for F & V in African American neighborhoods (Morland, Wing, & Roux, 2002). F & V intake has been shown to be higher still when more than one supermarket was present in African American neighborhoods with a lower prevalence of obesity and overweight (Glanz et al., 2007).

Certain neighborhoods may be at greater risk of poor health outcomes due to a lack of supermarket/grocery store availability, including rural communities (Liese et al., 2007). Poor spatial access to food stores may be a barrier as well for some rural residents to purchase fresh F & V (Bustillos et al., 2009). The lack of availability for purchase of more healthful food in supermarkets appears to exert a strong influence on food choices and consumption. The matter of availability incorporates the concept of physical access to a food outlet and selection within each food outlet (Butillos et al., 2009).

One major barrier that many residents in low-income neighborhoods face is an increasing number of convenience stores, which sell prepackaged, calorie-dense, low- nutrient foods. Residents with chronic health conditions who live in poorer neighborhoods may be more dependent on small markets and convenience stores for basic services, as trips to a supermarket are more difficult and therefore less frequent (Brown, Vargas, Ang, & Pedbley, 2008; Moreland. Wing, Diez-Rouz, et al., 2002). Convenience stores are often located spatially closer to neighborhoods than supermarkets, which could further lead to poor eating habits (Bustillos, et al., 2009).

With fewer supermarkets and higher availability of convenience stores in most low-income areas there may be an inherent increased risk of heart disease and obesity due to the poor nutritional environment. Residents of these communities, with easy access to convenience foods and less access to fresh foods, face a greater challenge in eating a health-promoting diet (Brown et al., 2008).

Nutritional Environment Measures Survey - Restaurants/Kids' Menus

American families are eating away from home more often, and in turn are consuming more calories, fat and sodium (French, Story, Neumark-Sztainer, Fulkerson, & Hannan, 2001;

Saelens, Glanz, Sallis, & Frank, 2007). Greater dependence on convenience foods creates the possibility of negative nutritional behaviors that could lead to increased risk of overweight/obesity and CVD (Bowman, Gortmaker, Ebbeling, Pereira, & Ludwig, 2004; French, Harnack & Jeffery, 2000; French et al., 2001; McCory, Fuss, Hays, Vinken, Greenberg, & Roberts, 1999; Schmidt et al., 2005).

Studies have suggested that fast-food restaurants are more concentrated in lower SES neighborhoods and that the less healthful food options at fast-food restaurants may be contributing to higher rates of obesity, particularly in poorer neighborhoods (Baker, Schootman, Barnidge, & Kelly, 2006; Block, Scribner, & DeSalvo, 2004; Brownell, 2004; Cummins, McKay, & MacIntyre, 2005; Morland, Wing, Diez, & Poole, 2002; Saelens et al., 2007). However, the current literature to date about the relationship between weight status and proximity of restaurants to their surrounding neighborhoods is limited and mixed (Burdette, & Whitaker, 2004; Simmons et al., 2005; Sturm & Datar, 2005).

To date, the literature indicates that there are many influences in food choices, and these influences likely vary across different communities or neighborhoods. For individuals, food choices may be strongly influenced by what is available to people in the physical environment in which they exist. Therefore, the purpose of this research is to assess the nutrition environment across Fargo, North Dakota. The NEMS survey will allow for quantified levels of access and availability of healthful food items and healthful food promotion within different neighborhood and food environments, with consideration of availability of healthful items in supermarkets, convenience stores and the consumer environment in restaurants.

NEMS Dissemination

The NEMS tools have been widely disseminated across the nation, making them the only nutrition environment measures that have been packaged for distribution and widely utilized (Honeycutt, Davis, Clawson, & Glanz, 2010). Honeycutt et al. (2010) reported that of 78 reported respondents of NEMS trainings, there were 46 unique projects in 23 states and Washington D.C. being used for various reasons (Table 1).

Table 1

Reported Purposes for Using NEMS

1. Descriptive assessment of diverse nutrition environments (e.g. rural, urban, ethnic communities, schools & surrounding areas).
2. Comparing availability & access of healthy food between different SES indicators.
3. Comparing environmental and individual data
4. Intervention development or evaluation
5. Exploring the association between nutritional enlivenments & chronic disease rates

Note. Source "Training and Dissemination of the Nutrition Environment Measures Surveys (NEMS)". S. Honeycutt, E. Davis, M. Clawson, K. Glanz (2010). *Preventing Chronic Disease*, *7*, 1-10.

Of those projects reported, 21 modified or intended to modify the NEMS measures. It was more common for NEMS users to modify the store tool than the restaurant tool, with the most common modification being foods that are regionally or culturally purchased more frequently (e.g. tailoring the measures for Latino/Hispanic populations by adding items such as tortillas), and acceptance of vouchers (e.g. WIC or SNAP; Honeycutt et al., 2010). These modifications and NEMS's ability to be flexible are essential for widespread use of the measures in diverse settings; however, users need to conduct extra developmental research on NEMS measures to retain sufficient reliability and validity (Honeycutt et al., 2010).

The nutritional environment could be a key element when studying nutritional disparities and behaviors among communities. If health professionals are to make the recommendation that Americans consume 9 servings of fruit and vegetables a day and limit intake of fat and sodium, then there is a need for investigate which food items are available to the public to meet these recommendations. If food items are not available, then policy, systems, or environments might need to be changed to support healthier eating behaviors.

Food Dessert Locator and Food Environment Atlas

Developed by the United States Department of Agriculture Economic Research Service, the 'Food Environment Atlas' and 'Food Desert Locator Tool' are internet-based mapping tools that could be used to assist communities in planning nutritional interventions that are environmental or policy driven.

The "Atlas" provides information on county level environmental factors interacting to influence food choices and diet quality and thus can be used to identify casual relationships and effective policy and environmental interventions. The 'Food Desert Locator' pinpoints the location of "food deserts" (low-income communities that lack ready access to health food) around the county. It provides data on population characteristics of census tracts covering smaller subdivisions whose general population characteristics are often relatively homogeneous.

PAPER 1. THE ASSESSMENT AND COMPARISON OF THE FARGO NUTRITION ENVIRONMENT: A CONTRAST AMONG NUTRITION ENVIRONMENT STUDIES

Two-thirds of Americans are overweight or obese (Ogden & Carroll, 2010) and each year the United States spends over $100 billion in health care and related costs attributable to weight-related diseases (Frazao, 2006). This dramatic trend has forced communities to ask and debate how this has happened and what can be done to reverse it. One key issue many communities discuss is whether improving nutrition and/or physical activity is a matter of individual behavior change (e.g., eating recommended daily amounts of fruit and vegetables) or a change that can occur at the environmental level, which the community may be able to play a role (e.g., access to healthful food; Larson, Story, & Nelson, 2009).

The number of restaurants per capita has increased exponentially during the rise in obesity rates (Cutler, Glaeser & Shapiro, 2003), and therefore have been considered a potential contributor to the obesity epidemic in the United States (Larson et al., 2009). However, not all restaurants should be considered similar, as the consumer nutrition environment within restaurants—that is, what the consumer experiences in the restaurant—may differ across restaurant types (fast food vs. full service). Some of these differences can include the availability or abundance of healthful eating promotions and nutritional information. Which preliminary evidence indicates may be directly related to neighborhood SES (Huddleston, Whipple, & VanAuken, 2004).

Other differences in restaurant foods can be a function of marketing, as targeted strategies for less healthful foods and insufficient marketing of healthful foods create barriers to healthful eating (Glanz, et al, 2007). It has been hypothesized that exposure to advertised unhealthful foods leads to the overconsumption of calories and/or lower consumption of healthful foods (i.e.,

fruit and vegetables; Henderson & Kelly, 2005). Little is known, however, about the effect of food promotions (posters, table tents, signs, and menu notations) inside the restaurant itself, specifically between restaurant types (fast food vs. full service) and across different SES locations (low, moderate, high).

With restaurants making up about 97% of commercial eating establishments in the United States health officials have recommended that chain restaurants be required to list nutritional information (i.e., calories, fat, and sodium) on menus (Mayer, Dubbert, & Elder, 1989). A study by Henderson and colleagues (2005) found that of 300 restaurant chains, 44% provided nutritional information for a majority of their basic menu items, with most posting the information only online. Given that lower SES neighborhoods are less likely to have high speed internet access (Schlozman, Verba, & Brady, 2010) and that fast food restaurants depend on point-of-purchase decisions, it would seem a prudent public health recommendation to provided nutrition information 'at the counter' to reach all customers, and still cost-effective means of educating about calories, fat, and sodium content of menu items (Mayer, Dubbert, & Elder, 1989).

Additionally, the retail grocery environment is believed to exert an important influence on individuals' access to affordable, healthful foods. However, this environment changes regularly, making it difficult to measure its impact on local public health. Poor eating patterns, which are an established risk of chronic diseases (Frazao, 2006), have been linked to neighborhood deprivation and low area population density. Therefore, neighborhood differences in access to fresh fruits and vegetables may contribute to poor eating habits within a neighborhood (Larson et al., 2009).

Today's consumers are noticeably different from consumer 40 years ago. Single-parent households now make up 45% of families (Huddleston et al., 2004), compared to 6% in the 1970's (US Census Bureau, 2011). This demographic change may have an impact on the amount of time consumers spend on food purchase decisions, store loyalties, and food preparation and consumption. A study of store loyalty conducted in 2003 suggested that proximity to residents' homes could be an influential factor in where residents shop at one place over another (Huddleston et al., 2004). However, residents of disadvantaged neighborhoods have reported that they would travel outside their neighborhood and shop at another location if they had reliable transportation, due to pricing differences and lack of produce availability (Alwitt & Donely, 1997; Chung & Myers, 1999).

There has been growing evidence that the nutrition environment may influence nutritional behaviors and health outcomes (Glanz, Clawson, Davis, & Carvalho, 2008). The nutrition environment, commonly defined as those food resources available in the community (retail grocery outlets and restaurants), is important to consider in most public health endeavors. Several recent studies have indicated that lack of availability of supermarkets is one of the many barriers to healthy eating in low-SES neighborhoods (Glanz et al., 2008; Wootan, Osborn, & Malloy, 2006). This lack of availability of healthful foods could make it more difficult to meet the recommended guidelines for fruit and vegetable intake by the Dietary Guideline for Americans by the U.S. Department of Health and Human Services and U.S. Department of Agriculture. Therefore, lack of access of supermarkets has become an important aspect of disparities in diet quality (Wootan & Osborn, 2006).

The nutrition environment has the potential to predict some socioeconomic disparities in nutrition and health outcomes. For instance, fast-food restaurants are excessively available in

low socioeconomic status (SES) communities, whereas supermarkets are less common (Block, Scribner, & DeSalvo, 2004; Larson et al., 2009). Previous research has show that urban residents pay up to 37% more for groceries in local community stores compared to suburban residents who buy the same items at large supermarkets (Chung et al, 1999; Frazao, 2006). A similar report indicated that because of the decline of supermarkets in low-income neighborhoods, residents have no choice but to depend on smaller stores with limited selections of foods that are substantially higher priced (Curtis & McClellan, 1995). Therefore, supermarkets can play a vital role in healthy eating behaviors due to their abundance of fresh and whole foods.

There is emerging evidence that the nutritional environment may be associated with disease risk (Liese, Weis, Pluto, Smith, & Lawson, 2007). Certain neighborhoods may be at greater risk of poor health outcomes due to a lack of supermarket availability, including rural communities with a limited number or type of grocery stores present (Liese, et al, 2007). Distance to food stores also may be a barrier for some rural residents to purchase fresh food and vegetables (Bustillos, Sharkey, Anding, & McIntoch, 2009). The availability of more healthful food in supermarkets may have a greater impact on food choices and consumption, and on health outcomes. Availability incorporates the concept of physical access to a food outlet and selection within each food outlet (Bustillos et al, 2009). Although cost may be a contributor to consuming more healthful foods, this study only considered availability and access to healthful foods.

Another barrier that many residents in low-income neighborhoods may face is an increasing number of convenience stores, which sell prepackaged, calorie-dense, low-nutrient foods. Residents who live in poorer neighborhoods may be more dependent on small markets and convenience stores for basic services because trips to a supermarket may be more difficult

and therefore less frequent (Brown, Vargas, Ang, & Pebley 2008; Morland, Wing, & Roux, 2002). Convenience stores are often located closer to neighborhoods than supermarkets, which could contribute to the poor eating habits of nearby residents if transportation is an issue (Bustillos et al., 2009). Additionally, restaurants use different point-of-purchase strategies to highlight specific menu options (i.e., posters, table tents, signs; Chung et al., 1999; Huddleston et al., 2004) and the question of whether these promotional strategies are healthful or not needs to be clearer. Therefore, the present study sought to assess the nutritional environment across SES neighborhoods, and compare categorical food outlets, in light of previous NEMS studies.

Methods

Study Locations

Fargo, North Dakota a U.S. city with a population of 105,549 was selected as the research site. Ethnic/specialty grocery stores, supermarkets, and convenience stores were assessed from February 2009 to August 2009. Sixty out of 62 retail food stores were surveyed, with a 96% representation rate of the area. Eighty-five percent of the total number of community restaurants were surveyed in Fargo including fast-food restaurants (n = 93) and full-service restaurants (n = 94) and 128 kids menus. Specialty eating establishments such as bakeries, coffee shops, bars that restrict patronage based on age, supper clubs, and eating establishments located in supermarkets were excluded from this study.

Identification and Classification of Instrument and Categories

The Nutrition Environment Measure Survey (NEMS) was used to assess the nutrition environment in Fargo. The NEMS tool was found to have a high degree of interrater and test–retest reliability, and to reveal significant differences across restaurant types and neighborhoods of high, medium, and low socioeconomic status (Glanz, et al, 2007). The NEMS also has good

face validity and support for construct validity and may be applicable in a variety of geographic locations (Glanz, Sallis, Saelens, & Frank, 2007).

Identification and Classification of Food Outlets and Neighborhood Socioeconomic Status

Store Type

Retail Food Stores

Retail food outlets were identified and mapped using multiple data sources. Retail food and restaurant license lists were matched against street names and addresses from land-use data from the Fargo—Moorhead Metropolitan Council of Governments and then verified using Internet yellow pages. Retail food stores that required membership were not surveyed; therefore, wholesale membership warehouses (such as Sam's Club) were not included in the data collection. Ethnic stores (n = 10) were defined as an establishments that sell a majority of goods that originate from a particular country or region outside the United States. Convenience stores (n = 41) were defined as establishments connected to gas stations, including truck stops. Supermarkets (n = 9) were defined as any large chain stores (Hornbachers, Wal-mart, Sun Mart).

