

## Characterizing Saskatoon's Food Environment: A Neighbourhood-level Analysis of In-store Fruit and Vegetable Access

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### *Abstract*

This paper evaluates the relationship between in-store food offerings and neighbourhood level socio-economic and demographic characteristics in Saskatoon, Saskatchewan, as well as to assess differences in fruit and vegetable access among grocery stores in neighbourhoods of varying socioeconomic status. This study compares measures of the food environment using data based on structured observations, self-reported data and measured data. A census of 116 food stores were measured in Saskatoon's residential neighbourhoods (n=60), of which 24 were grocery stores. Neighbourhoods were assigned to categories of high, mid and low socioeconomic status (SES) based on the Material and Social Deprivation Index. Proportion of Aboriginal ancestry by neighbourhood was also incorporated into the analysis. High SES neighbourhoods had a higher proportion of grocery stores, of all store types, than mid or low SES neighbourhoods, while low SES neighbourhoods had a much higher proportion of convenience stores compared to mid and high SES neighbourhoods. Overall in-store grocery measures did not vary significantly across neighbourhood-level SES, but did vary by proportion of Aboriginal ancestry. Price and availability of fruits and vegetables varied in low SES neighbourhoods and those with a higher proportion of Aboriginal ancestry. This study uncovers a disproportionately high distribution of convenience stores in lower SES neighbourhoods, suggesting that food swamps are prevalent in Saskatoon and confirms previous research findings of inequities experienced by Aboriginal people in the city. Further research, including more qualitatively-driven data, is necessary to elucidate the complexities of Saskatoon's food environment.

*Keywords:* food environment, food desert, food swamp, neighbourhoods, health, socio-economic status, Aboriginal, Saskatoon, Canada

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*Résumé*

Cet article évalue la relation entre l'offre de nourriture dans les magasins et les caractéristiques socio-économiques et démographiques des quartiers différents de Saskatoon, Saskatchewan ; ainsi qu'une évaluation des différences d'accès des fruits et légumes dans les épiceries de quartiers de statut socioéconomique différents. Cette étude compare les mesures de l'environnement alimentaire en utilisant des données basées sur des observations structurées, les données auto-déclarées et les données mesurées. Un recensement de 116 magasins d'aliments a été mesuré dans les quartiers résidentiels de Saskatoon (n = 60), dont 24 étaient des épiceries. Les quartiers ont été assignés à des catégories de statut socio-économique (SSE) élevé, moyen et défavorisé basé sur l'indice de défavorisation matérielle et sociale. La proportion d'ascendance autochtone par quartier a également été intégrée dans l'analyse. Les quartiers où le SSE est élevé ont une proportion élevée des épiceries que les quartiers moyens ou défavorisés. Les quartiers où le SSE est défavorisé ont une proportion élevée de dépanneurs que les quartiers moyens ou élevés. Les scores composites des épiceries ne varient pas beaucoup selon le niveau SSE du quartier, mais varient cependant selon la proportion d'ascendance autochtone. Le prix et la disponibilité des fruits et légumes se sont distingués parmi des quartiers défavorisés et avec la proportion d'ascendance autochtone. Cette étude démontre une répartition disproportionnée des dépanneurs dans les quartiers à faible SSE, les qualifiant de *marécages alimentaires* et confirme les conclusions d'études antérieures des inégalités vécues par la population autochtone de la ville. Les recherches plus poussées, y compris plus de données qualitatives, est nécessaire pour élucider les complexités de l'environnement alimentaire de Saskatoon.

*Mots clés:* environnement alimentaire, désert alimentaires, marécages alimentaires, quartiers, santé, statut socio-économique, Autochtone, Saskatoon, Canada

**Introduction**

A healthy diet, one that is high in fresh fruit and vegetables (Paquette 2005) and low in processed, energy-dense food, offers protection against the onset of many chronic illnesses (Townshend and Lake 2009). Low intake of fruits and vegetables is one of the leading risk factors for death, related to many conditions worldwide (Egger and Swinburn 1997). It is evident, however, that there is little benefit in encouraging people to eat more fruits and vegetables if the food stores and restaurants accessible to them do not offer these choices at affordable prices (Kamphuis et al. 2006), and studies suggest that low income individuals and families may be more affected by their neighbourhood environment, resulting from more constrained transportation options (Lytle 2009).

