Examining community and consumer food environments for children: An urban-suburban-rural comparison in Southwestern Ontario

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ABSTRACT

The aim of this study is to evaluate how retail food environments for children in the City of London and Middlesex County, Ontario, Canada, vary according to level of urbanicity and level of socioeconomic distress. Urbanicity in this study is defined as a neighbourhood's designation as urban, suburban, or rural. We assessed community food environments (e.g., the type, location, and accessibility of food outlets) using 800m and 1600m network buffers (school zones) around all public and private elementary schools, and we calculated and compared density of junk food opportunities (JFO) (e.g., fast food and full-service restaurants, grocery stores, and convenience stores) within each school zone in urban, suburban and rural settings. The study also assessed consumer food environments (e.g., the price, promotion, placement, and availability of healthy options and nutrition information) through restaurant children's menu audits using the Children's Menu Assessment tool. Results suggest JFO density is greater around elementary schools in areas with higher levels of socioeconomic distress and urbanicity, while urbanicity is also associated with greater use of branded marketing and inclusion of an unhealthy dessert on children's menus.

1. Introduction

The number of unhealthy foods and beverages marketed to and consumed by children has greatly increased in Canada over the past few decades (Heart and Stroke, 2017). This can have a negative impact on both diet quality and health-related issues, especially for children living in socioeconomically distressed neighbourhoods where high calorie, high fat, and high sugar foods and beverages are plentiful (Cummins and Macintyre, 2006). The diet quality and health of children in a neighbourhood may, however, relate not just to individual food choices, but to area socioeconomic characteristics as well as factors of the built environment (Glanz et al., 2005; Story et al., 2008; Gilliland et al., 2012).

Several existing studies examine the relationship between neighbourhood demographics and food access/availability, but few studies have examined the relationship between children's food environments and urbanicity to determine variation in both neighbourhood food outlet composition and items available between urban, rural, and suburban neighbourhoods. Studies tend to examine the impact that the FE has on children's BMI or diet, rather than examine the more fundamental issue of availability and accessibility of food options (Engler-Stringer et al., 2014). This paper examines the relationships among children's food environments, neighbourhood socioeconomic distress, and urbanicity to further understand how food availability and subsequently dietary behaviours are associated with the surrounding environment.

1.1. Community and consumer food environments

The food environment (FE), according to Glanz et al. (2005), is comprised of four features: (1) community (e.g., the type, location, and accessibility of food outlets), (2) consumer (e.g., the price, promotion, placement, and availability of healthy options and nutrition information), (3) organizational (e.g., access to food in other settings such as workplaces and schools), and (4) informational (e.g., marketing, media, advertising) environments. In their original model of community nutrition (food) environments, Glanz et al. (2005) considered community and consumer FEs as most important for future study.
Within the small body of literature on community and consumer FEs for children, few studies assess both. As Le et al. (2016, p. e544) observed, “not many studies have described the walkable community nutrition environment (proximity to and density of food outlets and fast-food restaurants) and the consumer nutrition environment (pricing, quality of food items within the stores or restaurants) together” especially with respect to children. In their systematic review of the community and consumer FE for children, Engler-Stringer et al. (2014) identified 26 studies, all of which assessed either the community or the consumer FE, but none assessed both in the same study area. This paper addresses both the community and consumer FEs, which is important in order to accurately assess neighbourhood FEs (Caspi et al., 2012).

1.2. Food environments, urbanicity, and socioeconomic status

United States-based research often most focuses on food deserts as the primary FE issue, where people in highly socioeconomically deprived neighbourhoods have worse access to healthy foods compared to people in wealthier, less deprived neighbourhoods (Black et al., 2014; Larson et al., 2009; Walker et al., 2010). In Canada, research likewise suggests people in highly deprived neighbourhoods have better access to unhealthy food outlets such as fast food restaurants or convenience/variety stores than people in less deprived neighbourhoods – indicating a food swamp (Black et al., 2014; Health Canada, 2013). In Gustafson et al. (2012) systematic review of the consumer FE, 10 out of 30 studies using an audit tool tested for socioeconomic deprivation, but these studies all took place within the United States. In assessing the consumer FE in restaurants specifically, Larson et al. (2009) found that restaurants in wealthier areas offer healthier menu options than lower income areas. Though research has been previously done to examine the relationship between the community and consumer FE and socioeconomic deprivation, research is lacking on this relationship as it pertains to children.