Restaurants

For this portion of the study, we used the NEMS-R classification for full-service restaurants that is listed in the 2008 Nutrition Environment Measures Training Manual. Full-service restaurants (n = 94) offer table service with wait staff who take orders at the table and provide wait service throughout the duration of the meal. Examples of these are Applebee's and Chili's. For fast-food establishments (n = 93), the researchers combined the definitions for fast-food and quick-service restaurants from the NEMS-R training manual: fast-food restaurants offer minimal service, with food supplied quickly after ordering at a counter or food delivered to a table after an order is taken and paid for at a counter (Glanz, et al, 2008).

Socioeconomic Status (SES)

Fargo was subdivision by elementary school boundaries and neighborhood SES was determined by the number of free and reduced-price lunches provided in each elementary school boundary. If more than one elementary school was within a single school boundary, then those schools' averages were combined to create one average score for that school boundary. Categories of SES were determined as follows: high SES ≤ 20% free and reduced-price lunches; moderate SES = 21 to 39% free and reduced-price lunches; low SES ≥ 40% free and reduced-price lunches.

Measures

Retail Food Stores

Tables 2 and 3 list the measures used for the retail food store assessments in Fargo. The only modification made to the NEMS-S was the choice of local brands to represent brands commonly found in Fargo.

Table 2

List of Fresh Produce Assessed for Availability

Fruits	Vegetables
Bananas	Carrots
Apples	Tomatoes
Oranges	Sweet peppers
Grapes	Broccoli
Cantaloupe	Lettuce
Peaches	Corn
Strawberries	Celery
Honeydew melon	Cucumbers
Watermelon	Cabbage
Pears	Cauliflower

Table 4 shows the measures used for restaurants and kids' menus. The researcher did not make any modifications to the NEMS-R for this portion of the study. For kids' menus, the surveyors look for the words baked, broiled, or grilled for healthy menu items.

Table 3

Healthful Items Assessed from Retail Stores

Item measures	Description
Low-fat/Skim milk	Most readily available brand of milk was selected from each store.
Lean ground beef	Ground beef had to be ≤ 10% fat. If no ground beef met this measure, ground turkey was substituted.
Fat-free/light hot dogs	Package must be labeled *fat-free* or *light*.
Reduce-fat/fat-free frozen foods	Only single-serving items were selected. Lean Cuisine was the selected brand , if not available then Healthy Choice or Smart Ones was substituted
Reduced-fat/fat-free baked goods	The FDA criteria were used to identify reduced fat options: ≤ 3 g fat/serving
Whole wheat bread	Package must have stated *100% whole wheat* or the first ingredient listed read *whole grain*
Baked chips	Baked chips must have ≤ 3 g fat/serving. If no baked chips were available, then any chip item with ≤ 3 g fat/serving was substituted
Low-sugar cereal	Cereal that had <7 grams of sugar per serving

Note, Source "Nutritional Environment Measures Training Manual" by K. Glanz, M. Clawson, E. Davis & M. Carvalho (2008). Atlanta, GA: Emory University.

Table 4

Restaurant Facilitators and Barriers to Healthful Eating

Facilitators	Assessed/description
In-store nutritional information availability	Posters, brochures, menus, verbal requests
Promotion of healthful eating through in-store promotional signage	Posters, signs, menus, menu boards and/or table tents
Highlighting healthy menu items within store through in-store indicators or promotions	Posters, signs, menu boards, and/or table tents
Barriers	
Encouragement of unhealthful eating	Posters, signs, menus, menu boards and/or table tents
Encouraging overeating	Posters, signs, menus, menu boards and/or table tents
Encouraging supersize or are large portion items encouraged	Posters, signs, menus, menu boards and/or table tents
Does the restaurant offer all-you-can-eat?	Posters, signs, menus, menu boards and/or table tents
Kids Menus'	
In-store nutritional information availability.	Poster, brochures, menus, verbal requests
Is nutritional information provided on the kids' menu?	Fat or calories
Are there any healthy entrées?	Based on non-fried foods (e.g., baked, broiled, grilled). Green salad was considered a healthy entrée, unless served with an unhealthy protein source (e.g. fried chicken strips).
Are healthy sides offered and/or assigned?	Fruit and vegetables were considered healthy unless sugar or fats (butter) were added to them. The only exceptions to this rule were applesauce and raisins. Green salads and raw vegetables were considered healthy regardless of dressing or dipping sauce. Baked potato/corn chips were considered healthy.
Are there any substitutions for unhealthy sides allowed?	Could a healthy side item be substituted for an unhealthy side item (e.g., French fries)?

Table 4 (continued)

Restaurant Facilitators and Barriers to Healthful Eating

Facilitators	Assessed/description
100% fruit juice and low fat/fat free milk?	Flavored milk did not count as a healthy drink.
Free refills on unhealthy drinks?	e.g., soda pop/juice drink
Unhealthy dessert included w/ meal?	Unhealthy desserts included ice cream-based desserts and other sugar-based desserts
Are there any healthy desserts?	Low sugar/fat or sugar/fat free

Note. Source "Nutritional Environment Measures Training Manual" by K. Glanz, M. Clawson, E. Davis & M. Carvalho (2008). Atlanta, GA: Emory University

Procedures

From prearranged lists of retail food outlets and eating establishments, surveyors used the NEMS tools to conduct a detailed assessment of the availability of specific healthful items and information and recorded whether the items were available at the time of data collection. For the retail food stores, two surveyors visited each store once and conducted the NEMS-S survey between the hours of 9:30 am and 11:30 a.m. and 1:30 p.m. and 4:15 p.m. Monday through Friday. These hours traditionally are times of low sales volume for ethnic/specialty grocery stores and would thus allow the researchers to complete the survey without interrupting any stocking of store shelf space or general grocery store work.

For restaurant and kids' meal assessments, surveyors used the NEMS-R survey to conduct a detailed assessment of the restaurant nutrition environment in the selected restaurants of Fargo. All site visits were conducted by two surveyors between the times of 8:30 a.m. and 11:30 a.m. and 1:30 p.m. and 4:30 p.m., typically slow times for restaurants. One surveyor

recorded the data directly onto the form, while the other surveyed the area and asked the staff questions about nutritional information if needed. The average time to conduct each survey about was about 25 minutes for fast-food and 40 minutes for full service restaurants. All data were collected between February 2009 and August 2009.

NEMS Scoring for Retail Food Stores

The NEMS protocol has a scoring rubric (Table 5) to calculate scores for each store to indicate relative access to healthy versus unhealthy food option within the community. Total store scores take into account the overall availability, affordability, and quality of food items. Each store received a separate score, and then the area that stores served was averaged for each area and an area score was calculated.

The Availability Score was calculated by assigning two points per food category for the availability of healthier options. For example, the availability of skim or low-fat milk earned store 2 points. If the store did not have skim or low-fat milk, those two points were not included in the score. Additional points were tallied for the availability of multiple varieties of healthy options (e.g., 2 extra points for three or more varieties of lean meats).

Although affordability was not discussed in this paper, the Affordability Score was still used to calculate the overall score for consistence purposes. The Affordability Score was calculated by assigning two points for a lower priced healthier option and subtracting 1 point for a higher priced healthier option. For example, if fat-free or low-fat hot dogs were less expensive than high-fat hot dogs, the store earned 2 points. If the high-fat hot dogs were less expensive, then the store's score went down 1 point.

The Quality Score only applied to fresh produce. Up to 3 points were assigned for having more produce of acceptable quality. If 25% - 49% of produce was of acceptable quality,

the store earned 1 point. If 50% - 74% of the produce was of acceptable quality, the store earned 2 points. And if 75%+ of the produce was of acceptable quality, the store earned 3 quality points.

Table 5

NEMS Scoring Categories

Points	Category rank
-9 to 6	Poor
7 to 22	Fair
23 to 38	Good
39 to 54	Excellent

Study Comparison

This research focused on investigating the nutrition environment with the use of the NEMS tools or similar processes. A computer search was conducted through MEDLINE, Google Scholar, and PubMed using the key terms *NEMS, built environment, nutrition environment,* and *community nutrition assessment*. Articles were identified that assessed the availability of healthful nutritional resources and information at the community level and consumer levels, as well as comparing differences of availability of healthful nutritional resource and information between SES neighborhoods.

Additional articles were also identified by searching each article's reference section. Of the literature searched, a total of four peer-reviewed articles used NEMS as the primary assessment tool, eight peer-reviewed articles assessed availability of and access of healthful foods that fit the criteria of the search, and three local NEMS reports were conducted by local or

regional health organizations. A comparative analysis was conducted to look for similarities and differences in methods and results for between the Fargo NEMS study and the four peer-reviewed NEMS studies conducted elsewhere.

Statistical Analyses

Retail Food Outlets

All data were analyzed using the Statistical Package for the Social Sciences (SPSS – Version 17.0). For analysis reasons, moderate and high SES were combined because of low retail food outlet representation in high-SES locations (n=3). Descriptive statistics were generated for all food category items available by store type and SES (Tables 10 and 11). Chi-square tests were conducted to see if there were distribution differences among supermarkets, convenience stores, and ethnic/specialty grocery stores between food categories. Chi-square tests for independence were also done among SES between food categories to look for similar distributions. For the NEMS summary score, one-way analysis of variance was used to look for a significant difference between store type and SES location. For analysis reasons, we combined moderate and high SES locations into one category (moderate/high SES) due to limited representation of retail food outlets in high SES locations.

Descriptive statistics were generated for all category items by restaurant categories (Table 6). Chi-square tests were used to compare distribution differences between fast food and full service restaurants for the promotional categories and nutritional information. Chi-square tests were also used to compare for similar distribution according to neighborhood SES.

Results

Convenience stores had the highest frequency of store availability in Fargo (Figure 2). Descriptive statistics were generated for all items and store types. Table 10 shows the distribution of stores by SES location. Milk was available in 75% of all store types. Fresh fruit was available in 38.3% and fresh vegetables were available in 33.3% of all store types. Reduced- fat/fat-free items were available in 78.3% of all store types (Table 6). Descriptive statistics for grocery items were also generated for all items based on SES neighborhood category (Table 7).

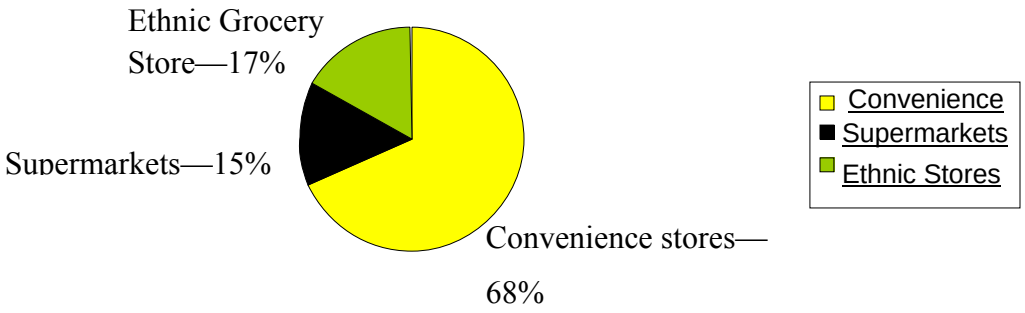

Figure 2. Pie chart of retail food stores surveyed in Fargo, ND. 96% of existing stores in the area were surveyed

Table 6

Descriptive Statistics for the Distribution of Retail Food Store Type by SES Location (n)

	School boundaries	Ethnic/specialty grocery	Convenience store	Supermarket
Low SES	4	6	19	4
Moderate/High SES	16	4	22	5

A two-way contingency table analysis was conducted to evaluate the distribution difference between food items and retail store type and food items' SES location. The Pearson chi-square test showed no statistically significant relationship between neighborhood SES and store type.

Table 7

Descriptive Statistics for Availability of Healthy Food Items by Retail Food Store Type & SES Category (%).

Store classification	Low fat/Fat free milk	Fruit	Vegetables	Reduced fat/ Fat-free items
[a]Ethnic/specialty grocery	-	10.0	10.0	80.0
[b]Convenience stores	87.8	34.1	26.8	73.2
[c]Supermarket stores	100	88.9	88.9	100
[d]Low-SES neighborhood	72.4	20.7	10.3	72.4
[e]Moderate/High-SES neighborhood	77.4	54.8	58.1	83.9

Note. [a]n = 10; [b]n = 41; [c]n = 9; [d]n = 29; [e]n = 31.

This could indicate that there is an equal distribution of store types throughout Fargo. However, significant relationships were noted between neighborhood SES and two healthy food categories (fruit: χ^2 (1, N = 60) = 7.392, p = .007; vegetables: χ^2 (1, N = 60) = 14.998, p <= .001,). Significant relationships were determined between store type and three of the four healthy food categories (fruits: χ^2 (2, N = 60) = 13.43, p <= .001; vegetables χ^2 (2, N = 60) = 15.730, p =<. 001; low fat/fat free milk: Pearson χ^2 (2, N= 60) = 36.59, p =< .001).

We created a box plot to show the distribution of the difference in NEMS summary scores of the retail store types (Figure 3). A one-way analysis of variance was conducted to evaluate the relationship between store types and the change in NEMS summary scores in the city of Fargo, North Dakota. The independent variable, store type, included three levels: ethnic/specialty store, convenience store, and supermarket. The dependent variable was the difference in the NEMS summary score. The ANOVA was significant, $F(2, 57) = 63.159$, $p <= .001$. The strength of the relationship between the store type and NEMS summary score, as assessed by η^2, was strong, with the store type accounting for 68.9% of the variance of the dependent variable.

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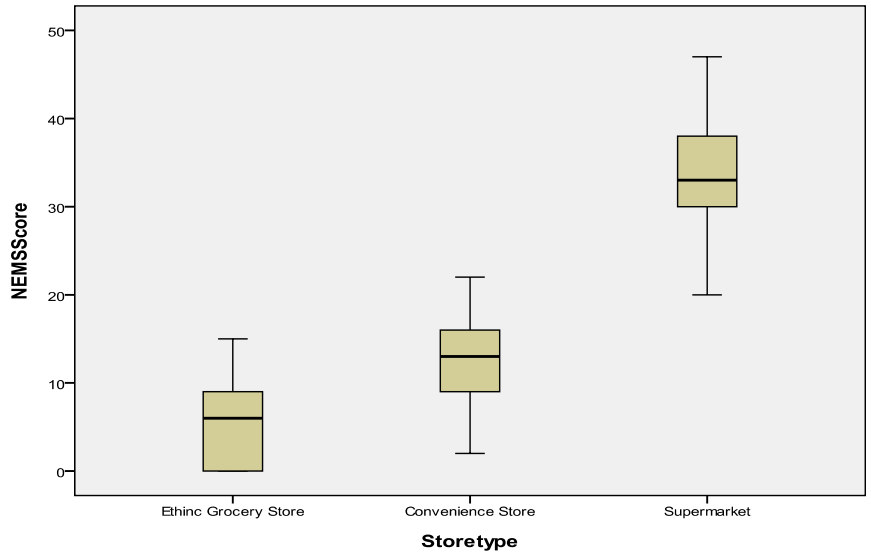

Figure 3. Differences in the NEMS summary score between retail food store types.