Previous research has shown that the cost of food plays a significant role in accessibility and is a barrier to healthy eating for people with low incomes (Paquette 2005). Nutritious food is often more expensive than highly processed, fat- or sugar-

laden food, putting a balanced diet out of reach for people with limited finances (Inglis, Ball, and Crawford 2009) healthier foods may be overlooked in favour of more energy-dense lower-cost options. The aim of this study was to investigate whether modifications to the available household food budget led to changes in the healthfulness of food purchasing choices among women of low and high income. A quasi-experimental design was used which included a sample of 74 women (37 low-income women and 37 high-income women). A common measure for fresh produce access—itsself a distal marker of a healthy diet—is residential proximity to a grocery store (Feng et al. 2010). A grocery store or supermarket format is the most likely to carry the widest range of healthy food, at more affordable prices compared to other store types, such as convenience stores (Powell et al. 2007). While grocery stores also carry unhealthy foods such as candy, chips and soft drinks, these items are more abundant at convenience stores (Farley et al. 2009; Wrigley 2002), making grocery stores the more desirable food outlet to have in a neighbourhood.

When people have trouble accessing healthy foods because of where they live and because of financial difficulty, they are said to live in a *food desert* (Wrigley 2002; Kershaw et al. 2010). Food deserts are the subject of great debate, as researchers attempt to define and delineate the extent of urban food deserts, and establish if they exist at all. In studies across Western, English-speaking nations, the findings are mixed: a number of food deserts have been uncovered in American cities (Morland et al. 2002; Morland and Filomena 2007), while findings in cities across Britain and Scotland suggest that they may not exist or may not be important indicators of healthy food access (Wrigley 2002).

Turning to Canada's growing food environment literature, researchers in London, ON, found that food deserts do exist, yet their findings indicate that areas of lower SES have better access to grocery stores, compared to higher SES areas, when public transit is taken into account (Larsen and Gilliland 2008). Researchers in both Edmonton, AB, and Montreal, QC, did not find evidence of food deserts, suggesting instead that interventions aimed at improving dietary outcomes should focus on issues broader than the geographic distribution of food stores (Smoyer-Tomic, Spence, and Amrhein 2006; Spence et al. 2009; Apparicio, Cloutier, and Shearmur 2007). Curiously, researchers in both London and Edmonton found that access to grocery stores was *greater* in neighbourhoods of lower SES (Larsen and Gilliland 2008; Smoyer-Tomic, Spence, and Amrhein 2006). These findings point to the complexity of Canadian food environment research and underscore the need to better understand the regional and demographic differences that may exist across cities of varying size and urbanity.

Food environment research in Saskatoon is relatively new. The Saskatoon Health Region, the University of Saskatchewan and the *Smart Cities, Healthy Kids* research initiatives have begun the process of enumerating this mid-sized city's built food environment, assessing the distribution of grocery and convenience stores, as well as fast food restaurants (Peters and McCreary 2008; Kershaw et al. 2010; Engler-Stringer, R. Muhajarine et al. 2014). Given its geographic similarity to Edmonton, also a Prairie city, it could be hypothesized that Saskatoon's built food environment would be similar. However, the size and urban development trajectory of Saskatoon (Engler-Stringer, R. Muhajarine et al. 2014) more closely parallels that of London (Larsen and Gilliland 2008), indicating that food deserts may have developed over

time as large supermarket chains moved their increasingly-larger stores towards the outskirts of the city (Miller, Reardon, and Mccorkle 2012). Evidence exists to illustrate the growing dearth of grocery store access in the Saskatoon's poorest neighbourhoods (Engler-Stringer, R. Muhajarine et al. 2014). A great deal of the Canadian literature shows associations between the built food environment and residents' diet-related outcomes (Office of Nutrition Policy and Promotion 2013). There is increasing evidence of food swamps—areas of low socioeconomic status with high geographic access to nonnutritive food sources—which may prove to be more important than food deserts in influencing residents' diets (Office of Nutrition Policy and Promotion 2013).

