A Systematic Review of the Localities of Food Purchasing and Consumption Behaviors

by

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A thesis submitted in conformity with the requirements for the degree of Master of Geography

Department of Geography and Planning

University of Toronto

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Abstract

In the past decade, researchers have increasingly explored the environmental determinants of food behaviors to support population dietary health. Recently, numerous papers have begun to integrate actual places of food behaviors, with a notable focus on the concept of activity spaces. In this study, we presented a systematic review of research using activity spaces to conceptualize the food environment. Using the PRISMA systematic review framework, a standardized search query to find research that examined the localities of food-related behaviors since 1995 was submitted. A total of 17 papers were determined to be eligible for inclusion. We synthesized these various findings to better understand the influential factors of the location of food purchasing and consumption behaviors, and particular attention was paid to a range of population subgroups (e.g.,
adults, adolescents). Finally, gaps in this literature were reviewed, and future research directions were suggested. »
Acknowledgments

« First of all, I would like to thank my supervisor, Prof. Michael Widener, for the continuous support, guidance, encouragement and advice he has provided throughout my time as his student. Besides my advisor, I would like to thank Prof. Leia Minaker, Prof. Lukar Thornton, and Prof. Jason Spicer for their insightful comments and encouragement.

Last but not the least, I would like to thank my family: my parents and to my sister for supporting me spiritually throughout writing this thesis and my life in general. »
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1. Introduction

Over the past decades, researchers have paid increasing attention to the location (localities) of food purchasing and consumption behaviors (Caspi et al., 2012). This research is largely driven by evidence that shows consuming healthy foods decreases the occurrence of nutrition related diseases (World Health Organization, 2003). Research investigating the influence of place on food purchasing and consumption behaviors has typically considered exposure to food stores around household locations and assumed that this is an individual’s most important food environment (Caspi et al., 2012; Charreire et al., 2010). However, researchers measuring food access have increasingly questioned this assumption and account for people’s mobility by considering exposure to food stores within activity spaces – the geography of where people spend time throughout the day (Kestens et al., 2010; Zenk et al., 2011; Chaix et al., 2017). With this shift in focus, there has been an additional emphasis on understanding where people actually buy and eat food (Thornton et al., 2017), rather than simply describing food retail exposure around the home. This potentially enables researchers to better understand the role of ‘place’ as an influence on eating behaviors.

To date, several published literature reviews (Charreire et al., 2010; Caspi et al., 2012; Cetateanu and Jones, 2016; Lytle and Sokol, 2017) have attempted to synthesize the evidence regarding food environments. However, no systematic literature reviews to date have addressed the question: “where do food purchasing and consumption behaviors happen?” Among these reviews, some assessed methodologies used for measuring food environments in the existing literature (e.g., Charreire et al., 2010; Lytle et al., 2017), while others focused on the role of data collection, such as articles that used GPS tracking (e.g., Cetateanu et al., 2016). Additionally, review articles in
this domain have considered how different types of food and dietary behaviors affect outcomes on health status (e.g., Giskes et al., 2011; Caspi et al., 2012).

To address this gap, we have conducted a systematic literature review, following the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines, that explicitly focuses on research that addresses the localities of food purchasing and consumption behaviors. This study analyzed peer-reviewed papers from January 1995 to July 2017, using the following two questions to guide our search:

1) where do people actually buy or eat food?

2) What factors influence the location of food purchasing and consumption behaviors, and how do these factors differ among different subpopulations?

These questions will help us understand the role proximity to food retailers plays in influencing food purchasing and consumption behaviors in varying spatial contexts, and whether other factors influence the use of food retailer types and locations.

2. Methods

This systematic review was conducted using the PRISMA method, which provides a standardized way to collect and review relevant articles within the specific area of study (Moher, Liberati, Tetzlaff, & Altman, 2009). The following subsections describe the search criteria,
inclusion/exclusion criteria, study selection, and finally, how data were extracted from the included articles. Figure 1 presents a PRISMA flow diagram.

### 2.1. Search strategy

This review searched for articles that measured the localities of food purchasing and consumption behaviors, and were published in English-language, peer-reviewed journals from January 1995 to July 2017. Three databases – PubMed, Scopus, and Web of Science – were searched for papers related to our topic of interest using a standardized query. The query submitted is shown in Table 1. The search string includes frequently used words for describing and capturing food purchasing and consumption behaviors and place of food retail venues.