Follow-up tests were conducted to evaluate pairwise differences among the means using the Dunnett's C test, which does not assume equal variance among the groups. There was a significant difference in the means between all three groups. The ethnic/specialty stores showed the lowest NEMS summary category scores. The 95% confidence intervals for the pairwise differences, as well as the means and standard deviation for the store groups, are reported in

Table 8. A one-way analysis of variance showed no significant difference between SES locations and NEMS summary score.

Table 8

95% Confidence Intervals of Pairwise Differences in Mean NEMS Summary Score.

Store type	M	SD	Ethnic/Specialty	Convenience	Supermarket
Ethnic/Specialty	5.80	5.69			
Convenience	12.59	5.21	1.39 to12.18*		
Supermarket	33.56	10.13	18.66 to 36.85*	13.15 to 28.79*	

Note. * Significantly different at $p < .05$

Table 9 shows the descriptive statistics concerning SES location. Low SES had the fewest elementary boundaries; however, 107 restaurants were located in just four low SES locations, 53 fast food and 54 full service. Ten boundaries were classified as moderate with 62 restaurants located in these boundaries (25 fast food, 37 full-service), and six boundaries were classified as high SES with 15 restaurants (15 fast food, 3 full-service).

Table 10 shows the descriptive statistics for categories for all restaurants and restaurant types. Fast-food restaurants offered nutritional information more frequently than full-service restaurants, encouraged healthful eating behaviors, and highlighted healthy menu options more often than full-service restaurants; however, fast-food restaurants were more likely to encourage unhealthful eating, encourage overeating and offer supersized items than full-service restaurants. Full-service restaurants were more likely to offer all-you-can-eat options than fast-food restaurants.

Table 9

Descriptive Statistics of Elementary School Boundaries (n)

Descriptive	*Total elementary school boundaries	**Total restaurants	***Fast food	^Full service
Low SES	4	107	53	54
Moderate SES	10	62	25	37
High SES	6	18	15	3

Note. * N = 20; **N = 18; ***n = 93; ^n = 94

Chi-square tests showed that fast food restaurants were significantly more likely than full service restaurants to encourage healthy eating (38.7% vs. 6.4% χ^2 (1, N = 180) = 26.711, p =< .001); highlight healthy menu options (25.8% vs. 1.1% χ^2 (1, N = 180) = 24.711, p = < .001,); encourage unhealthy eating (35.5% vs. 17.0%, χ^2(1, N = 180) = 8.241, p = .004,); encourage over eating (45.2% vs. 28.7%, χ^2(1, N = 180) = 5.425, p = .020); and encourage supersizing (45.2% vs. 18.1%, Pearson's χ^2 (1, N = 180) = 15.870, p =< .001). Full service restaurants were more likely than fast food restaurants to promote all-you-can-eat (23.4% vs. 5.4%, χ^2 (1, N = 180) = 12.299, p =<. 001). Any type of nutritional information was more readily available at fast-food restaurants than at full service restaurants (38.7% vs. 6.4%, χ^2 (1, N = 180) = 28.052, p =< .001).

Table 11 shows the descriptive statistics for survey categories across neighborhood SES. In general, restaurants in high-SES areas offered nutritional information more frequently than those in moderate-and low-SES neighborhoods; however, high-SES neighborhoods encouraged barriers to and facilitators of healthy eating behaviors more frequently than the other two SES areas.

Table 10

Descriptive Statistics of Restaurant Facilitators and Barrier Categories-Restaurant Type (%)

	All restaurants	Fast food	Full service
Facilitators			
Nutritional information	22.5	38.7	6.4
Do posters/signs/menus/table tents:			
Encourage healthful eating	13.9	26.9	1.1
Highlight healthy menu options	13.4	25.8	1.1
Barriers			
Do posters/signs/menus/table tents:			
Encourage unhealthful eating	26.2	35.5	17
Encourage overeating	36.9	45.2	28.7
Encourage supersizing or large-portions items	31.6	45.2	18.1
Offer all-you-can-eat	14.4	5.4	23.4

Note. N = 187; fast food, n = 93; full service, n = 94

Chi-square tests showed significant differences between SES locations and the following categories: restaurants using posters/signs/menus/table tents to encourage healthy eating (χ^2 (2, N = 180) = 10.387, p = .006); highlight healthy menu options (χ^2 (2, N = 180) = 23.242, p =< .001); encourage unhealthy eating (Pearson χ^2 (2, N = 180) = 9.576, p = .008); encourage over eating (χ^2 (2, N = 180) = 6.464, p = .039); and encourage supersizing (χ^2 (2, N = 180) = 20.450, p =< .001). Although not significantly different, the availability of nutrition information was highest in high-SES neighborhoods; this may be due to the presence of more fast-food restaurants than full-service restaurants available in high-SES locations.

Table 11

Descriptive Statistics of Restaurant Facilitators and Barrier Categories-SES All Restaurants (%)

	*Low SES	**Moderate SES	^High SES
Facilitators			
Nutritional information	26.2	12.9	33.3
Do posters/signs/menus/table tents:			
Encourage healthful eating	11.2	11.3	38.9
Highlight healthy menu options	10.3	8.1	50.0
Barriers			
Do posters/signs/menus/table tents:			
Encourage unhealthful eating	25.2	19.4	55.6
Encourage overeating	40.2	25.8	55.6
Encourage supersizing or large portion items	29.0	22.6	77.8
Offer all-you-can-eat	16.8	9.7	16.7

Note. * n = 107; ** n = 62; ^n = 18

Table 12 shows descriptive statistics between restaurant types by SES location. For low-SES locations, chi square showed a significantly greater portion of fast-food restaurants compared to full-service restaurants in the following categories: offering nutritional information (χ^2 (1, N = 180) = 12.793; p<=.001); encouraging healthy eating (χ^2 (1, N = 180) = 13.771; p <= .001); restaurants using posters/signs/menus/table tents to highlight healthy menu options (χ^2 (1, N = 180) = 8.397, p = .004); encouraging unhealthy eating (χ^2 (1, N = 180) = 4.241; p = .039,); offering supersizing options (χ^2 (1, N = 180) = 8.022; p = .005); and offering all-you-can-eat options (χ^2 (1, N = 180) = 12.780; p <= .001).

Table 12

Descriptive Statistics Restaurant Facilitators and Barriers Based on SES Location (%)

	Low		Moderate		High	
	Full service	Fast Food	Full service	Fast Food	Full service	Fast Food
Facilitator						
Nutritional Information	11.1*	41.5*	-	32.0*	-	40.0
Do posters/ signs/ menus/ table tents:						
Encourage healthful eating	-	22.6*	2.7*	24.0*	-	46.7
Highlight healthy menu options	1.9*	18.9*	-	20.0*	100	60.0
Barriers						
Do posters/ signs/ menus/ table tents:						
Encourage unhealthful eating	16.7	34.0	10.8*	32.0*	100	46.7
Encourage overeating	31.5*	49.1*	13.5*	32.0*	66.7	53.3
Encourage Supersizing or large-portion items	16.7*	41.5*	13.5*	32.0*	100	73.3
Offer all-you-can-eat	29.6*	3.8*	10.8	8.0	10.7	6.7

Notes. *significant difference at chi square < .05

For moderate SES, chi square showed that there was a significant difference in the following categories between full-service and fast-food restaurants: offering nutritional information (χ^2 (1, N = 180) = 13.594; p<=.001); encouraging healthy eating (χ^2 (1, N = 180) = 6.756; p = .009); highlighting healthy menu options (χ^2 (1, N = 180) = 8.049, p = .005); encouraging unhealthy eating (χ^2 (1, N = 180) = 4.292; p = .038); and offering supersizing options (χ^2 (1, N = 180) = 6.480; p = .011). Finally, for high SES, the Fisher's exact test was used because full-service restaurants had less than five observations. There were no statistically significant values to report between full-service and fast-food restaurants for the promotional categories in high-SES locations.

Table 13 shows descriptive statistics for categories between SES locations. For low vs. moderate, chi square showed that the availability of nutritional information was the only significant category between the two SES locations (25% [low] vs. 12% [moderate]; χ^2 (1, N =180) = 4.120 p =. 042), although slightly. For low- vs. high-SES locations, chi square showed that the following categories were significantly different: do posters/signs/menus/table tents encourage healthful eating (low [11.2%] vs. high [38.9%], χ^2 (1, N = 180) = 9.155, p = .002); highlight healthy menu options (low [10.3%] vs. high [50%], χ^2 (1, N = 180) = 18.087, p <= .001); encourage unhealthful eating (low [25.2] vs. high [55.6%], χ^2 (1, N = 180) = 6.798, p = .009); encourage supersize or large portion size (moderate [29%] vs. high [77.8%], χ^2 (1, N = 180) = 15.930, p <= .001).

For moderate- vs. high-SES locations, chi-square showed that the availability of nutritional information was significantly different between the two SES categories (moderate [13%] vs. high [34%], χ^2 (1, N = 180) = 4.033, p = .045). Chi square tests also showed that the following categories were significantly different: do posters/signs/menus/table tents encourage

healthful eating (moderate [11%] vs. high [39.9%], χ^2 (1, N = 180) = 7 .360, p = .007); highlight healthy menu options (moderate [8%] vs. high [50%], χ^2(1, N = 180) = 16.992, p <= .001); encourage unhealthful eating (moderate [19%] vs. [55.6%], χ^2 (1, N = 180) = 9.169, p = .002); encourage overeating (moderate [26%] vs. high [55.6%], χ^2 (1, N = 180) = 5.628, p = .018); encourage supersize or large portion size (moderate [22%] vs. high [77.8%], χ^2 (1, N = 180) = 18.682, p <= .001).

Table 14 shows the descriptive statistics for all restaurants surveyed. The availability of nutritional information for kids' menus was determined in 30% of the 128 restaurants (in 38 restaurants), with only 2% of all restaurants placing nutritional information directly on the kids' menu.

It was found that 100% fruit juice was quite common (60.9%) but that low-fat/fat-free milk was not (32%). Free refills for unhealthy drinks were offered at over 93% of all restaurants, while free refills for juice and milk were not available as a free refill. Only 46.9% of kids' menus offered healthy entrees, and 48.4 % offered any healthy side items. When it came to substituting a healthy side item for an unhealthy side item, very few allowed for this at no extra cost (8.6%). Very few restaurants (8.6%) had a healthy side assigned, and most kids' meals came with French fries or macaroni and cheese. Only 10.9% of kids' menus automatically offered an unhealthy dessert with a kid's meal; however, just 9.4% of all restaurants offered any kind of healthy dessert.

Table 15 also shows the descriptive statistics between full-service and fast-food restaurants. Chi square showed that 4 of the 11 kids' menu categories had a significant difference between fast-food and full-service restaurants: nutritional information for items on the kid's menu, 52.4% (FF) vs. 7.7% (FS): χ^2 (1, N = 112) = 30.608; p <= .001; low fat/fat free milk,

42.9% (FF) vs. 21.5% (FS): χ^2 (1, N = 112) = 6.679: p = .010; unhealthy desserts automatically included with kids' meal, 17.5% (FF) vs. 4.6% (FS): χ^2 (1, N = 112) = 5.419: p = .020; healthy dessert options, 15.9% (FF) vs. 3.1% (FS): χ^2 (1, N = 112) = 6.166: p = .013.

Table 13

Descriptive Comparison of Facilitators and Barrier Categories Between SES Locations (%)

	Low vs. Mod		Low vs. High		Mod. vs. High	
	Low	Moderate	Low	High	Moderate	High
Facilitators						
Nutritional information	26.2*	12.9*	26.2	33.3	12.9*	33.3*
Do posters/signs/menus/table tents:						
Encourage healthful eating	11.2	11.3	11.2*	38.9*	11.3*	39.9*
Highlight healthy menu options	10.3	8.1	10.3*	50.0*	8.1*	50.0*
Barriers						
Do posters/signs/menus/table tents:						
Encourage unhealthful eating	25.2	19.4	25.2*	55.6*	19.4*	55.6*
Encourage overeating	40.2	25.8	40.2	55.6	25.8*	55.6*
Encourage supersize or are large portion items	29.0	22.6	29.0*	77.8*	22.6*	77.8*
Offer all-you-can-eat	16.8	9.7	16.8	16.7	9.7	16.7

Note. ***** significant difference at chi square < .05

Table 14

All Restaurants' Kid's Menu Categories Combined

Kids' menu categories	Number of kid's menus combined (%):	% full service (n = 65)	% fast food (n = 63)
*Nutritional information (NI)	38 (29.6)	7.7	52.4
NI on kids' menu	3(2)	1.5	3.2
Healthy entrees	60 (46.9)	52.3	41.3
100% fruit juice	78 (60.9)	64.6	57.1
*Low-fat milk	41(32)	21.5	42.9
Unhealthy drink refills	120 (93.8)	90.8	96.8
Healthy side items	62 (48.4)	46.2	50.8
Substitute healthy for an unhealthy side	23 (18)	20.0	15.9
Healthy side assigned	11 (8.6)	10.8	6.3
*Unhealthy dessert automatically included with kid's meal	14 (10.9)	4.6	17.5
*Healthy desserts offered on menu	12 (9.4)	3.1	15.9

Note. N = 128; *****significant difference at chi square < .05

Fargo NEMS was unique in that it assessed multiple consumer environments (i.e., restaurants and retail food outlets) at one time. For the purposes of this dissertation, Fargo NEMS-S will be compared to those studies that conducted a NEMS-S survey, and for Fargo NEMS-R, comparison will be done between those peer-reviewed studies and government reports that conducted a menus analysis (n = 4).

Table 15

Summary of Nutrition Environment Articles by Environment and NEMS Use

Author Name/date	Environment	Tool/method	Total # stores assessed	Location	Population size
Fargo-NEMS	Restaurants/retail food outlets	NEMS-S/NEMS-R	60 RFS/187 restaurants	Fargo, ND	105,549*
Crouch, 2011	Retail food outlets	NEMS-S	14 RFSs	CCC-	10,157^
Andreyeva et al 2008	Retail food outlets	NEMS-S	75 RFS	New Haven, CT	129,779*
Franco et al, 2008	Retail food outlets	NEMS-S	226 RFS	Baltimore	620,961*
+Innes-Hughes et al 2011	Restaurants/Retail food outlets	Checklist	14 total	Hay, Narrandera, Temora, Australia	8,340***
Wootan et al, 2006	Restaurants	Availability assessment/ online/ phone	300 restaurant chains	USA based	--
Edmonds et al, 2001	Restaurants	Checklist/observation	62 restaurants	Houston, TX	--
Lewis et al, 2005	Restaurants	Checklist	659 restaurants	South Los Angeles	--

Note: Source: ^2000 US census; *2010 US census, *** 2006 combined Australian census data + NEMS was used to assist in the creation of an Australian consumer food check list.

Table 15 lists the articles that meet the scope of the dissertation and lists the environment assessed, tools/methods used, and location and population of area, if available.