American research findings indicate that residents of wealthier, white neighbourhoods tend to have better access to cheaper and more nutritious foods than those living in less affluent neighbourhoods. This disparity widens when obesogenic (obesity-promoting) built environments are factored in (Elinder and Jansson 2009). For example, a 2007 study by Morland and Filomena found that in wealthier, predominantly-white neighbourhoods in the US, the ratio of grocery stores to residents was 1:3816. In neighbourhoods of lower SES, where there was a greater proportion of black residents, the ratio was a disturbing 1:23,582 (Morland and Filomena 2007). While the body of Canadian food environment research has not explicitly documented race-based differences, there is extensive evidence of disparities in nutrition-related health outcomes (Office of Nutrition Policy and Promotion 2013). For instance, the prevalence of obesity and diabetes is considerably higher among First Nations communities (Loppie Reading and Wien 2009) and can be linked to, among other factors, the quality of an affordable diet (Office of Nutrition Policy and Promotion 2013). There is ample evidence to suggest that access to affordable, healthy food can be a challenge for Aboriginal people living on reserve or in remote, rural areas (Willows, Hanley, and Delormier 2012). Colonization, the Residential School Legacy, marginalization and ongoing systemic barriers contribute to disproportionately poor health outcomes among First Nations, Metis and, increasingly, Inuit, when compared to other Canadian populations (Loppie Reading and Wien 2009). Differences in neighbourhood-level SES and demographic indicators are linked to differences in health outcomes (Morland and Filomena 2007). Indicators such as income or race have been shown to possibly account for variations in grocery and convenience store distribution across neighbourhoods within the same city (Morland and Filomena 2007; Larson, Story, and Nelson 2009). A health disparities study by the Saskatoon Health Region (SHR) in 2007 contrasted the health status of residents within Saskatoon's six lowest income neighbourhoods—which have proportionally higher numbers of residents reporting Aboriginal ancestry—with the rest of the city, and found substantial disparities in chronic disease outcomes (Lemstra, Neudorf, and Beaudin 2007). Although inequities in health outcomes related to SES are not surprising, the magnitude of the disparity was enormous. After statistically controlling for variables of SES, cultural status, disease intermediaries, other health disorders, behaviours and healthcare utilization,

the researchers found that low-income residents in Saskatoon are 50% more likely to report low self-reported health, 118% more likely to have heart disease and 196% more likely to have diabetes (Lemstra, Neudorf, and Beaudin 2007). A food access study by SHR found that food stores are not equally distributed throughout the city: Neighbourhoods with the poorest access to grocery stores lie along the river, particularly on the west side, and on the edges of the city to the north, west and south, corresponding to some of the lower SES neighbourhoods within the city (Figure 1). Fewer than half of Saskatoon's residents (46%) have any grocery stores within a walking distance of 1 km and only 17% have more than one grocery store within walking distance. Previous research has uncovered several food deserts in Saskatoon, such as those in Figure 1 (Peters and McCreary 2008; Kershaw et al. 2010). Conversely, convenience stores are much greater in number throughout the city (Figure 2), indicating relatively easier access to unhealthier food choices. These initial findings point to the presence of both food deserts and swamps across the city. This present study aims to further an understanding of Saskatoon's built food environment through an analysis of in-store food offerings across neighbourhoods of varying SES and varying proportions of Aboriginal ancestry.