With respect to urbanicity, many FE studies have been conducted in urban and/or rural environments. Again in Gustafson et al. (2012) systematic review of the consumer FE, only four of 56 included studies focused on both urban and rural areas; none were labelled as suburban. Similarly, Fleischhacker et al. (2011) found 24 out of 40 reviewed studies on fast food access were conducted in urban areas. Only one took place exclusively in a rural area, while 11 compared urban and rural areas. Despite the differences in population density, land use, and built density between urban, suburban, and rural environments, research that combines all three of these areas is lacking. An exception is a recent study by Martinez-Donate et al. (2016) which compared restaurant differences among these three neighbourhood forms and found urban neighbourhoods had a higher restaurant density and urban and suburban neighbourhoods had healthier restaurants compared to rural areas.

1.3. Assessment of children's menus

Since its initial creation and use in 2009–2010, the Children’s Menu Assessment tool (CMA) has enabled increased research on children’s menus (Krukowski et al., 2011). This tool is an expansion of the Nutrition Environment Measures Survey for Restaurants (NEMS-R) children’s menu subsection, and a more comprehensive and extensive means of measuring the FE for children in restaurants (Krukowski et al., 2011; Saelens et al., 2007). For example, where the NEMS-R simply asks whether milk or juice are offered, the CMA delves deeper to examine whether juice is 100% fruit juice and milk is low-fat milk. Though the NEMS-R has been widely used, its role in FE research is assessing restaurant menus as a whole, not assessing children’s menus specifically.

The CMA addresses this limitation and not only asks whether a healthy option is available (as the NEMS-R does), but inquires further on the quantity as well as the availability of whole grains, fruits and vegetables, and other non-fried items. The CMA audit questions are grouped into eight categories: (1) healthfulness of entrées, (2) proportion of whole to white grains, (3) desserts (e.g., whether the price of a meal includes an unhealthy dessert), (4) beverages (e.g., availability of 100% juice or low-fat milk), (5) sides (e.g., availability of non-fried vegetables or fruits with no added sugar), (6) nutritional information, (7) toy promotions, and (8) branded marketing (Krukowski et al., 2011; Saelens et al., 2012).

To our knowledge, the CMA has not been used in Canada despite an increase in Canadian FE research (Minaker et al., 2016). As mentioned, however, current children’s FE research tends to focus on the individual effects of the FE (i.e., how access/exposure influence children’s BMI, diet, etc.). Interestingly, Engler-Stringer et al.’s (2014) systematic review of the community and consumer FE for children identified 26 studies, but only three focused on the consumer FE for children and none analyzed children’s menus specifically or used the CMA (Engler-Stringer et al., 2014).

1.4. Purpose

The purpose of this study is to examine both the community and consumer FEs for elementary school-aged children (ages 3–13 years) in the City of London and Middlesex County, Ontario, Canada, and determine the extent to which exposure to junk food opportunities (JFOs) varies based on urbanicity and level of socioeconomic distress. The study has the following research objectives:

1. Determine how JFO density in a school zone varies by neighbourhood level of socioeconomic distress and level of urbanicity.
2. Determine how the quality of restaurant children’s menus varies by neighbourhood level of socioeconomic distress and level of urbanicity.

2. Data and methods

We focus on Middlesex County, a rural county in Southwestern Ontario, Canada, with a population of 71,704, and the City of London (surrounded by Middlesex County), with a population of 383,822 (Statistics Canada, 2016). London is characterized as an over-bounded city, meaning it incorporates its suburbs and agricultural land. For the purpose of this paper, ‘urban’ is defined as the area within the limits of the City of London as of 1959, ‘suburban’ is defined as the area annexed by the City between 1960 and 1992, and ‘rural’ is defined as the remaining (predominantly agricultural and small-town) areas in London and Middlesex County in its entirety (Meligrana, 2000; Larsen and Gilliland, 2008). These definitions of urban and suburban, based on the built form of the neighbourhoods, are commonly used by planners in the City of London. Urban areas have more mixed land use with greater population densities and more grid-like street networks. Suburban areas usually have more isolated residential zoning with lower population densities, and have less permeable ‘loop-and-lollipop’ street networks, all diminishing pedestrian accessibility. The remaining areas in London and Middlesex County were classified entirely as rural, since they are more agricultural and less dense in terms of population (a function of more stringent Canadian urban planning policy).