Fargo NEMS had a few differences in methods compared to other NEMS studies, with the biggest differences being the establishment of low-, moderate- and high-SES areas. Fargo-NEMS utilized free and reduced price lunch statistics from local school districts to establish SES. The reasoning for this unique method is that Fargo elementary school boundaries are laid out in a north-and-south grid pattern that makes it easy to establish neighborhood identity. Using these boundaries and assessing free and reduce price lunch rates per boundary made it simple to establish economic SES. Whether this is a useful and reliable method will be discussed later.

All studies showed similar comparisons of supermarket/grocery store and convenience store availability (Table 16). Convenience stores are the dominant sites of retail food shopping in all areas. Few studies compared differences between SES categories, but those that did found that supermarkets/grocery stores had the lowest availability in low-SES areas, compared to other SES areas.

Table 16

Store Type Availability by SES (%)

				Low SES		Moderate SES		High SES	
Location	Total Stores	S/G Stores	C/S	S/G Stores	C/S	S/G Stores	C/S	S/G Stores	C/S
[a-b] Fargo	60	15	85	14	86	16	84	-	-
[c] New Haven	75	25	75	8	92	-	-	8	92
[d] Baltimore	226	18	82	11	88	10	90	42	58
[e] CCS-Phoenix	14	-	100	-	100	-	-	-	-
[f] Hay, Narrandera, Temora, Australia	13	-	100	-	-	-	-	-	-

Note: [a] Convenience stores and ethnic grocery stores where combined. [b] For analysis reasons moderate and high SES where combined to create one SES category for Fargo NEMS. [c] Study compared low to high SES only. [d] For this dissertation behind glass store, convenience stores, and grocery stores were combined for comparison. [e] CCS is a low income area located in the urban core of Phoenix, AZ with a population of over 10,000 in a 2 square mile area. [f] Hay, Narrandera & Temora are three small rural communities within the territory of NSW, Australia.

When comparing NEMS scores (Table 17), Fargo, Baltimore and CCS were the only sites to conduct a rating index summary. Fargo and CCS followed the NEMS scoring system out of 54 points, whereas researchers from Baltimore created a healthy food availability index based on the NEMS scoring system, which only rated stores based on the availability of healthy foods out of 27 points. Even though scoring styles were slightly different, Table 17 shows that across the board, supermarkets scored higher than those of convenience stores, and low-SES scored lower than high- and moderate-SES areas.

Table 17

Mean Scoring by Neighborhood Characteristic and Store Type

	Neighborhood scores M (SD)			Store type	
	Low	Moderate	High	Supermarket M (SD)	Convenience Store M (SD)
[a,c] Fargo	13.48 (3.23)	[c]15.65 (9.29)		33.56 (10.13)	12.10 (5.60)
[b] Baltimore	5.20 (4.37)	6.44 (6.20)	13.30 (8.78)	21.52 (1.95)	3.70 (2.04)
[a] CCS	10.85 (6.28)	-	-	-	10.85 (6.28)

Note. [a] Based in 54 point scale. [b] Based on 27 point scale. [c] Moderate & High SES where combined to calculate area score.

For restaurant comparison, even though each study used different tools and methods to assess the restaurants, each had similar findings. Even though the Lewis et al. (2005), study, Edmonds et al. (2001), and Fargo-NEMS are different geographically and demographically, all studies showed that the frequency of promoting healthy options was relatively low and that

availability of fruits and vegetables was limited. The same was true with the Fargo-NEMS study and Wootan et al. (2006) nutritional information study. Even though the methods were different, with Fargo conducting in-store assessments and Wooten et al conducting on-line and phone questionnaires, nutritional information was rarely available.

Conclusion

This research shows that food promotions and nutritional information are quite prevalent in fast-food restaurants, especially in high-SES locations. However, not all promotions encourage healthy eating habits, giving a mixed message of healthful and unhealthful eating. In contrast, full-service restaurants rarely offer nutritional information and instead promote all-you-can-eat and overeating. Unlike other studies, nutritional information was not readily available in Fargo (23% of restaurants surveyed), whereas Wootan and Osborn (2006) found that out of 300 restaurant chains across the United States, 96% provided nutritional information. Another study that assessed the availability of nutritional information in fast-food restaurants found that 59% of the restaurants had such information (Wootan et al., 2006), compared to 39% of the fast-food restaurants surveyed within the Fargo study. This may show that geographic location may contribute to whether or not nutritional information is available. Without the availability of nutritional information on location, consumers may find it difficult to determine the caloric content of menu items: this nutritional information would allow consumers to make more informed choices (Wootan et al., 2006).

Restaurant research has also indicated that restaurant type may be concentrated in areas according to SES, and previous research has suggested that the availability of fast-food restaurants is greater in lower SES areas. (Larson, et al., 2009; Moreland, et al. 2002; Zenk & Powel, 2008). Similar to a study by Powell, Chaloupka and Bao (2007), full-service and fast-

food restaurants were more readily available in moderate- and low-SES neighborhoods. However, with the trend of larger portion sizes, higher SES neighborhood restaurants are encouraging overeating and supersizing more often than the restaurants in lower SES neighborhoods. Even though high-SES neighborhoods had less than 10% of the restaurants, some consumers may be loyal to their neighborhood area and may frequent restaurants in their community more often than restaurants in other neighborhoods (Mattila, 2001); additionally workers may be loyal to their employment neighborhood, eating close to their place of employment. It should also be point out that this study was conducted during the spring and summer in Fargo, which may allowed for more travel outside residents neighborhoods for restaurant meals.

In terms of the consumer nutrition environment, specifically restaurant eating promotions there were mixed findings between restaurant types and neighborhood SES in this study. Between restaurant types, fast-food restaurants highlighted healthy menu items more often than full-service restaurants (26% vs. 1%). High-SES neighborhood restaurants, even though there were few of these relative to restaurants in other neighborhoods, promoted all types of eating behaviors, especially healthful eating, more often than restaurants in the other two SES neighborhood types. Similar findings were reported by Lewis and colleagues (2005), who found that higher SES area restaurants were more likely to promote healthful food items (9% vs. 6.5%), which would make it easier for consumers to make healthier choices (Lewis, et al., 2005).

Most of the previous studies considered only looked at food promotions or the marketing of restaurant items to consumers over television; however, there is limited research investigating in-store promotion of restaurant items to consumers, which may be meaningful, given that this is where purchases are made. Restaurants' decisions about what items to promote and how to

promote them (healthy or unhealthy) could have an impact on community health and an individual's weight. Therefore, further research is needed to explore how food promotions inside restaurant locations could affect eating behaviors of consumers and if these promotions could possibly contribute to the obesity epidemic.

With the kids' menu NEMS assessment, this study shows that nutritional information in the Fargo, North Dakota market had limited availability during the time of this study. This is consistent with the findings of Wootan, et al., (2006) that nutritional information was difficult to obtain, if available at all, at the top fast-food chains in America. A majority of those kids' menus surveyed did offer some sort of healthy entrees and healthy side items; however, this judgment was based on keys words (e.g., *baked, grilled, broiled*) instead of nutrient content. This study also found that low-fat milk/fat-free milk was rarely offered and that free refills of sugary drinks were quite common among the restaurants surveyed.

With the link between sugar-sweetened beverages and obesity in children, restaurants should rethink their stance on offering free refills of high-sugared drinks, especially to children. The odds ration of becoming obese among children increased 1-6 times for each additional sugary-beverage they consumed each day (Ludwig, Peterson, & Gortmaker, 2001). Therefore, parents who order healthful menu items for their children could have their efforts reversed if their child consumes multiple servings of a sugar-concentrated, high-calorie beverage.

In a comparison the differences of fast-food and full-service kids' menus, fast-food restaurants offered nutritional information, low-fat/fat-free milk, and healthful dessert items more often than full-service restaurants. However, fast-food restaurants automatically provided a dessert with a kid's meal more often than full-service restaurants did. This suggests that all

restaurants, regardless of style, need to incorporate more nutritional information so that parents can make more informed decisions for their children when ordering.

Current legislation titled "Providing American Families With Nutrition Information Act" from Title IV of the Health Care Reform Bill mandates that any restaurant chain having more than 20 locations include calorie information on its menus (March 2010). How the information will be provided has not yet been disclosed and kids' menus are not mentioned specifically in the act. Future research is warranted to determine the impact this legislative act will have, if any, on consumers, particularly parents and children, in terms of on their food choices while dining out.

Retail food stores are important community resources for providing healthy nutrition choices. It has been suggested that the availability and cost of healthy food may be among many main factors in the relationship between neighborhood environment and nutritional behaviors (Swinburn, Egger, & Raza, 1999). The current study shows that store type, especially in the case of supermarket stores, has the greatest influence on the availability of healthy foods, with SES also exerting some effect. Therefore, a lack of supermarket stores may limit the availability of healthy foods, regardless of other retail venues or neighborhood SES. Further, store size may influence what local retail food outlets carry. Large supermarkets may be able to afford to stock perishable foods more often than smaller, low-volume specialty stores.

Previous research has supported the claim that availability of healthy foods, especially fruit and vegetables, would improve the eating behaviors of community members (Glanz, Sallis, Saelens, & Franks, 2005; Morland, Wing, & Roux, 2002). Studies have shown that, of their study locations, African Americans reported increased intake of fruit and vegetables when there was one supermarket in their neighborhood compared to African Americans with no supermarkets in their communities (Glanz el al, 2005; Hu, 2009, Morland, Wing, Diez-Roux, et

al., 2002); this may show an association between availability of food resources and increased consumption of fruit and vegetables.

With fewer supermarkets and a more convenience stores in low-income areas, there may be an increased risk of heart disease and obesity due to the poor nutritional choices available. Residents in poorer communities, or those with easy access to convenience foods and less access to fresh foods, face a greater challenge in eating a healthy diet (Andteyeva, Blumenthal, Schwartz, Long, & Brownwell, 2008; Glanz et al., 2005, 2007). However, access may not always be neighborhood-related. If people pass a convenience store on their way to and from work–but not in their neighborhood–they may be apt to shop there. Previous research has shown that the nutritional environment might explain some of the socioeconomic disparities in nutrition and health outcomes (Glanz et al, 2005, 2007; Morland, Wing, Diez-Roux, et al., 2002). Convenience stores, which provide high-calorie, low-nutrient-dense foods, have been shown to be more prevalent in low-SES neighborhoods whereas supermarkets are less prevalent (Glanz et al., 2005). The presence of at least one supermarket has been shown to be associated with an 11% increase in meeting the dietary requirement for fruit and vegetables in lower SES neighborhoods (Morland, Wing, Diez-Roux, et al., 2002), and fruit and vegetable intake has been shown to be significantly higher when more than one supermarket was present (Glanz et al, 2007). A 2009 study by Larson and colleagues suggests that individuals who have better access to supermarkets and limited access to convenience stores tend to have healthier diets and lower levels of obesity. This may, in turn, reduce the individual risk of chronic disease.

The NEMS summary score categories could be useful for those involved in community nutrition interventions. The NEMS total could be used to rate local food outlets and then classify them in one of the four categories (poor, fair, good, excellent) to encourage local food outlets to

promote and make healthier food items more available at a price that is comparable to or cheaper than that of regular items. This research showed that supermarkets had the highest proportion of stores that were rated as excellent or good, ethnic/specialty stores had the highest proportion of poor, and conveniences store had highest proportion of stores rated as fair. Even though there was no significant difference between SES locations, this may not be representing all locations, especially much larger or smaller communities; the usefulness of the categories needs to be investigated further.

Strength of this study is that it investigates an urban community in an agricultural state that has a limited growing season do to long winter months. Also, Fargo is a unique community, with its mid-size and growing refugee/ethnic population; it demonstrates that there are nutritional challenges that will need to be addressed at a public health level.

The limitations of this study are worth noting. One major limitation is that the majority of the data were collected during the winter months (February and April) in Fargo, North Dakota. The time might have had an impact on the importation of fresh produce from other locations due to weather conditions (e.g., blizzards, icy roads, etc). It should also be noted that with the hazardous weather conditions that exist in Fargo during the winter, residents may be more likely to shop closer to home. Because these data were collected in Fargo only, the findings may not be representative of all northern communities or other areas of the United States. Additionally, because the data were collected during winter months only when the weather is harsh in Fargo, there would not have been the availability of local farmers' markets and other sources of fresh produce such as homegrown items.

Another limitation of this study is that each store was surveyed once, within between a specific time frame (9:30 a.m.–11:30 a.m. and 1:30 p.m.–4:15 p.m.), which is typically a time of

low sales during which much restocking takes place. Thus, shelves might not have been stocked at the time of the survey. Only stores that were open to the general public and did not require membership were surveyed. Finally, only the availability of fresh produce was observed, and other forms of fruits and vegetables, such as canned or frozen, were not surveyed. With Fargo's long winter,

The determination of healthful versus not-healthful food was based on menu wording (baked, broiled or grilled) and not on nutritional information; this was another limitation. Another limitation of the present study was its restriction to a small geographic area; the data are not representative of other North Dakota communities or the United States in general.

Communities may benefit from understanding the role that the consumer nutrition environment has in influencing the risk for health problems. The consumer nutrition environment is reflective of food resources available within a given community that can help meet the recommended daily dietary needs of the population. The overarching premise is that individual nutrition behaviors may be influenced by the food resources available and what information and promotions are pursued to promote choice of purchase in the local community.

Ultimately, consumers only can purchase only those foods that are available and accessible to them, so despite one's level of nutritional knowledge and/or income, food choice ultimately relies upon food availability (Bustillos et al, 2009; Glanz, et al 2005; Morland, Wing, & Roux, 2002). Given this**,** there is a need for further research on local consumer environments and the health of the local residents. If high nutrient-rich foods are not readily available for purchase then food choice is limited to calorie-dense, low-nutrient foods that tend to increase risks for CHD, obesity, and a host of other health problems. Supermarkets offer the greatest availability and variety of more healthful food choices (Bustillos et al., 2009); however,

consumer meals away from home have steadily increase over the past three decades, with restaurants serving more meals each year (Basset, & Perl, 2004; Saelens, Glanz, Sallis, & Franks, 2007). Therefore, communities need to investigate beyond the availability of eating establishment types by exploring what is offered within the walls of such establishments.

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PAPER 2. ASSESSING THE NUTRITION ENVIRONMENT BY CONTRASTING FREE AND REDUCED-PRICED LUNCH SCHOOL DATA AND CENSUS POVERTY DATA

Epidemiological data have suggested that access to and availability of healthful foods follows a socioeconomic (SES) slope, with people in high-SES having greater access and availability to healthy foods than those in lower SES areas. While SES is not a direct link risk factor for chronic disease, it does act as a proxy for environmental and lifestyle characteristics such as exercise and nutrition habits, and is therefore commonly associated with chronic disease (Darmon & Drewowski, 2008; Kwok & Yankaskas, 2001; Oakes & Rossi, 2003). Studies have shown that low low-income neighborhoods have fewer supermarkets as compared to higher income communities, making it difficult for low-income areas to access fresh produce (Jetter, & Cassady, 2006; Moore et al, 2006; Sallis Nader, & Atkins, 1986). Understanding these differences between difference socioeconomic areas could provide public health practitioners information in gaps of access and availability of health services and healthful products (e.g. areas to be active and fresh F & V).