Figure 1: Supermarket distribution

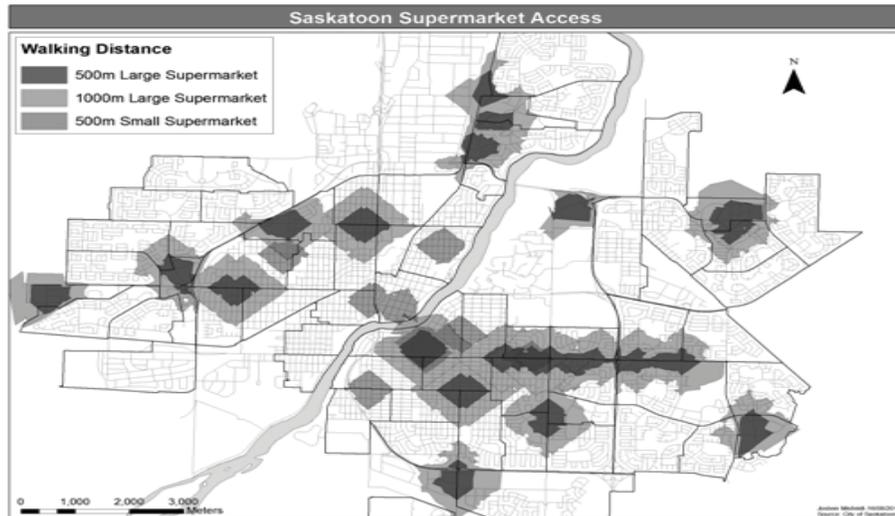
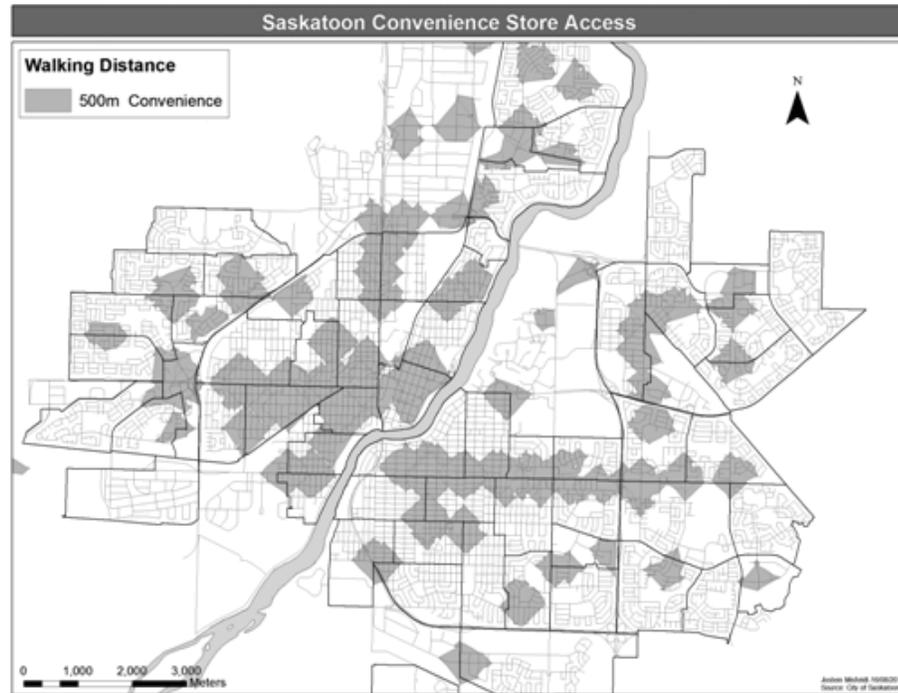


Figure 2: Distribution of convenience stores



### Methodology

In-store measures of ten food categories were collected using the Nutrition Environment Measurement Survey for Stores (NEMS-S) (Glanz et al. 2007). The findings addressed in this article focuses on measures of fruit and vegetable access (price and availability) within grocery stores in relation to the SES-level of the neighbourhoods in which the store is located. Further assessed were correlations of fruit and vegetable access with Aboriginal ancestry at the neighbourhood level.