Food outlet location data provided by the Middlesex-London Health Unit were used for both London and Middlesex County. Outlet types included in this study were grocery stores, convenience/variety stores, restaurants, and food take-out locations. All other location data and GIS shapefiles were provided by the planning departments of the City of London and Middlesex County. The full civic addresses of school and food outlet locations were geocoded in a GIS (ArcGIS 10.3, ESRI) and verified through websites, Google Maps and Streetview, phone calls, and site visits.
2.1. Neighbourhood-level socioeconomic distress

To address the research objectives, neighbourhood-level socioeconomic ‘distress’ or ‘deprivation’ was assessed by creating an area-based index of socioeconomic distress (Gilliland et al., 2006; He et al., 2012a; Larsen and Gilliland, 2008; Ley and Smith, 2000; Pampalon et al., 2011; Carstairs and Morris, 1991). The socioeconomic distress index in this study consists of four dissemination area (DA)-level variables from the 2011 Canadian Census and the 2011 National Household Survey: 1) low educational attainment (i.e., the proportion of the population that have not graduated from high school), 2) unemployment rate (i.e., the proportion of the population reported to be able to work but unemployed), 3) lone parent families (i.e., the proportion of single parent families to all families), and 4) low income (i.e., the proportion of individuals that fall below 50% of the median adjusted household income) (Sadler et al., 2011; Sadler et al., 2013).

Following previous studies, we computed standard scores (or z-scores) for all four variables and summed them to create a composite distress index for each DA (Larsen and Gilliland, 2008; Gilliland and Ross, 2005; Sadler et al., 2011; Sadler et al., 2013). Index scores ranged from −4.76 to 10.89, where a score of 0 represents the mean score for the area, positive scores indicate above average levels of overall socioeconomic distress (i.e. poorer), and negative scores represent below average distress (i.e. wealthier).

2.2. Community food environment data and methods

The community FE was evaluated by measuring junk food opportunities (JFOs) around elementary schools. Environments were mapped using both 800 and 1600 metre network buffers (synonymous with ‘school zone’) around each of the 136 public, Catholic, and private London-Middlesex elementary schools. Network buffers were built around schools because children spend many of their waking hours both at school and within the neighbourhood around the school (He et al., 2012a; He et al., 2012b; Hofferth and Sandberg, 2001; McConnell et al., 2010), and several studies have used schools as the point of focus (Engler-Stringer et al., 2014; Fleischhacker et al., 2011; Gilliland et al., 2012; Glen et al., 2013; Sadler et al., 2016; Sadler and Gilliland, 2015; Simon et al., 2008). Elementary schools were also an appropriate focal point as the student body at this level of schooling is typically the same age as that listed on restaurant children’s menus (i.e., under 13 years of age).

We combined a 2015 road file for Southwestern Ontario with Network Analyst in ArcGIS 10.3 to calculate network distances (DMTI, 2015). Network buffers were used because they more accurately depict the area that influences walking, whereas circular buffers are more likely to ignore barriers to walking (e.g. rivers and/or roadways that are difficult to cross), and thus erroneously include additional areas (Oliver et al., 2007). Two buffer distances were used rather than one to account for concerns of exposure measurement accuracy when using only one threshold (Sadler and Gilliland, 2015). These two distances were chosen specifically as they are frequently used among children’s FE studies (Engler-Stringer et al., 2014); as well, 1600m is the school board-mandated walking distance (the distance a student can live from the school before becoming bus-eligible), while 800m is a distance recognized as walkable in 10–15 min (Gilliland et al., 2012).