Two available tools for assessing SES include census-based data and school free and reduce lunch rate data, however both have certain limitations. Census-based area deprivation indices were developed to more effectively identify areas in need of resources to improve quality of life (Acheson, 1998). However, the limitations of census-based data to represent a neighborhood or community may present challenges to its use. The U.S. Census is taken once per decade, with time lags between data collection and public availability. It is also self-reported data, which implies certain social desirability bias in reporting may occur. However, census data is an accepted tool used to quantify SES deprivation of populations with poorer health outcomes (Carstairs & Morris, 1991; Jarman, 1983; Schurman, Bell, Dunn, & Oliver, 2007).

The National School Lunch program provides free or reduced-price school lunches to students who meet specific income eligibility guidelines (USDA, 2011). These data are collected yearly, through applications and are reported by the school. The data has been a fixture of quantitative educational research when exploring the SES of a school and its students. However, support for the use of these data in educational research has been mixed (Harwell & LeBeau, 2010). Additionally, and in contrast to census data, the school boundaries are unique and not necessarily the same as city boundaries. Nevertheless, the free and reduced school lunch method of determining SES can be a useful public health tool when assessing community differences in access to healthy foods based on SES.

Regardless of the source, indicators of SES are meant to provide information about an individual's access to social and economic resources. As such, they are indicators of social relationships and control over resources and skills that differ over time (Duncan, Daly, McDonough, & Williams, 2002; Link & Phelan, 1995; Macintyre, & Hunt, 1997). Household income has been widely used as an indicator of SES at the individual level (Duncan et al., 2002), with the households averaged to give a community estimate or community classification of SES, thereby creating block groups. However, the block groups are only created once every 10 years, and lose sensitivity over time, due to their static nature (Duncan et al., 2002). In contrast, free and reduced-price lunch rates provide a dynamic measure of SES with the ability to identify trends as they happen, due to the annual data reporting. Although the data is strictly related to household income, it is externally verified thereby minimizing self-reporting error.

While SES itself is real, its notion is still abstract (Lim, Gemici, Rice, & Karmel, 2011). Interventions or initiatives intended to increase social inclusion based on SES. However, still need a precise measure with little bias or influence. Regardless of the actual measure used, there

will always be some level of imprecision with SES measurement, as it is also influenced by the interaction and moderation of a range of other social and economic determinants (e.g. education, occupation, income) (Lim et al, 2011).

Therefore, the objective of this study was to compare the differences between census-block data and reported free and reduced-price school lunch rates in their ability to identify the availability of community nutritional resource based on SES. This was accomplished by directly comparing the two tools to determine similarities and differences in identifying a community's SES classification.

Methods

Fargo, North Dakota (pop. 105,549) was selected as the research site due to its convenience and ease of accessing necessary data. The study used two indicators of SES: The first was Free and Reduced School Lunch (FRSL) rates, as determined by the proportion of student receiving free and reduced-price school lunch, and the second was census-based poverty rates (CB). Fargo is sectioned off by elementary school boundaries, or 'neighborhoods' (n = 21), and SES for each neighborhood was determined by the percent of FRSL provided in each elementary school boundary during the 2008-2009 school year. If more than one elementary school was within a single school boundary, then the FRSL rate for the two schools' was averaged to create one FRSL score for that school boundary. Low SES was classified as >= 40% FRSL rate; moderate was classified being 21% to 39%; and high SES was <= 20% FRSL rate.

CB groups and poverty rates were collected and mapped using 2000 census data for Fargo, North Dakota. Low SES was determined to be >=20% poverty; moderate was classified being 11% to 19.9%; and high was <= 10.99% poverty. Cut-points for CB SES classification were determined by frequency distribution of census-block poverty rate. To determine cut-

points general description where chosen for SES (high, moderate, low), then Cut-points were determined by analytical judgment. Table 23 shows the total numbers of low-, moderate- and high-SES neighborhoods by each method.

After each indicator was collected, maps were created using ARC MAP Version 9.1 to show SES area based on indicator (Figure 5 and 6), along with the location of retail food outlets.

Table 18

Total SES Area Count by Method

	School boundaries	Census blocks
Low	5	6
Moderate	9	9
High	7	6

Data from the Fargo NEMS study was used to compare differences in availability and access to healthful foods between SES indicators. The Fargo NEMS study was an observational survey conducted by researchers at North Dakota State University to assess the availability of healthful food items and food promotions within the community and consumer nutrition environments.

Statistical Analysis

All data were analyzed using the Statistical Package for the Social Sciences (SPSS Version 17.0). Chi square and pairwise comparisons were used within SES indicator groups to gauge significant differences between SES indicators (e.g., Low FRSL vs. High FRSL; High FRSL vs. Moderate FRSL, Moderate FRSL vs. Low FRSL, etc.) and the distribution of restaurant type and retail food store type. For analysis purpose, both high and moderate

indicators were combined to compare retail food distribution due to the low distribution of retail food outlets within high-SES areas.

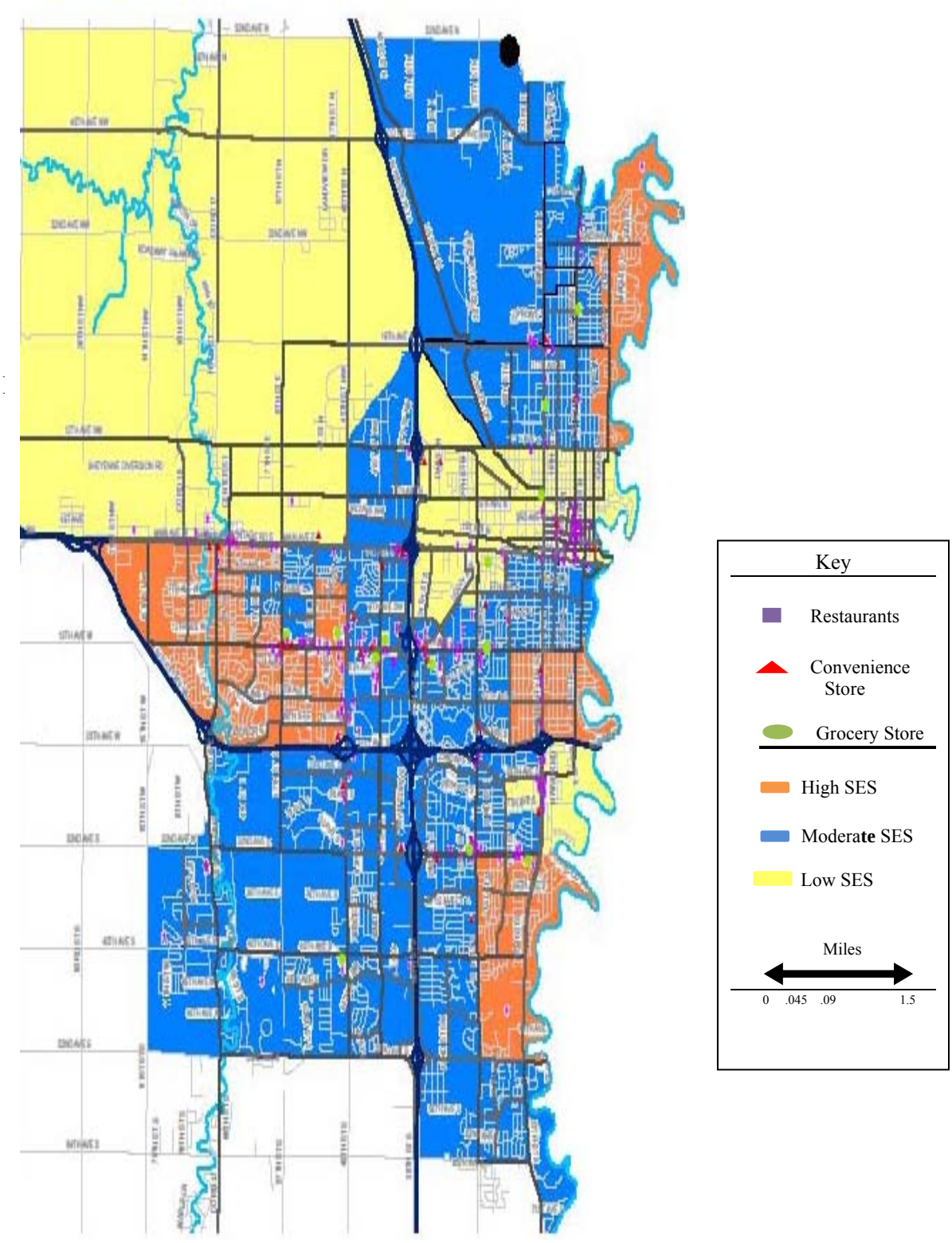

Figure 4. Socioeconomic status sprawl based on 2000 U.S. census poverty rate data.

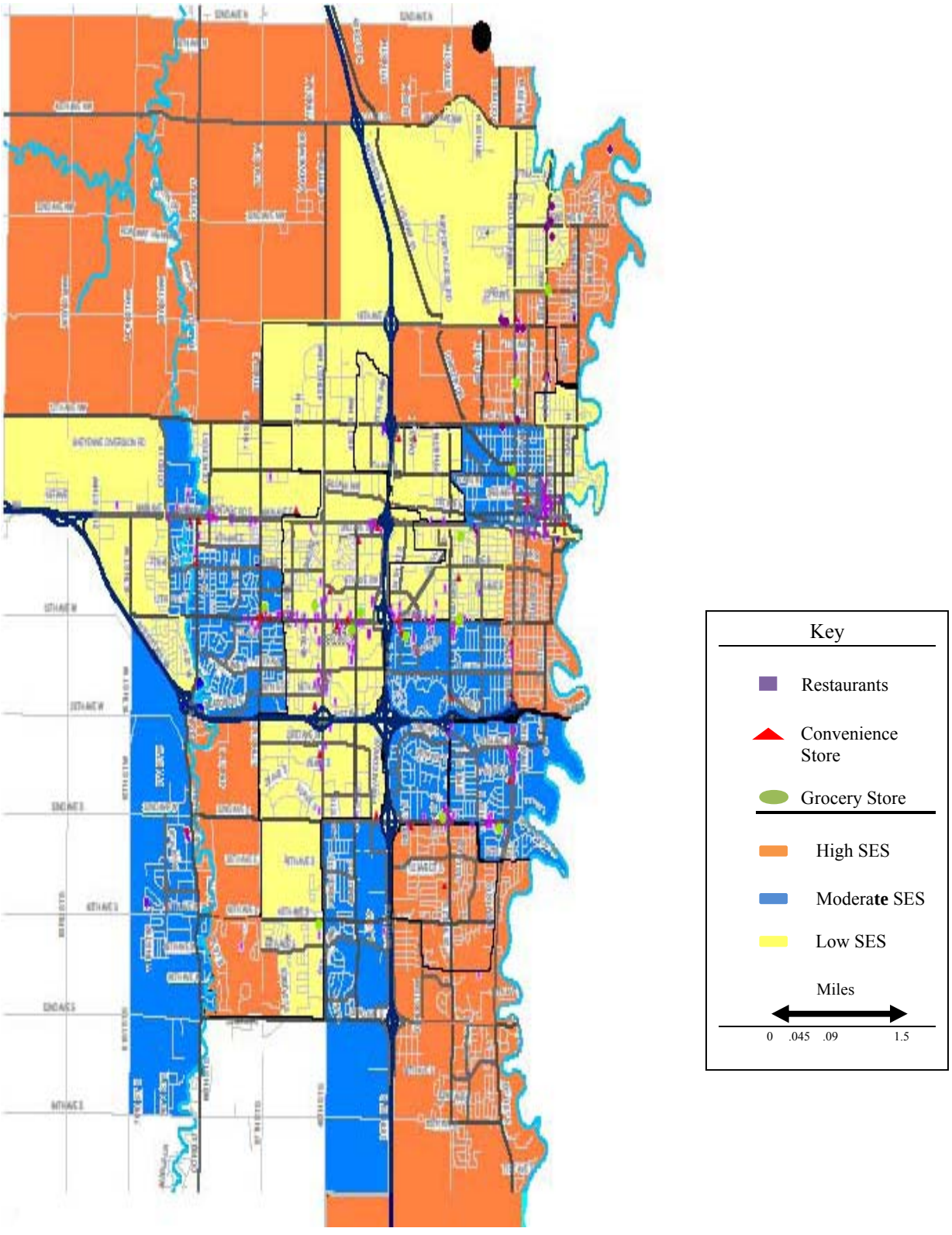

Figure 5. Socioeconomic status sprawl based on 2009 Fargo school district free and reduced price lunch rates.

Results

Figure 6 shows the change of the community weight status and FRSL changes for the 2004-2010 school years for the City of Fargo. From 2004-2010, overweight and obesity combined has seemed to vary from 2004-2010, stay on average around 59%. But FRSL has steadily climbed, from 18% in 2004 to over 28% in 2010, a 10% change in seven years.

Tables 20 and 21 show the distribution of retail food stores and restaurants by SES indicator. These tables show that the differences in SES indicators changed the distribution of retail food stores and that the total number of restaurants changed with different indicators.