**Table 1. Table of the search query string.**

<table>
<thead>
<tr>
<th>Theme</th>
<th>Search string</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place of food event</td>
<td>“supermarket” or “grocer*” or “corner store” or “convenience store” or “food retailer” or “food store” or “tienda” or “food outlet” or “fast food” or “food environment” or “foodscapes” or “restaurant” or “café” or “coffee shop” or “hypermarket” or “super center” or “food store” or “take away”</td>
</tr>
<tr>
<td>AND</td>
<td>“activity space” or “activity survey” or “travel” or “travel diary” or “travel survey” or “GPS” or “space time” or “space time” or “spatio-temporal” or “spatiotemporal” or “activity patterns” or “movement” or “location”</td>
</tr>
<tr>
<td>AND</td>
<td>“purchase*” or “procure*” or “consume*” or “purchasing” or “consumption” or “intake” or “diet*” or “eat*” or “fruit*” or “vegetable*” or “nutrition*”</td>
</tr>
</tbody>
</table>

**2.2. Inclusion and exclusion criteria**

In order to be included in the review, articles had to explore where food purchasing and consumption behaviors take place and be published in peer-reviewed journals from January 1995
through July 2017. Articles were excluded if they: 1) did not consider the place of a food purchasing and/or consumption behavior event; 2) studied appetite, preferences, eating habits, energy intake, quality of food, or portion sizes at specific places but did not take a comprehensive approach to a person’s daily activity patterns; 3) solely examined different analysis or data collection methodologies rather than addressing where people buy or eat food; or 4) was a review or purely conceptual or theoretical article.

Notably, articles excluded in the second criteria that examined food purchasing and consumption behaviors in specific places tended to focus on a small subset of daily activity locations (e.g., schools). An example of one of these excluded papers is work done by Briggs and Lake (2011) who explored only students’ home and school food environments but no other locations. Our goal is to document research that considers a more comprehensive conceptualization of a person’s activity patterns.

2.3. Study selection

As shown in Figure 1, the initial search of databases resulted in 1,131 references. The paper’s author and the author’s supervisor conducted an initial screening of all article titles and selected 272 articles. After duplicates were removed, a second round of screening on 163 studies’ abstracts was completed. Among these, 143 articles were excluded based on the criteria described in section 2.2, leaving 20 to be reviewed fully. Finally, of these, three literature review papers were excluded, leaving a final count of 17 studies.
Records identified through Web of Science searching (n = 48)

Additional records identified through PubMed (n = 106)

Additional records identified through Scopus (n = 977)

Records after topics screened (n = 272)

Records after duplicates removed (n = 163)

Duplicates excluded (n = 109)

Records excluded based on abstract (n = 143)

Full-text articles assessed for eligibility (n = 20)

Review articles excluded (n = 3)

Studies included in synthesis (n = 17)

Figure 1. PRISMA flow diagram.
2.4. Data extraction

From the final selection of articles, the following information was extracted: data collection methods (e.g., interview, travel diary, GPS, telephone survey, questionnaire, or focus group), location of the study area (e.g., rural, urban, or suburban area), study population (e.g., adults, adolescents), and food venue places studied. Table 2 shows all of these criteria for included papers, and also includes a description of a list of influential factors on the selection of the location of food purchasing and consumption within these papers.
Table 2. A description of the study setting, study population, selected food stores, and factors associated with the place of food consumption and procurement in final selected papers.