#### *Measurement of food stores*

Based on a geo-coded list of stores in residential neighbourhoods obtained from the City of Saskatoon and updated through observation, food stores were delineated by store type. **Grocery** stores included all large grocery stores and supermarkets—stores stocking fresh meat, wheat-based Western style bread, fruits, vegetables, and dairy milk, and requiring no membership (Smoyer-Tomic, Spence, and Amrhein 2006). **Convenience** stores were classified as those carrying a limited range of foods (compared to a grocery store). These included stores attached to gas stations, pharmacies carrying a range of food products and free-standing convenience stores. Consistent with other studies (Smoyer-Tomic, Spence, and Amrhein 2006; Apparicio, Cloutier, and Shearmur

2007), excluded were stores not open to the public or those requiring membership (such as Costco). “Big box” style department stores that sell a limited range of food, such as some Giant Tiger or Shoppers Drug Mart locations, were categorized as convenience stores. Food stores located in non-residential neighbourhoods were excluded in this analysis. The in-store survey instrument was administered in a census of 116 food stores (24 grocery and 92 convenience stores) across a total of 60 residential neighbourhoods between January and February 2011. As the purpose of this analysis was fresh and frozen fruit and vegetable access, only grocery stores are included. This inclusion criteria was based on the observation that, while canned fruits and vegetables may be available through convenience stores, fresh and frozen produce is available in the widest variety at grocery stores. It is posited that variations across grocery stores serve as a more meaningful analysis of the built food environment than variations across grocery and convenience stores combined.

### *Data Collection*

The Nutrition Environment Measurement Survey for Stores (NEMS-S) was originally developed to measure healthy food options in grocery and convenience stores in neighbourhoods differing by income and community design. The tool has been tested extensively for reliability (test-retest and inter-rater) and validity (face and construct validity) (Glanz et al. 2007). The in-store survey is completed by a trained rater, for each food store, based on structured observations of price, availability and quality for ten indicator food categories: milk, bread, fruit and vegetables (fresh, frozen and canned), ground beef, hot dogs, frozen dinners, baked goods, beverages, chips, and cereal (Glanz et al. 2007). A composite score from each food category was used to assess the overall “healthiness” of a store, with higher score indicating a wider variety of healthy options at prices either equal to, or lower than, less healthy options within a comparable category. The in-store survey has been adapted for the Canadian context by researchers at the University of Alberta, including a wider list of fruits and vegetables for assessment, as well as additional sections for canned and frozen produce (Susan Buhler, personal communication, January 7, 2011).

Neighbourhoods were characterized as high, mid and low SES using the Material and Social Deprivation Index, a tool developed by the Institut national de santé publique (INSPQ) in Quebec (Pampalon et al. 2009) and which has been frequently adapted to characterize neighbourhood-level SES (Apparicio, Cloutier, and Shearmur 2007; Smoyer-Tomic et al. 2008; Pouliot and Hamelin 2009). The Material and Social Deprivation Index is based on material indicators of income, employment and education, and social indicators of marital status, lone parent status and living alone status (Pampalon et al. 2009). A material and social deprivation index was developed for Quebec and Canada. Data used for this index were derived from Statistics Canada’s 2006 Census and projected data from the City of Saskatoon, up to 2010. Z-scores were calculated for each variable for each neighbourhood, and the sum of

these values was used to divide neighbourhoods into categories of high, mid and low SES, (n=20 neighbourhoods of each type). Data on proportion of Aboriginal ancestry, by neighbourhood, was gathered from Statistics Canada's 2011 Census.

The decision to undertake a neighbourhood-level analysis, rather than a census tract-level analysis—as has been done in some Canadian studies (Apparicio, Cloutier, and Shearmur 2007; Black et al. 2011)—was based on several considerations. Previous studies of Saskatoon's food environment (Kershaw et al. 2010) and other pivotal health-related studies in the city (Lemstra, Neudorf, and Beaudin 2007) are neighbourhood-based. It was felt that keeping this present study at the neighbourhood-level would facilitate intra-city comparability of this study's findings.