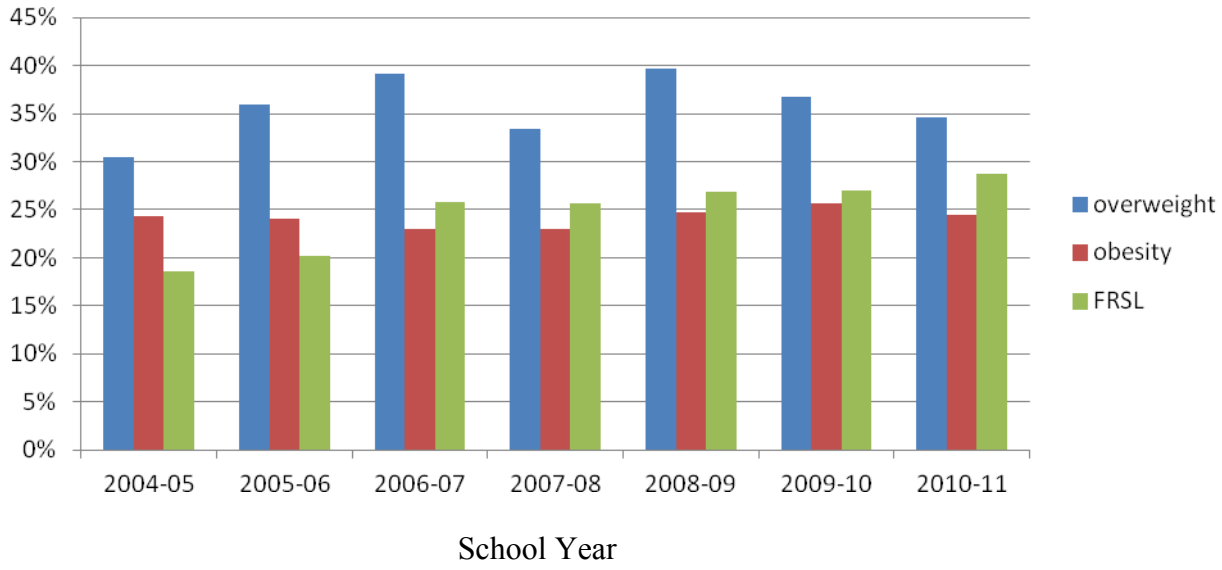

Figure 6. Comparison of free and reduced lucnh ans wight status changes from 2004-2010. Free and reduced lunch data was provided by Fargo Public School lunch program; overweight and obesity data was retreivied June 1, 2012 form the Centers For Disease Control and Prevention, http://apps.nccd.cdc.gov/BRFSS-SMART/

Table 19

Distribution of Retail Food Outlet by SES Indicator (n)

	High/moderate FRSL	High/moderate census poverty rate	Low FRSL	Low census poverty
Ethnic Grocery	4	6	6	4
Convenience Store	23	33	19	9
Supermarket/Grocery	4	8	4	-

Table 20

Distribution of Restaurants Type by SES Indicators(n)

	High FRSL	High CB	Moderate FRSL	Moderate CB	Low FRSL	Low CB
Fast Food	12	10	25	60	56	24
Full Service	-	8	32	54	61	30
Total	12	20	57	114	117	54

Note. Total restaurants surveyed N = 187.

Contingency table analyses were conducted to evaluate whether there were differences in the distribution of store types based on SES indicator. The variables used were Low FRSL vs. Low CB, Moderate FRSL vs. Moderate CB, and High FRSL vs. High CB, with nine levels for restaurant: and Low FRSL vs. Low CB and High/Moderate FRSL vs. High/Moderate CB with nine for retail food outlets. To show differences between proportions, follow-up pairwise

comparisons were conducted to evaluate the differences. Tables 22 and 23 show the results of these analyses. Holm's sequential Bonferroni method was used to control for Type I error at the .05 level across all comparisons. In table 22, the probability of a retail food outlet being available was about 2.23 (29/13) times more likely when FRSL boundary zones where used to assess availability of resources.

In table 23, the probability of a restaurant being available was about 1.66 (20/12) times more likely between High SES areas when CB boundaries where utilized for distribution analysis. Between groups, in was more 9.75 (117/12) time more likely that a restaurant was available in a low FRSL neighborhood than a high SES FRSL neighborhood, and 4.75 (57/12) more likely that a within a moderate FRSL neighborhood than a high SES FRSL neighborhood.

Table 21

Results for the Pairwise Comparisons Using the Holm's Sequential Bonferroni Method for Retail Food Outlets

Comparison	Item	Person chi-square	P-value (alpha)
High/mod FRSL vs. High/mod CB	Retail food outlets	.299	.861
Low FRSL vs. Low CB	Retail food outlets	12.484*	.002
High/mod FRSL vs. Low SL	Retail food outlets	.715	.699
High/mod CB vs. Low CB	Retail food outlets	4.195	.123

Note: *p value ≤ alpha

Table 22

Results for the Pairwise Comparisons Using the Holm's Sequential Bonferroni Method for Restaurants

Comparison	Item	Person chi-square	P-value (alpha)
High vs. Low FRSL	Restaurants	11.512*	.001
High vs. Mod. FRSL	Restaurants	11.097*	.001
Mod. vs. Low FRSL	Restaurants	.045	.832
High vs. Low CB	Restaurants	1.806	.176
High vs. Mod. CB	Restaurants	.710	.399
Mod. Vs. Low CB	Restaurants	.811	.368
Low FRSL vs. Low CB	Restaurants	.190	.663
Mod. FRSL vs. Mod. CB	Restaurants	.455	.500
High FRSL vs. High CB	Restaurants	5.711*	.017

Note: *p value ≤ alpha

Discussion

The objective of this study was to compare the differences between census-block data and reported free and reduced-price school lunch rates in their ability to identify the availability of community nutritional resources based on SES. Studies have shown that association between SES indicators and a range of health outcomes (Duleep, 1989; Adler, Boyce, Chesny, Flokman, & Syme, 1993; Pappas, Queen, Hadden & Fisher, 1993; Hahn, Eaker, Barker, Teutsch, Sosniak, & Krieger, 1995; Moss, & Krieger, 1995), comprehensive indicators of SES are not collected in the United States (Duncan, Daly, McDonough & Williams, 2002). Despite growing knowledge of the need for regular collection of SES, there is little agreement on which indicators should be collected (Winkleby, Jatulis, Frank, & Fortmann, 1992; Duncan et al, 2002). This research suggests that while differences do exist in SES sprawl, both FRSL and CB data are acceptable methods to classify neighborhood socioeconomic status with regards to healthy nutritional resource availability. The 2000 CB data show a great proportion of moderate SES sprawl throughout Fargo, yet the 2008 FRSL rates show an increase of low SES sprawl. The CB data also classified specific areas as low SES that was instead considered moderate or high by FRSL rates.

These differences in SES sprawl may very well be a function of time, as CB data is from 2000 and SL rates are from 2008, as demographic changes may have occurred in the ensuring years. Additional influences on SES sprawl could be related to Fargo's population increase of 16.5% population increase from 2000 to 2010 (US Census, 2010), as the influx of new residents would not be represented in the current CB data.

Although differences in sprawl were noted between the two SES measures, there were very few differences noted in availability of different food store types. There was a statistically

significant difference between Low CB and Low FRSL among retail food outlets and a statistically significant difference between high CB and high FRSL among restaurants. There were also few differences when looking within each measure such as comparing low FRSL and high SL. With the only significant differences being high FRSL vs. moderate FRSL and high FRSL vs. low SL.

Research of SES differences in relation to health status in the United States has generally not considered alternative measures of financial status. Most studies have relied on income, homeownership, education (Kaplan & Hann, 1989; Kaplan, Seeman, Cohen, Knudsen, & Guralnik, 1987; Liberators, Link & Kelsey, 1998; Wolfson, Rome, Gentlemen & Tomiak, 1993). However, depending on the population being considered, specific indicators should be directly related to the representative community or population. Socioeconomic indicators are meant to provide information about an individual's access to resources (Duncan et al., 2002); however, using self reported individualized data that is collected once each decade may limit representation of a community in subsequent years.

One of the most striking findings in this study was the shift of area SES classifications between SL and CB data. The CB data clearly indicate that moderate-SES sprawl was the dominant class in 2000. However, the 2008 SL data show a dominant sprawl of low-SES areas, and an increase of high SES sprawl, with limited moderate-SES sprawl. Between SES indicators, however, there were little differences noted, practical or otherwise.

There are limitations to this study; including FRSL data have not been utilized outside school research (Harwell et al., 2010). Another limitation of the use of FRSL data is that not all residents in each neighborhood have school-aged children; therefore, these data may not fully represent the intended neighborhood. Additionally, SES was indicated by a single variable,

household income, where other studies have used a combination of indicators (e.g., education, income, home ownership, etc.) in a regression model to classify SES (Duncan, et al., 2002; Link et al., 1995; Macintyre et al. 1997).

There are several benefits of using FRSL as a measure of SES. FRSL measures show participation rates that are unrelated to a student's grade level, and new data are readily accessible each year. In addition, FRSL may eliminate nonresponse bias, as the data of a school are stored together and the schools FRSL rate is used, not the individual's (Harwell et al., 2010). Also, with annual data collection trends of change are easier to identify.

Future research should include basic studies into conceptual and operational definitions of SES (Oakes et al., 2003). Even though FRSL data are self-reported, they are collected each year and can be utilized on a yearly basis to track trends of health indicators. Researchers will do well to remember that the development of a new approach to measure SES is sure to be filled with problems (Oakes, et al 2002; Robert & House, 1996). However, looking for indicators that represent a neighborhood year-by-year might be the best solution.

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SUMMARY

Effective understanding of the nutrition environment and health disparities require an understanding of not only what type of food outlets are available in a community but what these outlets offer to the consumer. This study adds to the rapidly expanding literature that has greatly increased our knowledge on the topic over that last several years. There are two parts of this study: part one examines Fargo, North Dakota's nutrition environment the NEMS tools to makes comparisons to other similar studies : part two analyses the use of free and reduced-priced lunch rates as an indicator of SES for community's for nutrition environment research in comparison to census-based data..

The first part of this study focuses on the NEMS tools as a method to investigate the consumer environment to better understand access and availability of healthful nutritional resources and promotions. Part one reinforces and extends the findings of previous research in this area. The limited access of healthful foods was similar across all studies reviewed; however, Fargo saw limited healthful food promotions in higher-SES neighborhoods. While it would be nice to assume higher SES consumers make healthier choices when eating out, there is little evidence to support this. Instead, this pattern of no to limited healthy foods promotion may be more a result of economics, as healthier foods usually come at higher cost, therefore likely also have a lower profit margin. Although this is not confirmed, it is nonetheless disheartening that promotional materials, regardless of SES, tend to favor unhealthy food choices.

All studies discussed, including Fargo, indicated that low-SES areas had less access and availability evident in regards to supermarkets within SES groups. There was also low availability event with the presences of a supermarket within the community. What was unique about Fargo is the high volume of ethnic/specialty stores (17%), however, only 10% of these

stores carried vegetables listed on the NEMS survey (Appendix A), suggesting that those consumers who frequent these retail establishments have low access to fresh produce. However, NEMS is intended by its developers to be locally customized (Glanz, et al., 2008), which may be a logical extension of this research, as the immigrant population of Fargo continues to grow.

Using educational research theory, free and reduced-price school lunch data should be a suitable indicator for SES when compared it to census block poverty rate data. The use of CB data may not fully represent a community and is limited by its self-report nature and once-decade data collection. A possible substitute could be FRSL data which is collected annually and externally audited.

Our results showed few differences between the two indicators (FRSL vs. Census) as well with either indicator based on SES grouping, suggesting that each indicator may be suitable for SES research related to healthy food access and availability. Additionally, adding FRSL data to the established regression models may further strengthen the overall SES model (Wagstaff & Watanabe, 2003).

Taken together, these results emphasize the need to improve the access and availability for healthful nutritional resources. This task cannot be accomplished without quality investigations of the nutrition environment. Also, there needs to be collaboration of efforts between government, the food industry systems, and consumers when dealing with access to healthful nutritional resources. Consumers can demand more healthful resources be offered, but most importantly government policies that affect zoning, promotion of high fat/high sugar foods and competitive pricing need to be in place to assist consumers in making these demands the correct choice.

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APPENDIX A. NEMS-STORES.

Food Outlet Cover Page

Rater ID: | |

---

0 Grocery Store
0 Convenience Store
0 Other_____

Store ID: | | - | | - | | | | | |

Date: __/__/__
Month Day Year

Start Time: | | : | | |
0 AM
0 PM

End Time: | | : | | |
0 AM
0 PM

Number of cash registers: | |

SD 0 FC 0 FF 0 Specialty 0 Other

Restaurant ID: | | - | | - | | - | | | |

Site Visit Date: __/__/__
Month Day Year

Start Time: | | : | | |
0 AM 0 PM

End Time: | | : | | |
0 AM 0 PM

Menu/Internet Review Date: __/__/__
Month Day Year

Start Time: | | : | | |
0 AM 0 PM

End Time: | | : | | |
0 AM 0 PM

Other Visit/ Interview Date: __/__/__
Month Day Year

Start Time: | | : | | |
0 AM 0 PM

End Time: | | : | | |
0 AM 0 PM

Comments:
_____
_____

Nutrition Measures Survey (NEMS) Cover Page

Measure Complete ☐

Nutrition Environment Measures Survey (NEMS)
Measure #1: MILK

Rater ID: ☐☐ Store ID: ☐☐-☐-☐☐-☐☐☐

Date: ☐☐/☐☐/☐☐
Month Day Year

O Grocery Store **O** Convenience Store **O** Other

Marking Instructions

Please use a pencil or blue or black ink ■ Correct ✓ Incorrect ⊗ ⊖ ◉

A. Reference Brand

1. Store brand (preferred) **O** yes **O** no
2. Alternate Brand Name ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Comments:

_____

_____

B. Availability

Comments:

1. a. Is low-fat (skim or 1%) available? **O** Yes **O** No

_____

b. If not, is 2% available? **O** Yes **O** No **O** NA

_____

2. **Shelf Space:** (measure only if low fat milk is available)

Type	Pint	Quart	Half gallon	Gallon
a. Skim	☐☐	☐☐	☐☐	☐☐
b. 1%	☐☐	☐☐	☐☐	☐☐
c. Whole	☐☐	☐☐	☐☐	☐☐

C. Pricing: All items should be same brand Comments:

1. Whole milk, quart $☐.☐☐

_____

2. Whole milk, half-gal. $☐.☐☐

_____

3. Skim or 1% milk, quart $☐.☐☐

_____

(Lowest available)

4. Skim or 1% milk half-gal. $☐.☐☐

_____

(Lowest available)

Alternate Items:

5. 2%, quart $ ☐ . ☐☐ **O** N/A

6. 2%, half gal. $ ☐ . ☐☐ **O** N/A

Measure Complete ☐

Nutrition Environment Measures Survey (NEMS)
Measure #2: FRUIT

Rater ID: ☐☐ Store ID: ☐☐-☐-☐☐-☐☐☐

Date: ☐☐/☐☐/☐☐
Month Day Year

O Grocery Store **O** Convenience Store **O** Other

Availability and Price

Produce Item	**Available** **Yes**	**No**	**Price**	**Unit** **#**	**Quality** **pc**	**lb**	**A**	**UA**	**Comments**
1. Bananas	**O**	**O**	$ ☐ . ☐☐	☐	**O**	**O**	**O**	**O**	
2. Apples **O** Red delicious **O** _____	**O**	**O**	$ ☐ . ☐☐	☐	**O**	**O**	**O**	**O**	
3. Oranges **O** Navel **O** _____	**O**	**O**	$ ☐ . ☐☐	☐	**O**	**O**	**O**	**O**	
4. Grapes **O** Red Seedless **O** _____	**O**	**O**	$ ☐ . ☐☐	☐	**O**	**O**	**O**	**O**	
5. Cantaloupe	**O**	**O**	$ ☐ . ☐☐	☐	**O**	**O**	**O**	**O**	
6. Peaches	**O**	**O**	$ ☐ . ☐☐	☐	**O**	**O**	**O**	**O**	
7. Strawberries	**O**	**O**	$ ☐ . ☐☐	☐	**O**	**O**	**O**	**O**	