<table>
<thead>
<tr>
<th>Author</th>
<th>Study area (SU = Suburban, U= Urban , R= Rural )</th>
<th>Study group</th>
<th>Data Collection</th>
<th>types of food stores studied</th>
<th>Significantly related to the location of food purchasing and consumption (*)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wang &amp; Lo. 2007</td>
<td>(SU), Toronto, ON, CANADA</td>
<td>Immigrant focus group, Survey</td>
<td>Chain and Chinese food stores</td>
<td>*</td>
<td><strong>Ethnic identification</strong></td>
</tr>
</tbody>
</table>
| Hillier et al., 2011 | (U), Philadelphia, PA, USA                        | Low-income Hispanic and African American parents who received WIC | Interview Food stores excluding butcher, fish shops, dollar stores, and chain pharmacies | ...    | *                                                              | ... | *     | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ...
<p>| Drewnowski et al., 2012 | (U), King County, WA, USA | adults Telephone survey | Full-service supermarkets | ...    | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | *    |</p>
<table>
<thead>
<tr>
<th>Author</th>
<th>Study area (SU = Suburban, U = Urban, R = Rural)</th>
<th>Study group</th>
<th>Data Collection</th>
<th>types of food stores studied</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chaix et al., 2012</td>
<td>(U), Paris, France</td>
<td>Adults</td>
<td>Survey</td>
<td>City market, small/large supermarket, hypermarket, hard discount supermarket</td>
</tr>
<tr>
<td>Kerr et al., 2012</td>
<td>(U), Atlanta, GA, USA</td>
<td>Adults</td>
<td>SMARTAQ, paper travel diary (2 days)</td>
<td>Fast food restaurants, sit down restaurants, grocery stores, coffee shops and large superstores</td>
</tr>
</tbody>
</table>

**Significantly related to the location of food purchasing and consumption (*)**

**Not related to the location of food purchasing and consumption (...)**

<p>| Household size | Ethnic identification | Income | Race | Gender | Employment | Age | Length of residency | Setting | Proximity | Store availability | In-store products | Car ownership/ride | Physical activity | Mode transport | Day of the week | Marital status | Education | Convenience |</p>
<table>
<thead>
<tr>
<th>Author</th>
<th>Study area (SU = Suburban, U= Urban , R= Rural )</th>
<th>Study group</th>
<th>Data Collection</th>
<th>types of food stores studied</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cannuscio, 2013</td>
<td>(U), Philadelphia, PA, USA</td>
<td>Adults</td>
<td>door-to-door survey</td>
<td>Large chain supermarkets and big box stores; medium-sized, non-chain grocers; corner and convenience stores, chain pharmacies, and dollar stores; specialty shops and produce stores.</td>
</tr>
<tr>
<td>Hirsch &amp; Hillier, 2013</td>
<td>(U), Philadelphia, PA, USA</td>
<td>Adults</td>
<td>Door-to-door survey</td>
<td>Food stores</td>
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<tr>
<th>Household size</th>
<th>Ethnic identification</th>
<th>WIC-SNAP</th>
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<th>Length of residency</th>
<th>Setting</th>
<th>proximity</th>
<th>Store availability</th>
<th>In-store products</th>
<th>Car ownership/ride</th>
<th>Physical activity</th>
<th>Mode transport</th>
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Significantly related to the location of food purchasing and consumption (*)
Not related to the location of food purchasing and consumption (...)
<table>
<thead>
<tr>
<th>Author</th>
<th>Study area (SU = Suburban, U= Urban, R= Rural)</th>
<th>Study group</th>
<th>Data Collection</th>
<th>types of food stores studied</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gustafson et al., 2013</td>
<td>(U), Lexington, KY, USA</td>
<td>Adults</td>
<td>GPS (3days)- telephone Survey</td>
<td>Supermarket, supercenter, specialty grocer, farmers’ market</td>
</tr>
<tr>
<td>Aggarwal et al., 2013</td>
<td>(U), King County, WA, USA</td>
<td>Adults</td>
<td>telephone survey</td>
<td>Supermarkets</td>
</tr>
<tr>
<td>Shannon, 2014</td>
<td>(U), Minneapolis and St. Paul, MN, USA</td>
<td>Low income and SNAP clients</td>
<td>data inventory</td>
<td>Food stores accepting SNAP</td>
</tr>
<tr>
<td>Sohi et al., 2014</td>
<td>(U, R), Eight Couties, SC, USA</td>
<td>Adults</td>
<td>cross-sectional telephone survey</td>
<td>Food outlet, Supermarket, Large grocery store</td>
</tr>
</tbody>
</table>

| Significantly related to the location of food purchasing and consumption (*) |
|-----------------------------------------------|-----------------------------------------------|
| Not related to the location of food purchasing and consumption (...) |