For this study, fast food restaurants (restaurants where customers order, pay, and receive food at a register or drive-thru), full service restaurants (restaurants where food is served to customers by wait staff), convenience stores (small stores offering a limited selection of food, drinks, and other items), and grocery stores (larger stores offering a wide selection of food and drinks—including supermarkets and supercentres) were included as JFOs. After assessing the children’s menus in the study area, as outlined in the following section, full service restaurants were found to offer the same items as their fast food counterparts (e.g., hamburgers, chicken fingers, fried sides, soda, etc.), and were thus also included as JFOs. Grocery stores are typically characterized as healthy food outlets, but Creel et al. (2008) found grocery stores were on par with convenience stores in providing over double the potential availability of unhealthy foods. Similarly, Sharkey et al. (2011) found that limiting fast food or junk food analysis to only traditional sources (i.e. fast-food restaurants) greatly underestimates the exposure of a neighbourhood to fast food and suggested future studies include all retail outlets for fast/junk food. Since the majority of grocery stores still sell sugar-sweetened beverages, unhealthy snacks (e.g., potato chips, chocolate, and other candy), highly-processed foods and meals to-go, and/or have tables and seating where one can sit and dine, they have been included in this study as JFOs (see also, Creel et al., 2008; Sharkey et al., 2011). These four food outlets were chosen as JFOs, rather than focusing solely on traditional fast food restaurants and convenience stores as unhealthy food sources, to more accurately measure exposure to junk food (Creel et al., 2008; Sharkey et al., 2011).

For each school, the number of restaurants, convenience stores, and grocery stores were calculated for both the 800m and 1600m respective network buffers. These three outlet counts were then summed together resulting in the total number of JFOs per school per buffer distance. JFO density was calculated by dividing each buffer area (calculated in square kilometres) by the total number of JFOs within that buffer. The population of each 800m and 1600m school zone was calculated to account for the percentage of the population from each DA covered by the school zone. Using these population figures, total number of JFOs per capita was calculated by dividing the total number of JFOs by the population of each school zone. Finally, proximity measures in kilometres were calculated using Network Analyst, including distance from each elementary school to the nearest grocery store, convenience store, and JFO.

Each elementary school was assigned the individual socioeconomic distress variables and index of the DA within which the school was situated to determine the relationship with measures of JFO saturation within the respective school zones. JFO density with respect to level of socioeconomic distress and urbanicity was then mapped in ArcGIS, with each school proportionally symbolized per the JFO density within the respective 800m buffer (Fig. 1).

SPSS (IBM SPSS Statistics 24) was used to examine descriptive statistics and correlation matrices, and conduct multiple linear regressions on the variables of the community FE, socioeconomic distress, and urbanicity to meet the first objective.

2.3. Consumer food environment data and methods

Next, we analyzed the consumer FE through children’s menus by examining what outlets are available around elementary schools. We omitted the consumer FE within schools, as that would be the organizational FE, a separate aspect of the FE as discussed by Glanz et al. (2005). More importantly, elementary schools within this region do not have cafeterias nor vending machines where food can be purchased. We also narrow in on what is offered within one of the outlet types included in the community FE analysis – restaurants.

Restaurants were selected for consumer FE analysis to keep the focus on food items specifically marketed towards children. While grocery stores and convenience stores do sell items that may draw the attention of children with branded marketing, many restaurants offer a separate menu just for children. Through these menus, we explored the availability, price, promotion, and placement of healthy options targeted specifically for children.

Menu collection occurred from June to August 2016, beginning with a Google search conducted for each individual establishment to determine if a children’s menu was posted online. If the establishment’s children’s menu was found online, the menu was saved. After the Google search was completed for all restaurants, phone calls were made to the restaurants that did not have children’s menus online to confirm if a menu existed in house. Restaurants with phone numbers that did
After online and in-person menu collection, each menu was assessed using the CMA. The term ‘healthy’ is used to refer to children’s menu items, but the CMA puts the burden of determination on the restaurant, rather than the researcher scoring the menu, to identify whether items are healthy or not using the criteria included with the tool. After a menu was assessed, it was then scored using the CMA scoring protocol which yields information on healthy option availability for each restaurant. CMA scores range from −5 to 21, with higher scores corresponding to a greater number of healthy options (Krukowski et al., 2011). Two raters assessed and scored each children’s menu in the study area and when discrepancies arose, a third rater was consulted. Interrater reliability was high, as mean percent agreement was 93.7%.