8. Honeydew Melon		**O O**	$ ☐ . ☐☐	☐	**O O**	**O O**
9. Watermelon	**O** Seedless	**O O**	$ ☐ . ☐☐	☐	**O O**	**O O**
10. Pears	**O** Anjou	**O O**	$ ☐ . ☐☐	☐	**O O**	**O O**

11. Total Types: (count # of yes responses) ☐☐

Measure Complete ☐

Nutrition Environment Measures Survey (NEMS)
Measure #3: VEGETABLES

Rater ID: ☐☐ Store ID: ☐☐-☐-☐☐-☐☐☐

Date: ☐☐/☐☐/☐☐
Month Day Year

O Grocery Store **O** Convenience Store **O** Other

Availability and Price

Produce Item	**Available Yes**	**No**	**Price**		**Unit #**	**pc**	**lb**	**Quality A**	**UA**
1. Carrots **O** 1 lb bag	**O**	**O**	$ ☐ . ☐☐	☐		**O**	**O**	**O**	**O**
2. Tomatoes	**O**	**O**	$ ☐ . ☐☐	☐		**O**	**O**	**O**	**O**
3. Sweet Peppers	**O**	**O**	**$** ☐ **.** ☐☐	☐		**O**	**O**	**O**	**O**
4. Broccoli	**O**	**O**	$ ☐ . ☐☐	☐		**O**	**O**	**O**	**O**
5. Lettuce	**O**	**O**	$ ☐ . ☐☐	☐		**O**	**O**	**O**	**O**
6. Corn	**O**	**O**	$ ☐ . ☐☐	☐		**O**	**O**	**O**	**O**
7. Celery	**O**	**O**	$ ☐ . ☐☐	☐		**O**	**O**	**O**	**O**

8. Cucumbers _____	**O O**	$ ☐ . ☐☐ ☐	**O O**	**O O**
9. Cabbage _____	**O O**	$ ☐ . ☐☐ ☐	**O O**	**O O**
10. Cauliflower _____	**O O**	$ ☐ . ☐☐ ☐	**O O**	**O O**

11. Total Types: (count # of yes responses) ☐☐

Measure Complete ☐

Nutrition Environment Measures Survey (NEMS)
Measure #4: GROUND BEEF

Rater ID: ☐☐ Store ID: ☐☐-☐-☐☐-☐☐☐

Date: ☐☐/☐☐/☐☐
Month Day Year

O Grocery Store **O** Convenience Store **O** Other

Availability and Price

Item	**Available**			**Price/lb.**
	Yes	**No**	**N/A**	
Healthier Option:				
1. Lean ground beef, **90% lean, 10% fat** (Ground Sirloin) _____	**O**	**O**		$ ☐ . ☐☐
Alternate Items:	**Yes**	**No**	**N/A**	
2. Lean ground beef (<10% fat) _____ ☐☐ **% fat** _____	**O**	**O**	**O**	$ ☐ . ☐☐
3. Ground Turkey (≤ 10% fat) _____ ☐☐ **% fat** _____	**O**	**O**	**O**	$ ☐ . ☐☐

4. # of varieties of lean ground beef (≤ 10% fat) **O** 0 **O** 1 **O** 2 **O** 3 **O** 4 **O** 5 **O** 6+

Regular option:

5. Standard ground beef, **80% lean, O O** $ ☐ . ☐☐

_____

20% fat

_____

Alternate Item:	**Yes No N/A**	
6. Standard alternate ground beef, if above is not available _____ ☐☐ **% fat**	**O O O**	$ ☐ . ☐☐

Measure Complete ☐

Nutrition Environment Measures Survey (NEMS)
Measure #5: HOT DOG

Rater ID: ☐☐ Store ID: ☐☐-☐-☐☐-☐☐☐

Date: ☐☐/☐☐/☐☐
Month Day Year

O Grocery Store **O** Convenience Store **O** Other

Availability and Price

Item **Comments**	**Available** **Yes No N/A**	**Price/pkg.**
Healthier Option:		
1. Oscar Mayer 98% Fat-free Wieners _____ (turkey/beef) 0g fat	**O O**	$ ☐ . ☐☐ _____
Alternate Items: (≤ 9 g Fat)	**Yes No N/A**	
2. Fat-free other brand 0g fat _____ ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐ Brand name	**O O O**	$ ☐ . ☐☐ ☐☐☐ Kcal/svg
3. Light Wieners (turkey/pork) _____	**O O O**	$ ☐ . ☐☐
4. Light beef Franks, _____ (about 1/3 less calories 50% less fat)	**O O O**	$ ☐ . ☐☐ _____

5. Turkey Wieners **O O O** $ ☐ . ☐

(about 1/3 less fat)

6. Other

☐☐☐☐☐☐☐☐☐☐☐☐ **O O O** $ ☐ . ☐☐ ☐☐ oz pkg ☐

Hot dogs/pkg

☐ g fat ☐☐ kcal/svg

Regular option:

7. Oscar Mayer Wieners **O O** $ ☐ . ☐☐

(turkey/pork/chicken)-regular 12g fat

Alternate Items: (≥ 10g fat)

8. Beef Franks (regular) 13 g fat **O O O** $ ☐ . ☐☐

9. Other

☐☐☐☐☐☐☐☐☐☐☐☐ **O O O** $ ☐ . ☐☐ ☐☐ oz pkg ☐☐ Hot dogs/pkg ☐☐ g fat ☐ kcal/svg

Measure Complete ☐

Nutrition Environment Measures Survey (NEMS)
Measure #6: FROZEN DINNERS

Rater ID: ☐☐ Store ID: ☐☐-☐☐-☐☐-☐☐☐

Date: ☐☐/☐☐/☐☐

Month Day Year **O** Grocery Store **O** Convenience Store **O** Other

A. Reference Brand

1, Stouffer's brand (preferred) **O** Yes **O** No

2. Alternate brand (with reduced-fat dinners available) Brand Name: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Comments:

B. Availability

1. Are reduced-fat frozen dinners available? (≤ 9 g fat/8-11 oz.)

Shelf Space: (measure only if reduced-fat frozen dinners are available)

2. Reduced-fat dinners/regular dinners: Proportion **O** <=10% **O** 11-33% **O** 34-50% **O** 51%+

C. Pricing (All items must be same brand)

Reduced-Fat Dinner **Price/Pkg** **Comments**

1. Lean Cuisine **Lasagna** $|__|.__|
fat |__| oz |__|__|__| K cal. |__|__| g

2. Lean Cuisine **Roasted** $|__|.__|
Turkey Breast
|__| oz |__|__|__| K cal. |__|__| g fat

3. Lean Cuisine **Meatloaf** $|__|.__|
fat |__| oz |__|__|__| K cal. |__|__| g

Reduced-Fat Alternate (<9 g fat)
Price/Pkg

4. Other _____ $
|__|.|__|__| .
fat |__| oz |__|__|__| K cal. |__|__| g

5. Other _____
$|__|__|.|__|__| .
fat |__| oz |__|__|__| K cal. |__|__| g

6. Other _____
$|__|__|.|__|__| .
fat |__| oz |__|__|__| K cal. |__|__| g

Regular Dinner **Price/Pkg**

Stouffer's **Lasagna** $|__|__|.__|__|
fat |__| oz |__|__|__| K cal. |__|__| g

Stouffer's **Roasted** $|__|__|.__|__|
Turkey Breast
fat |__| oz |__|__|__| K cal. |__|__| g

Stouffer's **Meatloaf** $|__|__|.__|__|
fat |__| oz |__|__|__| K cal. |__|__| g

Regular Alternate (≥10g fat)
Price/Pkg

Other _____
$|__|__|.|__|__|
fat |__| oz |__|__|__| K cal. |__|__| g

Other _____
$|__|__|.|__|__|
fat |__| oz |__|__|__| K cal. |__|__| g

Other _____
$|__|__|.|__|__|
fat |__| oz |__|__|__| K cal. |__|__| g

Measure Complete ☐

Nutrition Environment Measures Survey (NEMS)
Measure #7: BAKED GOODS

Rater ID: ☐☐ Store ID: ☐☐-☐-☐☐-☐☐☐

Date: ☐☐/☐☐/☐☐

Month Day Year **O** Grocery Store **O** Convenience Store **O** Other

Availability & Price

Low-fat baked goods ≤3g fat/serving

Item Comments	Available Yes	No	Amt. per package	g fat/ per item	kcal/ per item	Price
Healthier option:						
1. Bagel Single _____	**O**	**O**		☐☐	☐☐☐	$☐.☐☐
Package _____	**O**	**O**	☐☐	☐☐	☐☐☐	$☐.☐☐
Alternate Items: _____	**Yes**	**No**	**N/A**			
2. English muffin _____	**O**	**O**	**O** ☐☐	☐☐	☐☐☐	$☐.☐☐
3. a. Low-fat muffin _____	**O**	**O**	**O** ☐☐	☐☐	☐☐☐	$☐.☐☐
☐☐☐☐☐☐☐☐☐ _____						
b. # varieties of low fat muffins				**O** 0	**O** 1 **O** 2 **O** 3+	

Regular option (>3g fat/serving or 400 Kcal/serving):

4. Regular muffin _____	**O**	**O**	☐☐	☐☐	☐☐☐	$☐.☐☐
Alternate Items _____	**Yes**	**No**	**N/A**			
5. Regular Danish _____	**O**	**O**	**O** ☐☐	☐☐	☐☐☐	$☐.☐☐

6. Other **O** **O** **O** | | | | | | $. | | _____

_____

Measure Complete

Nutrition Environment Measures Survey (NEMS)
Measure #8-CS-BEVERAGE

Rater ID: | | Store ID: | | - | | - | | - | | | |
Date: | | / | | / | | | **O** Grocery Store **O** Convenience Store **O** Other
Month Day Year

Availability & Price

Healthier option:	**Available**			**Price**	**Comments**
		Yes	**No**		
1. Diet Coke	12 oz.	**O**	**O**	$.	
	20 oz.	**O**	**O**	$.	
2. Alternate brand of diet soda		**Yes**	**No**	**N/A**	$.
_____	12 oz.	**O**	**O**	**O**	$.
_____	20 oz.	**O**	**O**	**O**	$.
Regular option:		**Yes**	**No**		
3. Coke	12 oz.	**O**	**O**		$.
	20 oz.	**O**	**O**		$.
4. Alternate brand of sugared soda		**Yes**	**No**	**N/A**	
_____	12 oz.	**O**	**O**	**O**	$.
_____	20 oz.	**O**	**O**	**O**	$.
Healthier option:					
5. **100% juice, 15.2 oz.**		**Yes**	**No**		
O Minute Maid **O** Tropicana **O** Other		**O**	**O**		$.
Alternate Items:		**Yes**	**No**	**N/A**	
6. **100% juice, 14 oz.**					
O Minute Maid **O** Tropicana **O** Other		**O**	**O**	**O**	$.
_____					
7. **100% juice,** _____ oz.					
O Minute Maid **O** Tropicana **O** Other		**O**	**O**	**O**	$.

Regular option: **Yes No**

8. **Juice Drink, 15.2 oz**
O Minute Maid **O** Tropicana **O** Other **O O** $[ ][ ].[ ][ ]

Alternate Items: **Yes No N/A**

9. **Juice Drink, 14 oz.**
O Minute Maid **O** Tropicana **O** Other **O O O** $[ ][ ].[ ][ ]

10. **Juice Drink,** ____ oz.
O Minute Maid **O** Tropicana **O** Other **O O O** $[ ][ ][ ][ ].[ ][ ][ ][ ]

_____

Measure Complete [ ]

Nutrition Environment Measures Survey (NEMS)
Measure #8-GS:BEVERAGE

Rater ID: [ ][ ] Store ID: [ ][ ]-[ ][ ]-[ ][ ]-[ ][ ][ ][ ]

Date: [ ][ ]/[ ][ ]/[ ][ ][ ][ ] **O** Grocery Store **O** Convenience Store **O** Other
Month Day Year

Availability & Price

Available **Price**

Comments

Healthier option: **Available size** **Yes No N/A**

1. Diet Coke 12 pack 12 oz. **O O O** $[ ][ ].[ ][ ]
6 pack 12 oz. **O O O** $[ ][ ].[ ][ ]

2. Alternate brand of diet soda $[ ][ ][ ][ ][ ][ ][ ][ ].[ ][ ][ ][ ]

_____

[ ][ ][ ][ ][ ][ ][ ][ ][ ][ ] 12 pack 12 oz. **O O O** $[ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ].[ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]

_____

[ ][ ][ ][ ][ ][ ][ ][ ][ ][ ] 6 pack 12 oz. **O O O** $[ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ].[ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]

_____

Regular option: **Yes No**

3. Coke 12 pack 12 oz. **O O** $[ ][ ].[ ][ ]

Yes No N/A

6 pack 12 oz. **O O O** $[ ][ ].[ ][ ]

4. Alternate brand of sugared soda **Yes No N/A**

[ ][ ][ ][ ][ ][ ][ ][ ][ ][ ] 12 pack 12 oz. **O O O** $[ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ].[ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]

_____

[ ][ ][ ][ ][ ][ ][ ][ ][ ][ ] 6 pack 12 oz. **O O O** $[ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ].[ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]

_____

Healthier option: **Yes No**

5. Minute Maid 100% juice, (64 oz., half gallon) **O O** $[ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ].[ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]

_____

Alternate Items:		**Yes**	**No**	**N/A**	
6. Tropicana 100% juice, (64 oz, half gallon)	**O**	**O**	**O**		$[ ].[ ]
7. Other: [ ]	**O**	**O**	**O**		$[ ].[ ]

Regular option:	**Yes**	**No**	
8. Minute Maid juice drink, (64 oz, half gallon)	**O**	**O**	$[ ].[ ]

Alternate Items:		**Yes**	**No**	**N/A**	
9. Tropicana juice drink, (64 oz, half gallon)	**O**	**O**	**O**		$[ ].[ ]
10. Other: [ ]	**O**	**O**	**O**		$[ ].[ ]

Measure Complete [ ]

Nutrition Environment Measures Survey (NEMS)
Measure #9: BREAD

Rater ID: [ ] Store ID: [ ]-[ ]-[ ]-[ ]

Date: [ ]/[ ]/[ ] **O** Grocery Store **O** Convenience Store **O** Other
Month Day Year

Availability & Price

Item	Available			Loaf size	Price/loaf	Comments
	Yes	No	N/A	(ounces)		

Healthier Option: Whole grain bread (100% whole wheat bread and whole grain bread)

1. Nature's Own 100% Whole Wheat Bread _____ **O** **O** [ ] $[ ].[ ]

Alternate Items:

2. Sara Lee Classic 100% Whole Wheat Bread _____ **O** **O** **O** [ ] $[ ].[ ]

3. Other: [ ] **O** **O** **O** [ ] $[ ].[ ]
_____

4. # of varieties of 100% whole wheat bread and whole grain (all brands) **O** 0 **O** 1 **O** 2 **O** 3 **O** 4 **O** 5 **O** 6+

Regular Option: White bread (bread made with refined flour)