<table>
<thead>
<tr>
<th>Household size</th>
<th>Ethnic identification</th>
<th>WIC-SNAP</th>
<th>Income</th>
<th>Race</th>
<th>Gender</th>
<th>Employment</th>
<th>Age</th>
<th>Length of residency</th>
<th>Setting</th>
<th>proxi...</th>
<th>Store availability</th>
<th>In-store products</th>
<th>Car ownership/ride</th>
<th>Physical activity</th>
<th>Mode transport</th>
<th>Day of the week</th>
<th>Marital status</th>
<th>Education</th>
<th>Convenience</th>
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<tr>
<td>Author</td>
<td>Study area (SU = Suburban, U = Urban, R = Rural)</td>
<td>Study group</td>
<td>Data Collection</td>
<td>types of food stores studied</td>
<td>Significantly related to the location of food purchasing and consumption (*)</td>
<td>Not related to the location of food purchasing and consumption (…)</td>
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<tr>
<td>Liu et al., 2015</td>
<td>(U), Los Angeles, CA; Chapel Hill, NC; Albuquerque, NM; Columbus, OH; Philadelphia, PA, USA</td>
<td>Adults</td>
<td>GPS (3 weeks), food and travel diary survey</td>
<td>Sit-down restaurants, fast food/convenience stores, grocery/supermarkets, and malls or stores</td>
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<tr>
<td>Hillier et al., 2015</td>
<td>(U), Philadelphia, PA, USA</td>
<td>Adults</td>
<td>door-to-door surveys</td>
<td>Stores accepting SNAP</td>
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</tbody>
</table>
| Author                  | Study area (SU = Suburban, U = Urban, R = Rural) | Study group | Data Collection       | types of food stores studied                                                                 | Significantly related to the location of food purchasing and consumption (*) | Not related to the location of food purchasing and consumption (...)
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<tbody>
<tr>
<td>DiSantis et al., 2016</td>
<td>(U), Philadelphia, PA, USA</td>
<td>Black mothers or caregivers living with at least one child</td>
<td>Interviews</td>
<td>Supermarkets, wholesale stores, small corner grocers, farmers markets, meat markets, take-out restaurants, sit-down restaurants, and foods delivered to home.</td>
<td>...</td>
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</tr>
<tr>
<td>Thornton et al., 2017</td>
<td>(U), Melbourne, Australia</td>
<td>Adults</td>
<td>Survey, food purchasing diary</td>
<td>Chain supermarkets</td>
<td>...</td>
<td>*</td>
</tr>
</tbody>
</table>
| Author                  | Study area (SU = Suburban, U = Urban, R = Rural) | Study group | Data Collection | types of food stores studied                                                                 | Significantly related to the location of food purchasing and consumption (*) | Not related to the location of food purchasing and consumption (...)
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<tbody>
<tr>
<td>Shearer et al., 2015</td>
<td>(U, R, SU), Halifax, NS, Canada</td>
<td>Adolescent</td>
<td>Survey, GPS</td>
<td>Fast food, restaurants, grocery store, convenience store</td>
<td></td>
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</tr>
<tr>
<td>Sadler et al., 2016</td>
<td>(U), London &amp; Middlesex County, ON Canada</td>
<td>Adolescent</td>
<td>Activity diary- GPS (2 weeks)</td>
<td>Fast food, variety stores, pizza places, ice cream shops</td>
<td></td>
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</tr>
</tbody>
</table>
3. Results

3.1. Synthesis of results

The articles included in this review all use a framework that emphasizes the location of food-related behaviors including food consumption and purchasing. The majority of studies considering the actual location of food-related behaviors were conducted in cities within the United States (n=12). There were only two studies in Canada, one in France, and one in Australia. Near 82% of these studies focused on localities of food behaviors among urban dwellers. The only paper that explicitly studied localities of food behaviors among residents of suburbs was done by Wang and Lo (2007) for Canadian suburbanians. While no study specifically studied localities of food behaviors for the residents of rural areas, one paper surveyed both residents of urban and rural settings in the United States (Sohi et al., 2014). There was also one paper by Shearer et al. (2015) which studied residents of rural, urban, and suburban settings in Canada.