Based on the natural breaks in the menu scores, low scoring menus (indicating poorer quality menus) were categorized as those with CMA scores of 0 or below, medium scoring menus were those with CMA scores from 1 to 4, and high scoring menus were those with CMA scores of 5 or higher.

Each restaurant with a children’s menu was then assigned the socioeconomic distress variables and index score of the DA within which the restaurant was situated to determine the relationship with socioeconomic measures. SPSS was used to conduct statistical analyses including descriptive statistics and correlation matrices on the variables of the consumer FE, socioeconomic distress, and urbanicity to meet our second objective.

Fig. 1. Community food environment for children in London-Middlesex, ON.
Table 1
Descriptive statistics for the community food environment for children in London-Middlesex, ON.

<table>
<thead>
<tr>
<th>800m Threshold</th>
<th>Urban</th>
<th>Suburban</th>
<th>Rural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total # Grocery</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Total # Convenience</td>
<td>0</td>
<td>13</td>
<td>6</td>
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<tr>
<td>Total # Restaurants</td>
<td>0</td>
<td>37</td>
<td>9.77</td>
</tr>
<tr>
<td>Total # JFOs</td>
<td>0</td>
<td>49</td>
<td>17.07</td>
</tr>
<tr>
<td>1600m Threshold</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total # Grocery</td>
<td>0</td>
<td>6</td>
<td>2.7</td>
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<tr>
<td>Total # Convenience</td>
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<td>2</td>
<td>25.93</td>
</tr>
<tr>
<td>Total # Restaurants</td>
<td>0</td>
<td>5</td>
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</tr>
<tr>
<td>Total # JFOs</td>
<td>7</td>
<td>267</td>
<td>75.4</td>
</tr>
</tbody>
</table>

3. Results

3.1. Community food environment results

Descriptive statistics for the community FE of each level of urbanicity can be found in Table 1. As expected, the number of JFOs increased as school zone threshold increased from 800m to 1600m. Similarly, the number of JFOs increased as urbanicity increased from rural to urban. The minimum number of total JFOs in an 800m school zone was 0 for all levels of urbanicity. This may be because the nearest opportunity was just outside the 800m buffer. When the school zone threshold was increased to 1600m, the minimum number of total JFOs was 7 for urban, 1 for suburban, and 0 for rural. The maximum number of JFOs in an urban 1600m school zone was 267, while the maximum number of JFOs in a rural 1600m school zone was 40. This urban zone number may be because of the school’s close proximity to nearby shopping malls and plazas, but especially illustrates the notion that as urbanicity increases from rural to urban, the number of JFOs per school zone threshold increases as well.

Correlation analysis (Table 2) indicates that urbanicity has a significant negative correlation with all proximity counts, suggesting as urbanicity increases from rural to urban, the distance from each elementary school in the study area to the nearest JFO (Spearman’s Rho correlation = -0.429), convenience store (Spearman’s Rho correlation = -0.491), and grocery store (Spearman’s Rho correlation = -0.454), decreases. This suggests urban schools are closer to JFOs. Correlation analysis also indicates a significant positive correlation between urbanicity and number of JFOs per population at both 800m (Spearman’s Rho correlation = 0.508) and 1600m (Spearman’s Rho correlation = 0.630), total count of JFOs at both 800m (Spearman’s Rho correlation = 0.516) and 1600m (Spearman’s Rho correlation = 0.692), and JFO density at 1600m (Spearman’s Rho correlation = 0.650). When using JFO density for 800m school zones, 58.8% of rural schools had zero JFOs per square kilometre compared to 25% of suburban schools and only 3.33% of urban schools.

The results also show significant positive correlations between level of neighbourhood distress and total count of JFOs at 800m (Pearson’s correlation = 0.244), total count of JFOs at 1600m (Pearson’s correlation = 0.198), JFO density within 800m (Pearson’s correlation = 0.262), and JFO density within 1600m (Pearson’s correlation = 0.232), and a significant negative correlation between distress and proximity to nearest convenience store (Pearson’s correlation = -0.201). In other words, the results suggest school zones in more highly distressed areas (i.e. poorer) are more saturated with JFOs and have shorter distances to the nearest JFOs.