5. Nature's Own Butter Bread _____ **O** **O** [ ] $[ ].[ ]

Alternate Items:

6. Sara Lee Classic White Bread _____ **O** **O** **O** [ ] $[ ].[ ]

7. Other: [ ] **O** **O** **O** [ ] $[ ].[ ]
_____

Measure Complete ☐

Nutrition Environment Measures Survey (NEMS)
Measure #10: BAKED CHIPS

Rater ID: ☐☐ Store ID: ☐☐-☐☐-☐☐-☐☐☐

Date: ☐☐/☐☐/☐☐ **O** Grocery Store **O** Convenience Store **O** Other
Month Day Year

Availability & Price

Low-fat chips ≤3g fat per 1 oz. serving

Item	**Size**	**Available (ounces)**	**Price**	**Comments**
Healthier Option :			**Yes No**	
1. Baked Lays Potato Chips	☐☐ oz.		**O O**	$☐.☐☐
Alternate Item:			**Yes No N/A**	
2. ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐			**O O O**	$☐.☐☐
	☐☐ oz.			
3. # of varieties of low-fat chips (any brand) **O** 0 **O** 1 **O** 2 **O** 3 **O** 4 **O** 5 **O** 6+				

Regular Option (select most comparable size to healthier option available):

	Size	**Yes No**	**Price**
4. Lays Potato Chips Classic	☐☐ oz.	**O O**	$☐.☐☐
Alternate Item:		**Yes No N/A**	
5. ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐	☐☐ oz.	**O O O**	$☐.☐☐

measure Complete ☐

Nutrition Environment Measures Survey (NEMS)
Measure #11: CEREAL

Rater ID: ☐☐ Store ID: ☐☐-☐☐-☐☐-☐☐☐

Date: ☐☐/☐☐/☐☐ **O** Grocery Store **O** Convenience Store **O** Other
Month Day Year

Availability & Price

Healthier cereals < 7 g sugar per serving

Item	Available Yes	No	N/A	Size (ounces)	Price	Comments
Healthier Option:						
1. Cheerios (Plain) _____	**O**	**O**		☐☐	$☐☐☐☐.☐☐	
Alternate Item:	**Yes**	**No**	**N/A**			
2. Other _____ _____	**O**	**O**	**O**	☐☐	$☐☐☐☐.☐☐	
3. # of varieties of healthier cereals	**O** 0	**O** 1	**O** 2	**O** 3+		
Regular Options (≥7g of sugar per serving):						
4. Cheerios (Flavored) _____ _____	**O**	**O**		☐☐	$☐☐☐☐.☐☐	
Alternate Item:	**Yes**	**No**	**N/A**			
5. Other _____ _____	**O**	**O**	**O**	☐☐	$☐☐☐.☐☐	

APPENDIX B. NEMS-RESTAURANT MEASURES.

Restaurant ID: [| |]-[|]-[| |]-[| |] Date: [| |]/[| |]/[| |]
Rater ID: [| |] Month / Day / Year

1) Type of Restaurant: Code #: [| |]

2) Data Sources: **Site Visit/Observation** **O** yes **O** no; **Take-Away Menu** **O** yes **O** no; **Internet** **O** yes **O** no; **Interview** **O** yes **O** no

3) Site Visit Information:
Take–away menu **O** yes **O** no
Nutrition Information **O** yes **O** no
Other: **O** yes **O** no
Other: **O** yes **O** no
Comments:_____
_____
_

4) Take-Away Menu Features:
Nutrition Information **O** yes **O** no
Identification of Healthier menu items **O** yes **O** no
Other: **O** yes **O** no
Other: **O** yes **O** no
Comments:
_____

5) Internet Site Features:
Menu **O** yes **O** no
Nutrition Information **O** yes **O** no
Identification of Healthier menu items **O** yes **O** no
Other: **O** yes **O** no
Web Site URL:
_____

6) Interview Information:
Menu Options **O** yes **O** no
Pricing **O** yes **O** no
Other: **O** yes **O** no
Comments (describe items above)_____

7) Hours of operation: **Data Source(s): O Site O Menu O Web**

Sunday **O** open **O** closed
O B: 6:00-11:00 am
O L: 11:00 am-3:00 pm
O D: 5:00 pm to Close
[| |]:[| |] **O** AM **O** PM

Thursday **O** open **O** closed
O B: 6:00-11:00 am
O L: 11:00 am-3:00 pm
O D: 5:00 pm to Close
[| |]:[| |] **O** AM **O** PM

Friday **O** open **O** closed
O B: 6:00-11:00 am
O L: 11:00 am-3:00 pm
O D: 5:00 pm to Close
[| |]:[| |] **O** AM **O** PM

Saturday **O** open **O** closed
O B: 6:00-11:00 am
O L: 11:00 am-3:00 pm
O D: 5:00 pm to Close
[| |]:[| |] **O** AM **O** PM

O open 24 Hours (If 24 hour, leave *Hours of Operations section* blank)

8) Access: Drive-thru window **Parking onsite**
O Seating capacity = [| |] OR **O** Number of tables = [| |]

9) Size of Restaurant: **O** yes **O** no **O** yes **O** no

Nutrition Environment Measures Survey (NEMS)
RESTAURANT MEASURES—DATA COLLECTION

Restaurant ID: |__|__|-|__|__|-|__|__|-|__|__|__| Date: |__|__|/|__|__|/|__|__|
Month / Day / Year

Rater ID: |__|__|

Site Visit (Observation)	**Select One**	**Comments**
10) Restaurant has a salad bar	**O** yes **O** no	
11) Signage/Promotions	**O** yes **O** no	
a. Is nutrition information posted near point-of-purchase, or available in a brochure?		
b. Do signs/table tents/displays highlight healthy menu options?	**O** yes **O** no	
c. Do signs/table tents/displays encourage **healthy** eating?	**O** yes **O** no	
d. Do signs/table tents/displays encourage unhealthy eating?	**O** yes **O** no	
jumbo, grande, supreme, king size, feast descriptors on menu or signage)?		
f. Does this restaurant have a low-carb promotion?	**O** yes **O** no	
g. Other? _____	**O** yes **O** no	
Menu Review/Site visit		
12) a. Chips _____	**O** yes **O** no	
b. Baked chips _____	**O** yes **O** no	
13) a. Bread _____	**O** yes **O** no	
b.100% wheat or whole grain bread _____	**O** yes **O** no	
14) 100% fruit juice _____	**O** yes **O** no	
15) 1% Low-fat, skim, or non-fat milk _____	**O** yes **O** no	

Nutrition Environment Measures Survey (NEMS)

RESTAURANT MEASURES—DATA COLLECTION

Restaurant ID: ☐|☐-☐-☐|☐-☐|☐|

Date: ☐|☐/☐|☐/☐|☐|
Month / Day / Year

Rater ID: ☐|☐

Menu Review	**Select One**	**Choices (#)**	**Comments**
16) Main Dishes/Entrees:	**O** yes	# ☐|☐|	
a. Total # Main Dishes/Entrees	**O** no		_____
b. Healthy Options	**O** yes	☐|☐|	
	O no		_____
17) Main dish salads:			
a. Total # Main dish salads	**O** yes	☐|☐|	
	O no		_____
b. Healthy Options	**O** yes	☐|☐|	
	O no		_____
c. Low-fat or fat free salad dressings	**O** yes	☐|☐|	
	O no		_____
18) Fruit (w/out sugar)	**O** yes	☐|☐|	
	O no		_____
19) Non-fried vegetables (w/out sauce)	**O** yes	☐|☐|	
	O no		_____
20) Diet soda	**O** yes		
	O no		_____
21) Other healthy or low calorie beverage?	**O** yes		
_____	**O** no		_____

Nutrition Environment Measures Survey (NEMS)
RESTAURANT MEASURES—DATA COLLECTION

Restaurant ID: |__|__|-|__|__|-|__|__|

Date: |__|__|/|__|__|/|__|__| Month / Day / Year

Rater ID: |__|__|

Menu Review/Site Visit	Select One	Comments
22) a. Nutrition information on menu (paper or posted menu)	**O** yes **O** no	
b. Healthy entrees identified on menu	**O** yes **O** no	
c. Reduced-size portions offered on menu	**O** yes **O** no **O** standard	
d. Menu notations that encourage healthy requests	**O** yes **O** no	
e. Other? _____	**O** yes **O** no	
23) Barriers		
a. Large portion sizes encouraged? Super-size items on menu	**O** yes **O** no	
b. Menu notations that discourage special requests (e.g *No substitutions* or charge for substitutions)	**O** yes **O** no	

Nutrition Environment Measures Survey (NEMS)

RESTAURANT MEASURES—DATA COLLECTION

Restaurant ID: |__|-|__|-|__|-|__|__| Date: |__|__|/|__|__|/|__|__|
Month / Day / Year

Rater ID: |__|__|

23) **Barriers (Cont.)**	**Select One**	**Comments**
c. All-you-can-eat or "Unlimited trips"	**O** yes **O** no	
d. Other? _____	**O** yes **O** no	
24) Pricing a. Sum of individual items compared to combo meal	**O** more **O** less **O** same **O** NA	
b. Healthy entrees compared to regular ones	**O** more **O** less **O** same **O** NA	
c. Charged for shared entrée?	**O** yes **O** no	
d. Smaller portion compared to regular portion (If 22c is No or Standard then mark N/A.)	**O** yes **O** NA **O** no	
e. Other? _____ _____	**O** more **O** less **O** same **O** NA	

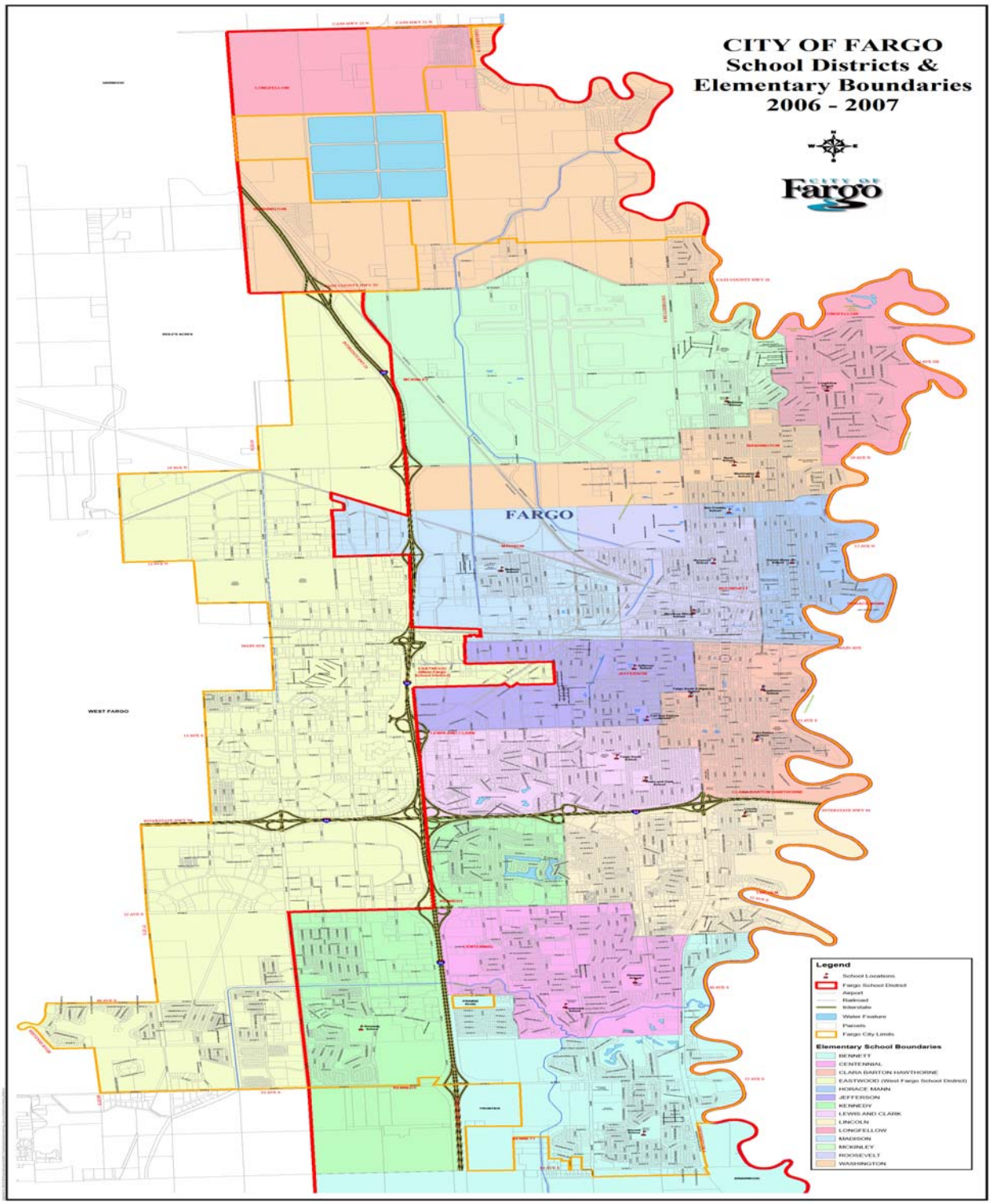
Nutrition Environment Measures Survey (NEMS) RESTAURANT MEASURES—DATA COLLECTION

Restaurant ID: |__|-|__|-|__|-|__|__| Date: |__|__|/|__|__|/|__|__|
Month / Day / Year

Rater ID: |__|__|

Menu Review	Select One	Comments
25) Kid's menu?		
a. Age limit	**O** 10 & Under **O** 12 & Under **O** Other **O** NA	
b. Any healthy entrees?	**O** yes **O** no **O** NA	
c. 100% fruit juice	**O** yes **O** no **O** NA	
d. 1% low-fat, skim or non-fat milk	**O** yes **O** no **O** NA	
e. Are there any free refills on unhealthy drinks?	**O** yes **O** no **O** NA	
f. Are there any healthy side items (either assigned or to choose)?	**O** yes **O** no **O** NA	
g. Can you substitute a healthy side for an assigned unhealthy one?	**O** yes **O** no **O** NA	
h. Do any entrees that have assigned sides include an assigned healthy side?	**O** yes **O** no **O** NA	
i. Is an unhealthy dessert automatically included in a kid's meal?	**O** yes **O** no **O** NA	
j. Are there any healthy desserts (either free or at additional cost)?	**O** yes **O** no **O** NA	
k. Is nutrition information (e.g. calories or fat) provided on the kid's menu?	**O** yes **O** no **O** NA	
l. Other unhealthful eating promotion?	**O** yes **O** no **O** NA	
m. Other healthful eating promotion?	**O** yes **O** no **O** NA	_____

APPENDIX C. 2006-2007 FARGO SCHOOL DISTRICT ELEMENTARY BOUNDARIES.



APPENDIX D. 2000 CENSUS BLOCK GROUP BOUNDARIES.