In order to answer the second question of this review paper outlined in the introduction section (what factors influence different demographic groups to engage with different food retailers in different places?), this review categorized findings from the selected articles for each demographic group and discussed the location of food-related behaviors and influential factors on the choice of food location among each demographic group. For the purpose of this review, the final selected articles (n=17) were categorized into two main groups based on their study population: 1) articles that analyzed the locations of food purchasing and consumption for adults, 2) articles that analyzed the locations of food purchasing and consumption for adolescents. Table 2 includes the list of articles within each demographic group with a summary of their findings.
Both categories of articles on adults (n = 15) and adolescents (n=2) used empirical data to understand where different demographic population groups buy and consume food and what factors influence their selection of the place of the food retailer. Through the next section of this paper, we will explore findings from each of these demographic groups.

3.2.1. Group 1: Locations of food purchasing and consumption among adults

Among the 17 articles reviewed here, 15 studied the primary location of adults’ food shopping and eating behaviours in the US. Canada, France, and Australia (Wang & Lo. 2007; Hillier et al., 2011; Drewnowski et al., 2012; Chaix et al., 2012; Kerr et al., 2012; Cannuscui, 2003; Hirsch & Hillier, 2013; Gustafson et al., 2013; Aggarwal et al., 2013; Shannon, 2004; Sohi et al., 2014; Liu et al., 2015; DiSantis et al., 2016; Thonton et al., 2017). These papers were all in consensus that adults, in general, tend to travel more than 1 mile for food shopping and eating, and their primary food store was not the closest store to their residence. Results from studies that considered types of food establishments reported that participants tended to travel shorter distances to grocery stores, and longer distances to visit sit-down restaurants. For example, Liu et al. (2015) found that residents were likely to travel about 1.9 miles to grocery stores, but travel approximately 75% further (3.3 miles) to visit sit-down restaurants in the US. In addition, these studies noted that a majority of adult participants were more likely to do their primary grocery shopping at supermarkets, large grocery stores, supercenters, and national chain supermarkets ( Sohi et al., 2014) rather than discount stores, locally owned grocery stores, or supermarkets like Walmart and Target (Hillier et al., 2015).

Some of the studies went into more detail by exploring the localities of food behavior among a specific group of adults populations (e.g., males, elderlies, immigrants, and so forth) and examined
influential factors on their choice of primary food venue place. The following sections discuss the localities of food behavior among different adult groups as well as any findings regarding influential factors on the choice of their food places.

3.2.1.1. Adults with different immigration status:

There were no studies that compared the localities of food-related behaviors among immigrants versus non-immigrants. However, one of the selected studies by Wang and Lo (2007) examined localities of food behaviors among Chinese immigrants who resided in two neighborhoods in Toronto, ON, Canada, where one neighborhood had a higher density of Chinese supermarkets and the other one did not. The purpose of this study was to compare Chinese immigrants’ preference to purchase food from western stores versus Chinese supermarkets. Their study found that immigrants tended to travel longer distances to their preferred ethnic Chinese supermarkets rather than purchasing food from the nearby western supermarket. According to Wang and Lo, the most influential factor in the location of food purchasing among Chinese immigrants was the ethnic identification of the food store and for this group of people proximity to the food retailer had a very modest impact on their choice. Interestingly, they did not find any significant difference between immigrants coming from different origins (Hong Kong versus China) and with different duration of stay in Canada. However, they found that immigrants who were younger had a lower preference to buy from Chinese stores, while older immigrants had a stronger preference to buy food from Chinese stores rather than western stores.

There was also one other study conducted in the US, in which the researchers controlled for the impact of residents’ length of stay on their primary food store selection (Sohi et al., 2014). However, similar to the previous study they found no significant association between the choice of food venue place and shoppers length of stay.
3.2.1.2. Adults with different age groups:

Among 15 selected studies on adults, eight of them considered age. However, only three of these studies found that adults of different ages choose significantly different locations for food purchasing and consumption (Wang & Lo, 2007; Kerr et al., 2012; Drewnowski et al., 2012). According to one of these studies by Kerr et al. (2012), older adults were more likely to visit the grocery store and less likely to visit fast food outlets compared to the younger population in Atlanta, GA, USA. Not only did the types of preferred stores vary between different age groups, but their choice of food store also influenced by the food store price range. This can be seen in the study by Drewnowski et al. (2012) which reported that American older adults residing in King County, WA, USA preferred to shop for food from supermarkets with low to middle prices compared to younger adults who were more likely to shop food from higher price supermarkets. Age also matters in the food shopping location patterns among immigrants. Wang and Lo (2007) noted that older Chinese immigrants were more likely to shop at Chinese food retailers with greater ethnic identification compared to younger Chinese immigrants.