Fig. 1 illustrates this, showing the schools within the urban boundary as having the heaviest concentration of JFOs per 800m school zone. Similarly, Fig. 1 indicates some of the highly distressed urban areas as having school zones with a very high density of JFOs (note the overlap of darkly shaded schools (signifying high JFO density) and dark background (signifying high socioeconomic distress).

Recognizing that urbanicity would be expected to have a strong association with store density, and building on our correlation analysis, multiple linear regressions analysis was also run to control for urbanicity and examine the influence socioeconomic distress has on JFO density and proximity. With this regression analysis, the coefficients table (Table 3) shows all the p-values associated with socioeconomic distress are above 0.05 indicating non-significance. Thus, when controlling for urbanicity, socioeconomic status of an elementary school is no longer a significant predictor of number, total count, density, or proximity to nearest junk food outlet.

3.2. Consumer food environment results

Our original list included 1071 restaurants within London and Middlesex County, with 364 (33.9%) identified as having separate

<table>
<thead>
<tr>
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<tr>
<td>Socioeconomic Distress Level</td>
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<tr>
<td>Number of JFOs per population within 800m</td>
<td>.508**</td>
<td>.070</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Number of JFOs per population within 1600m</td>
<td>.630**</td>
<td>.014</td>
<td>.862**</td>
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<tr>
<td>Total count of JFOs within 800m</td>
<td>.516**</td>
<td>.244**</td>
<td>.785**</td>
<td>.563**</td>
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<td></td>
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<tr>
<td>JFO density within 800m</td>
<td>.459**</td>
<td>.262**</td>
<td>.669**</td>
<td>.411**</td>
<td>.920**</td>
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<tr>
<td>Total count of JFOs within 1600m</td>
<td>.692**</td>
<td>.198**</td>
<td>.658**</td>
<td>.765**</td>
<td>.734**</td>
<td>.572**</td>
<td></td>
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<tr>
<td>JFO density within 1600m</td>
<td>.650**</td>
<td>.232**</td>
<td>.605**</td>
<td>.725**</td>
<td>.686**</td>
<td>.569**</td>
<td>.966**</td>
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</tr>
<tr>
<td>Proximity to nearest JFO</td>
<td>.439**</td>
<td>-.142</td>
<td>.261**</td>
<td>-.208</td>
<td>.360**</td>
<td>.533**</td>
<td>-.296**</td>
<td>.327**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proximity to nearest convenience store</td>
<td>.391**</td>
<td>-.101</td>
<td>.292**</td>
<td>-.243**</td>
<td>.408**</td>
<td>.405**</td>
<td>.361**</td>
<td>.406**</td>
<td>.868**</td>
<td></td>
</tr>
<tr>
<td>Proximity to nearest grocery store</td>
<td>.454**</td>
<td>-.162</td>
<td>.284**</td>
<td>-.237**</td>
<td>.393**</td>
<td>.394**</td>
<td>.360**</td>
<td>.415**</td>
<td>.627**</td>
<td>.707**</td>
</tr>
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</table>

*aCorrelation is significant at the 0.05 level.

**Correlation is significant at the 0.01 level.
children's menus. After excluding duplicate restaurants (e.g. chain restaurants with identical menu options), establishments outside of the scope of this project (concession stands, etc.), and restaurants found to be closed at the time of study, 174 unique children's menus were found within the London-Middlesex area. Total menu scores for all 174 unique menus ranged from $-3$ to $9$ with a mean score of $1.02$ and standard deviation (SD) of $2.27$. These total scores, visualized in Fig. 2, are comparable to total scores found in previous studies (Hill et al., 2015; Krukowski et al., 2011). Urban total menu scores ranged from $-3$ to $8$ (mean = $1.61$, SD = $2.61$), suburban total menu scores ranged from $-2$ to $9$ (mean = $1.22$, SD = $2.40$) and rural total menu scores ranged from $-2$ to $8$ (mean = $1.18$, SD = $2.38$). The restaurant with the highest scoring children's menu within the urban and rural boundaries was Subway with a score of $8$, and within the suburban boundaries was Montana's BBQ and Bar with a score of $9$. Other common restaurant chains found in the study area include, but are not limited to, Wendy's (score: 7), McDonald's (score: 5), Arby's (score: 2), and A&W (score: 1).