### *Data Analysis*

Mean in-store scores were calculated for the 18 neighbourhoods in which grocery stores are located. Fruit and vegetable access measures were based on the price and availability of 16 fruit and 16 vegetable varieties (fresh and frozen) available within grocery stores. While the original in-store measurement survey collected three dimensions of accessibility—price, availability and quality—the latter has not been included in the present analysis due to its greater degree of subjectivity. To measure **price**, the displayed cost of an item within a store is recorded and, to measure **availability**, the presence or absence of an item within a store is recorded by the rater. However, an assessment of **quality** is subject to the perception of the rater, where an item is recorded as being of *acceptable* or *unacceptable* quality (Glanz et al. 2007). Among the in-store raters of this study, there were several instances of non-consensus regarding the quality of an item within a store, such as the acceptability of a display of apples. Though quality (and, by extension, the desirability) of an item is an important metric, the researchers felt that the way in which this dimension was captured in the measurement tool had a high degree of subjectivity.

Using SPSS 21.0, *t*-tests assessed differences in the geographic distribution of grocery and convenience stores across neighbourhood types. Data gathered during store audits were used to calculate mean availability and price of fruits and vegetables in each grocery store. Data were also collected on the price per kilogram, or the price per item, for 32 individually-priced produce items within each store. Associations between price and availability measures and SES were assessed using ANOVAs (F-tests) and correlation ( $r^2$ ). Significance was set at  $\alpha=0.05$ .

### **Results**

Table 1 indicates the distribution of food stores by neighbourhood type. Low SES neighbourhoods were found to have significantly more convenience stores than high and mid SES neighbourhoods ( $p=0.052$ ), while high SES neighbourhoods had a higher proportion of grocery stores than low or mid SES neighbourhoods ( $p=0.007$ ). Table 2 indicates that in-store scores across grocery stores did not vary by neighbourhood-

level SES, but did vary by Aboriginal ancestry ( $p=0.037$ ). While the availability of fruits and vegetables did not vary, it did vary by price, with lower SES neighbourhoods experiencing higher prices ( $p=0.035$ ). This finding of higher prices was also reflected in neighbourhoods with more Aboriginal-identifying residents ( $p=0.02$ ).

**Table 1: Distribution of grocery and convenience stores by neighbourhood-level SES**

Neighbourhoods	No. of food stores†	No. of grocery stores (% of total food stores)	No. of convenience stores (% of total food stores)
All	131	24 (20.9)	92 (80)
High SES	35	10 (28.6)*	21 (60.0)
Mid SES	41	5 (12.19)	31 (75.6)
Low SES	55	9 (16.4)	40 (72.7) **

†Includes all grocery, convenience and specialty food stores (such as bakeries and ethnic grocery stores), however, this analysis focuses solely on grocery and convenience stores. As such, percentages in the last two columns will not equal 100%

\* $p=0.007$

\*\* $p=0.052$

**Table 2: Fruit and vegetable (F/V) access in Saskatoon’s grocery stores**

		Price (F/V)	Availability (F/V)	Total NEMS-S
SES				
High	F	1.225	2.681	2.762
	$r^2$	0.09	0.054	0.006
Mid	F	0.345	5.673	1.554
	$r^2$	0.077	0.089	0.015
Low	F	6.244*	1.840	1.233
	$r^2$	0.343**	0.064	0.032
Aboriginal				
	T	6.708***	4.002	3.785*****
	$r^2$	0.201****	0.091	0.391

( $\alpha=0.05$ )