3.2.1.3. Adults with different Income status:

Ten articles controlled for the role of income status on adults’ choices of food store. These articles were conducted in the USA (n = 7), Canada (n= 1), France (n= 1), and Australia (n=1). Among these papers, only three found that food store place selection significantly varies among people with different levels of income (Drewnowski et al., 2012; Kerr et al. , 2012; Hirsch et al., 2013). According to Drewnowski et al. (2012), higher income families tended to shop at higher price supermarkets while lower-income families tended to shop at lower price supermarkets in King County, WA, USA. When considering the difference in shopping from the grocery store and fast food restaurants, Kerr et al. (2012) found that lower-income families residing in Atlanta, GA, USA
were more likely to travel farther distances to their preferred food store and tended to eat more fast food compared to higher income families. However, a study by Hirsch et al. (2013) in Philadelphia, PA, USA found contradictory evidence regarding the travel distance to food stores among different income levels. According to Hirsch et al. (2013), people with lower incomes tended to travel shorter distances compared to those with higher incomes (about 5.6 miles less), while those with middle incomes tended to travel longer distances compared to higher incomes (about 0.7 miles more).

Some papers only studied low-income adults’ choices of food store location with a focus on those who took part in public assistance programs for purchasing food, including WIC and SNAP assistance programs (Hillier et al., 2011; Shannon, 2014; Hillier et al., 2015). The WIC assistant program provided by federal grants to states in the US is a specific type of supplemental nutrition program for women, infants, and children. The SNAP or Food Stamps program is another type of supplemental nutrition assistance program which is a monthly coupon like a debit card provided for eligible low-income families in the US. Among these studies, only one of them considered foods purchased with and without help from assistance programs (Hillier et al., 2011), while the other two papers only considered food purchased with assistance program vouchers (Hillier et al., 2015; Shannon, 214). According to Hillier et al. (2011), WIC recipients living in Philadelphia, PA, USA traveled further distances to do non-WIC food shopping, mainly at a chain supermarket (98% of participants), and travelled shorter distance for WIC shopping. However, only 30.2% of the study participants do their WIC shopping in their residential neighborhood. On average, recipients

2 https://www.in.gov/fssa/dfr/3099.htm
of WIC travel 0.65 miles beyond the closest chain supermarket for non-WIC shopping and 0.95 miles beyond the closest chain supermarket for WIC-based shopping. Both studies on SNAP clients found that recipients tended to shop from stores other than the closest store to their residencies (Shannon, 2014; Hillier et al., 2015). According to Hillier et al. (2015) SNAP clients residing in Philadelphia, PA, USA had an average distance of 1.9 miles between their home to their selected store accepting SNAP redemptions to purchase food. The same study found that about 89.2% of SNAP clients chose national chain supermarkets, 11.5% chose national discount and limited supermarkets, 1.3% chose small locally owned supermarkets, and 0.9% chose superstores like Target and Walmart.

Only one study by Hillier et al. (2015) addressed the reason low-income populations travel long distances for food shopping. According to this study populations with lower incomes who received SNAP benefits preferred to travel a further distances to go to stores with better quality and variety of in-store food products.

3.2.1.4. Adults with different Household size:

Among 17 studies, five controlled for the families’ household size. Only one of these studies found a significant relationship between the number of family members with travel distance for food shopping trips (Hirsch et al., 2013). According to Hirsch et al. (2013) for every additional family member, the travel distance for big food shopping trips decreased by 0.8 miles in Philadelphia, PA, USA. There was also one paper that specifically studied localities of food-related behaviors of mothers or caregivers with at least one child in Philadelphia, PA, USA (Disantis et al., 2016). According to this study, food shopping stores used by these families were not limited to only one store, and they purchased food from multiple stores over the time of the study. However, the most frequented food store location for these families was within less than 1 mile from their home or
other most visited places. Disantis et al. (2016) also interviewed study participants to identify factors influencing their choice of food store and reported “convenience” was the primary factor for these families in choosing food store location. Participants of this study defined convenience not only related to proximity but also depended on availability and accessibility of transport, travel time, and in-store variety of products that fit all the family members’ preferences.