Restaurants offering children's menus and their scores are shown in Fig. 2. Rather than congregating in areas based on urbanicity or socioeconomic distress, they tend to follow major arterial roads. Notably,
a sizeable gap in the location of restaurants with children’s menus exists just southeast of the center of the city, in a highly socioeconomically distressed neighbourhood. No pattern in CMA scores is immediately apparent from examining Fig. 2.

Most locations (59.2%) did not specify an age range for the children’s menu. Just over one-quarter (27.6%) specified 12 years old or under, and 13.2% specified 10 years or under. Just under one-third (31%) offered a non-fried vegetable side such as a salad or steamed broccoli. Twenty-one (12.1%) offered fruit, but only 12 (6.9%) specified fruit without added sugar. A large portion of the menus (43.6%) also included dessert with a children’s meal but only seven (4%) offered healthy desserts such as fresh fruit. Additional CMA results and the variation between urbanicity can be found in Table 4.

Correlation analysis did not indicate a relationship between level of neighbourhood distress and children’s menu total score. There was, however, a significant negative correlation between urbanicity and unhealthy dessert automatically included with children’s meal (Spearman’s Rho correlation = −0.121, significant at the 0.05 level), and a significant positive correlation between urbanicity and branded marketing used to promote children’s menu items (Spearman’s Rho correlation = 0.143, significant at the 0.01 level).

4. Discussion

Despite the non-significant influence found in regression analysis, the level of socioeconomic distress was positively correlated with all measures of JFO exposure at the 800m level, and the total number of JFOs and JFO density per square kilometre at the 1600m level (Table 2). This suggests there is a relationship between children attending schools in areas with higher distress and exposure to JFOs.
Socioeconomic distress was also negatively correlated with the proximity to nearest convenience store, suggesting a relationship between schools in higher distressed areas and distance to the nearest convenience store compared to those in areas with moderate to low levels of distress.

As the urbanicity of a school increases from rural to urban, the number of JFOs per school zone increases (Table 1), the school zones become more saturated with JFOs per square kilometre, and the distance to nearest JFO type decreases meaning urban schools are closer to JFOs. Notably, we also discovered a positive correlation between urbanicity and restaurant use of branded marketing to promote children’s meals. Policymakers can use this information to offer incentives for restaurants to implement dessert-free children’s menus, or menus that offer healthier side substitutions.

Our results provide further evidence toward impacting public policy to improve the community FE for children. One example may be in limiting the density of JFOs in areas where children routinely go (such as near schools), especially in more urban, more socioeconomically distressed areas. Such policies have been pursued in many countries (Bae et al., 2012; Times, 2016; Ministry of Food and Drug Safety, 2017; Offic...s, 2013), but many school zone policies fall shorter than the school zones we have used in this study (800m and 1600m). Policymakers may consider using these results in an intervention targeting children’s dessert options. Restaurants offered child-targeted desserts that ran up to 750 calories. Menus included reminders of how many calories children need per day decreasing on age, but by automatically including unhealthy desserts and specifically promoting unhealthy desserts for consumption by children, they implicitly promote overconsumption of sugar and fat. Policymakers can use this information to offer incentives for restaurants to implement dessert-free children’s menus, or menus that offer healthier side substitutions such as fresh fruits. It may, however, be more challenging to incentivize chain restaurants as these decisions would need to be negotiated at the corporate level.

Importantly, we found that children’s menus in areas with high levels of socioeconomic distress are not more or less likely to have poorer quality children’s menus. Over half (52.8%) of the children’s menus included in this study received low (poor quality) scores, but these are found in areas of all levels of distress. In other words, a child in a highly distressed area or poorer area would see similar unhealthy menu items such as fried chicken, pizza, cheeseburgers, and so forth, as a child in a less distressed or wealthier area. While children’s menus in general are of poor quality, poorer neighbourhoods are not unduly affected. Even though children’s menus are generally unhealthy across all levels of neighbourhood distress, highly-distressed neighbourhoods were found to have a greater density of JFOs. This is consistent with other studies that higher distressed areas have greater access to unhealthy food marketing for healthy items such as stickers of familiar characters on fruits or milk cartons, children may be more likely to order healthy options rather than unhealthy options. This type of policy change could greatly improve the consumer FE for children, especially when considering the presence of chain restaurants relative to independent restaurants. For example, our study area contained 18 McDonald’s locations. If McDonald’s stopped including toys in unhealthy meals, that would impact the consumer FE at 5% of restaurants assessed, a considerable change.