\* $p=0.035$

\*\* $p=0.023$

\*\*\* $p=0.02$

\*\*\*\* $p=0.037$

## Discussion

This study highlights the complex nature of food environments, and contributes to the growing body of literature specific to the Canadian context (Office of Nutrition Policy and Promotion 2013). These findings build upon the mapping and assessment of Saskatoon's food environment begun by SHR, providing a further understanding of in-store healthy food offerings and produce access across the city (Kershaw et al. 2010). The identification and measurement of food deserts can be important, but there are limits in what it can reveal about healthy food access (Kamphius et al. 2006). The most prevalent nutritional problems in high-income countries (where the food desert metaphor has been applied) are related to over-consumption, particularly overweight and obesity, which are more prevalent among low-income populations (Ard 2007). If environment influences consumption, then the excess of unhealthy food found in convenience stores spread across low-income neighbourhoods is a potentially more pressing problem than the distribution of grocery stores (Farley et al. 2009). As discussed earlier in this paper, and supported by the findings of this study, a shift in focus towards identifying and understanding food swamps may be a more informative, and perhaps more comparable approach (Office of Nutrition Policy and Promotion 2013).

*Food swamp* is a term increasingly used to describe areas in which an abundance of energy-dense snack foods, such as those found in convenience stores or at fast food restaurants, inundate neighbourhoods and represent a disproportionately larger share of food options (Office of Nutrition Policy and Promotion 2013). The findings of the present study indicate that lower SES neighbourhoods in Saskatoon are more likely to be characterized as a food swamp, having significantly more convenience stores than mid or high SES neighbourhoods. This combination of ubiquitous convenience stores and economic marginalization indicate that the availability and affordability of healthy foods may be a challenge. Inequity is perhaps exacerbated by the fact that high SES neighbourhoods have a greater proportion of grocery stores, highlighting that healthy food access may be a function of a neighbourhood's level of SES.

No differences of in-store composite measures were found among grocery stores in neighbourhoods of varying SES and, due to the extremely small sample size of grocery store, results must be interpreted with great caution. While the correlation found between Aboriginal ancestry and in-store measures may be statistically weak, it is in keep with the extensive evidence of health inequity documented in other studies (Lemstra, Neudorf, and Beaudin 2007). Compounded by the finding of slightly significantly higher prices of fruits and vegetables, all of this is in keeping with the adverse health outcomes among marginalized communities reported in both SHR's Health Disparities Report (Lemstra, Neudorf, and Beaudin 2007) and Health Canada's *Measuring the Food Environment in Canada* (Office of Nutrition Policy and Promotion 2013).

These findings are troubling in that they support evidence of neighbourhood-level

inequities of health determinants across the city, specifically in terms of residents' ability to access a healthful diet. This study underscores the need for further research into Saskatoon-specific, as well as Canadian-specific, inequities in the food environment and what impact this might have on diet-related health outcomes. Further analysis is needed to determine whether produce access varies among other ethno-specific populations in Saskatoon and other Canadian cities and, if so, to what extent.

This study has several limitations. Though all grocery stores in residential neighbourhoods were measured, the relatively small number (n=24) may have made it difficult to assess relationships with neighbourhood-level SES. This initial analysis is, admittedly, a fairly rudimentary first glimpse of Saskatoon's in-store food environment. Quite likely, more telling relationships will emerge with further examination of individual socio-economic and demographic factors. The category of specialty food stores, which includes ethnic grocery stores, were excluded from this analysis, and this may have led to an under-reporting of overall fruit and vegetable access in neighbourhoods, particularly in neighbourhoods that do not have a chain grocery store. However, it is worth noting that the produce available in these stores (such as eggplant and mangoes) are not captured in the measurement tool, likely resulting in a low score on fruit and vegetable access for the neighbourhoods in which they are located. Stores requiring membership, such as Costco, were excluded. These stores offer a relatively wide array of fresh and frozen produce, and excluding them from this analysis may also have contributed to an under-reporting of fruit and vegetable access.