We also found that children’s menus in rural areas are more likely to automatically include unhealthy desserts (e.g. ice cream-based desserts or generic ‘frozen treats’). Policymakers may consider using these results in an intervention targeting children’s dessert options. Restaurants offered child-targeted desserts that ran up to 750 calories. Menus included reminders of how many calories children need per day depending on age, but by automatically including unhealthy desserts and specifically promoting unhealthy desserts for consumption by children, they implicitly promote overconsumption of sugar and fat. Policymakers can use this information to offer incentives for restaurants to implement dessert-free children’s menus, or menus that offer healthier side substitutions such as fresh fruits. It may, however, be more challenging to incentivize chain restaurants as these decisions would need to be negotiated at the corporate level.
outlets (Black et al., 2014; Larson et al., 2009; Walker et al., 2010).

FE studies that examine the consumer FE tend to focus on what is available within grocery stores or assess general restaurant menus. Though FE research in Canada is a rapidly growing field (Minaker et al., 2016), a focus on FEIs for children is still lacking. Studies that do examine FEIs for children tend to examine the relationships at the individual level (i.e. how FE influences children's BMI, diet, etc.) rather than explore food access and availability specifically for children but at the neighbourhood level (Engler-Stringer et al., 2014). By using the CMA to explore the variation in children's menus specifically, not just in urban or rural regions, but suburban regions as well, and by analyzing children's menus with respect to level of socioeconomic distress and JFO density, this study helps fill a gap in the literature. Additionally, this paper is the first, to our knowledge, to use the CMA in Canada.

We also acknowledge some limitations within this study. Although convenience stores and grocery stores were included as JFOs for the community FE assessment, we examined only restaurant children's menus for the consumer FE assessment. We acknowledge that children are not only exposed to restaurants – nor only items from children's menus – and future research should include the assessment of all opportunities. Such inquiries could use variations of the NEMS tools for grocery stores, convenience stores, and restaurants in the consumer FE to better understand what is available for children. Similarly, this study highlights what choices are available to children in restaurants but does not examine what items children are actually ordering off of these menus. Future studies may build on this research and explore what food choices children are actually making within the restaurant consumer FE.

Finally, several restaurants indicated no physical children's menu, but that the establishment served 'kid-friendly items' or offered child-sized portions of entrées on request. Because there was no physical children's menu, restaurants offering 'kid-friendly items' or child-sized portions were excluded from the study because the CMA only assesses separate children's menus. Similarly, the 'kid-friendly items' offered by these restaurants lacking a separate children's menu were typically French fries, chicken tenders/nuggets, and other fried foods. Despite these items appearing on almost every children's menu, the presence of these items was not included on the CMA as a scored item. Because both healthy and unhealthy beverage choices are scored items on the tool (e.g., presence of milk and low-fat milk receive points while presence of pop and free refills receive negative points), future CMA studies may consider adding a category that accounts for fried food availability as well.

5. Conclusion

Though regression results were non-significant, overall, our results suggest urbanicity and neighbourhood socioeconomic distress are associated with children's exposure to junk food opportunities within elementary school zones, while urbanicity is associated with the inclusion of branded marketing and unhealthy desserts on restaurant children's menus. Menus targeted to children, regardless of the level of neighbourhood socioeconomic distress or urbanicity are, however, generally of poor quality. This study provides new insight on children's menus. Menus targeted to children, regardless of the level of socioeconomic distress or urbanicity, are scored items on the tool. These items was not included on the CMA as a scored item. Because both healthy and unhealthy beverage choices are scored items on the tool (e.g., presence of milk and low-fat milk receive points while presence of pop and free refills receive negative points), future CMA studies may consider adding a category that accounts for fried food availability as well.

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