A possible limitation of this study is that *quality*, one of metrics of the in-store tool (along with price and availability), was excluded from further analysis due to its subjective nature (discussed in *Data Analysis*). Quality points to the desirability of a produce item (whether it is free from spoilage, bruises or other undesirable characteristics that discourage purchase). Unlike price and availability, however, measures of quality are based on the perceptions of each rater and, as such, pose a challenge to objective interpretation. In the subsequent, qualitative phase of this study (not reported here) interviews with primary food purchasers within a household explore their perceptions of quality and produce desirability, both within and outside of their neighbourhoods. The assessment of quality from the perspective of neighbourhood residents, though subjective, may be a more useful insight than attempts to capture this through a survey instrument.

Overall, there are limits in these types of studies (Lytle 2009), resulting from the sole use of quantitative measures, particularly cross-sectional data (such as measuring in-store offerings without considering individual or neighbourhood-level food shopping practices), a gap which is to be addressed in subsequent phase of this study. Examining the influence of the environment on individuals' food choices may reveal the extent to which the built food environment interacts with choice and how this may influence the foods that people eat. The more restricted an environment is with regard to the accessibility of healthy, inexpensive options, the more influence the physical

environment may have on decisions about food purchases and consumption (Lytle 2009).

Very little is known about appropriate confounders in the relationship between the environment and fruit and vegetable intake. Without knowing which confounders to correct for, certain associations, such as the SES variables used in this study, might be overestimated (Bustillos et al. 2009; Morland et al. 2002). *Neighbourhood* may be a more appropriate unit of measure than *census tract* in an ecologic model, but operationalizing the term is much more difficult. There are several important issues that pose challenges to defining neighbourhoods: people live and function in multiple settings and contexts; people live and work in multiple geographic areas and influential environments often intersect; and, single neighbourhoods contain multiple types of environments, including physical, social, cultural, and policy environments (Lytle 2009). This further contributes to the notion that people are not confined to shopping in their neighbourhood of residence.

Individuals are not randomly assigned to neighbourhoods—rather, they locate in neighbourhoods based on their incomes, lifestyles, preferences, proximity to work, and a variety of other factors (Gustafson, Hankins, and Jilcott 2012; McKinnon et al. 2009). This type of “self-selection” bias may influence the overall SES of a neighbourhood in ways that are difficult to measure and properly account for. People with lower incomes, for instance, may have fewer choices of neighbourhoods of residence. A neighbourhood-level approach to analysis may also blur some of the meaningful differences among the population, where households of greatly varying food security may live within the same neighbourhood.

Despite these limitations, this study contributes an important baseline dataset from which to implement and build upon further Canadian food environment research, particularly in smaller urban centres such as Saskatoon. An analysis of a smaller, Prairie city contributes to Canadian urban research by providing a comparison to the larger cities where research tends to be focused—such as Toronto, Montreal and Vancouver—illustrating differences in built food environments in a demographically and geographically distinct city.

Given the significant health inequities that exist in Saskatoon, this research is both timely and needed. This study represents the first attempt to measure in-store food offerings in the city, giving weight to the hypothesis that lower SES neighbourhoods have a greater preponderance of unhealthy food choices, and that such SES differences may also manifest as race-based differences. It is the first study in Canada, to our knowledge, that captures the discrepancy in urban fruit and vegetable access and Aboriginal ancestry.

Like a number of other food environment studies (Larsen and Gilliland 2008; Apparicio, Cloutier, and Shearmur 2007; Spence et al. 2009) or disadvantaged areas of cities with relatively poor access to healthy and affordable food. This paper explores the evolution of food deserts in a mid-sized Canadian city (London, Ontario, the findings

of this study suggest that, overall, food items within stores may not be consistently associated with low-income or other socioeconomic variables. However, given the complex nature of measuring in-store contents and the influence of a wide range of socioeconomic and demographic variables, it remains to be determined to what extent the consumer food environment affects the diet of a population. Objective measures alone can only provide a partial picture, and there is a need to better understand how people perceive and interact with their food environment in order to improve healthy food access among all neighbourhoods in Saskatoon. Identifying, developing and implementing solutions to address this inequity will require a multi-level response from leadership, businesses, urban planners, health care providers, researchers and the broader community.

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