Regarding marital status, only two studies controlled for the impact of marital status on the location of food purchasing and they did not find any significant relation (Sohi et al., 2014; Disantis et al., 2016).

3.2.1.5. Adults with different race:

Among 15 studies, ten controlled for participants’ race, however only one of the studies found a significant relationship between participants’ race with food store selection (Kerr et al., 2012). Other studies found little variation based on the ethnic or racial composition of neighborhoods with choice of food store location. These studies focused mostly on mixed race neighborhoods located in Philadelphia, PA, USA (n=4), King County, WA, USA (n=2), Lexington, KY, USA (n=1), eight counties, SC, USA (n= 1), Atlanta, GA, USA (n=1), and Toronto, ON, Canada (n=1). Participants of these studies included Chinese immigrants from China, Chinese immigrants from Hong Kong, Hispanics, African Americans, Asians, Whites, and Black populations. However, only one of these studies found significantly different preferences for food store locations between non-white Americans and white Americans (Kerr et al., 2012). According to this study, non-white Americans in general tended to travel farther to food stores and were more likely to visit grocery stores compared to white Americans in Atlanta, GA, USA.
3.2.1.6. Adults with different Genders:

Apart from one study that only considered the female population (DiSantis et al., 2016), among the other 14 papers focusing on adults, eight papers controlled for the relation between gender with primary food store selection. However, only two papers found significant differences between males’ and females’ food store selection. Both studies were conducted in the USA (Drewnowski et al., 2012; Kerr et al., 2012). Evidence from a study by Drewnowski et al. (2012) showed that shoppers of low and middle price supermarkets located in King County, WA, USA tended to be more male, whereas shoppers of high price supermarkets tended to be more female. Gender also has been identified as an influential factor on the likelihood of visiting a fast food outlet versus a grocery store in Atlanta, GA, USA (Kerr et al., 2012). According to a study by Kerr et al. (2012) men were less likely to visit a grocery store than women, while men were more likely to visit fast food outlets than women.

3.2.1.7. Adults with different Employment status:

From 15 selected studies, only six studies controlled for employment status from which only two papers found a significant association between employment status and distance traveled for food shopping (Hirsch et al., 2013; Hillier et al., 2013). One of these studies compared food shopping travel distance among full-time employees, part-time employees and students. According to Hirsch et al. (2013) in Philadelphia, PA, USA compared with the full-time employees, being a student increased the distance traveled for big food shopping trips by 7.9 miles while being a part-time employee increased travel distance for big food shopping by 5.3 miles. However, another study by Hillier et al. (2013) found that for low-income Hispanics and African Americans living in Philadelphia, PA, USA the number of hours at work was the only predictable factor in their food shopping travel distance. According to their study, one-hour increase in the number of hours at
work per week increased the travel distance for food shopping by 0.02 miles among this population.

3.2.1.8. Adults with different Education level:

Education level has been controlled for within ten of the fifteen articles, and among these papers, four of them found that education level is significantly related to the distance traveled for food shopping and selection of food store place (Hirsch et al., 2013; Drewnowski et al., 2012; Kerr et al., 2012; Chaix et al., 2012). Findings of these four papers had consensus that as the lower level of education increase the distance traveled for shopping food. According to Hirsch et al. (2013) in Philadelphia, PA, USA, for big food shopping trips compared to those with bachelor’s degree, those with some college or an associate’s degree traveled 5.1 miles further. Similarly, they find that for small food shopping trips compared to those with bachelor’s degree, those with some college or an associate’s degree tended to travel 0.9 miles further. Not only the distance of shopping trip but also the price of food store selected by different education level residents varied in the USA. A study by Drewnowski et al. (2012) found that higher educated residents of King County, WA, USA were more likely to purchase food from higher price supermarkets whereas lower educated people tended to purchase food from lower price supermarkets. Education also has been found significantly related to fast food outlet visits by Kerr et al. (2012) among residents of Atlanta, GA, USA. According to their study, those residents without a college degree were more likely to visit fast food outlets and travel farther for food shopping compared to those with a higher degree. Research in residents of France found similar results as were identified by Kerr et al.(2012) for educated American residents of the US. According to a study in France by Chaix et al. (2012), French residents of higher average education neighborhood tended to buy from the closest supermarket.
3.2.1.9. Other factors:

Some studies also considered the impact of non-demographic factors such as urban form, days of the week, mode, type, and direction of trips, as well as in-store food variety, quality, and price on adults choice of food store location (Hillier et al., 2011; Drewnowski et al., 2012; Chaiex et al., 2012; Kerr et al., 2012; Aggrawal et al., 2013; Hillier et al., 2015; DiSantis et al., 2016; Thornton et al., 2017). In the following section the other assessed factors within the selected articles focusing on food-related behavior of adults are discussed.

3.2.1.9.1. Urban form:

Among 15 selected articles, only two assessed urban form and residential density (Kerr et al., 2012; Aggarwal et al., 2013), however only one study found a significant association. According to Kerr et al. (2012), urban form influenced the distance traveled for food purchasing among residents of Atlanta, USA. According to their study, less accessible urban form resulted in farther travel distances to food stores.

3.2.1.9.2. Day of the week:

Another influential factor influencing the place of food store considered by two of the studies was food shopping on weekdays versus weekends. Both of these studies for the residents of USA and Australia (Kerr et al., 2012; Thronton et al., 2017) found that people tended to travel farther distances to food stores on weekends compared to weekdays. In addition, Kerr et al. (2012) reported that the total number of fast food trips were higher during weekdays (workdays) compared to weekends (non-work days).
3.2.1.9.3. Mode of transport:

Among 15 studies, eight considered having access to a car. In general, most of these studies reported that the majority of study participants owned a car or got a ride for food shopping. According to Kerr et al. (2012) only 7% of all trips to food stores were made by foot among residents of Atlanta, GA, USA. However, four of these studies found that having access to different modes of transport significantly related to the location engaging with a food store. A study by Hirsch et al. (2013) found that having more than one car increased travel distance of residents of Philadelphia, PA, USA by 2.5 miles. Another study by Kerr et al. (2012) found that those without a car were more likely to visit grocery stores compared to other types of food stores in Atlanta, GA, USA. Similar findings were reported for Australian adult residents who bike or walk to food stores, as they were more likely to buy food from stores closer than 3 km to their homes compared to those using the car for food shopping. According to Thronton et al. (2017), active travel users in Australia tended to use more local food stores than other types of food stores. Although a study by Hillier et al. (2015) found no significant relation between being located within ¼ mile of transit store and store choice, their results showed that this factor would be influential among public transit users and make transit users less likely to travel an extra mile further than stores closest to the transit stops.

3.2.1.9.4. Trip direction and type:

Direction and type of trips have also been studied by five of the studies, among which only one study found that people were more likely to travel farther for food shopping when the trip was part of a larger trip with different origin and destination before and after the trip to food location (Kerr et al., 2012). Additionally, Kerr et al. (2012) reported that people were less likely to visit fast food
outlets on the way to and from home whereas there was higher probability of visiting fast food outlet on the way to and from work, especially when the trip was from home on the way to work.

3.2.1.9.4. Availability of food store venue and in-store food products quality, variety, and price:

Four of the selected papers looking at the localities of food behaviors among adults considered the availability of food store venues within participant’s residential neighborhoods. Three of them (e.g., Sohi et al., 2014) reported that residing in a block or neighborhood with high or low access to supermarkets did not relate to residents choice of food store. However, one of the papers by Hirsch et al. (2013) found that living in a favorable food environment in Philadelphia, PA, USA decreased the distance traveled by residents for small food shopping trips by 0.8 miles compared to those living in the unfavorable food environment.

About half of the papers (n=8) studied the association between in-store food availability, quality, price, and variety with residents choice of food store. A majority of these studies used the NEMS-S score to quantify in-store food products quality, price, and variety. The NEMS-S (Nutrition Environmental Measurement Survey – Stores) score measures the store nutrition environment and assesses availability and pricing of food products within the food stores (Hillier et al., 2015). However, only two of these papers found a strong association between NEMS-S score and food store location selection. According to Cannuscio et al. (2013), residents of Philadelphia, PA, USA preferred to shop at food stores that offered more diverse and healthful food options than from stores located closer to their home. They found that the probability of traveling beyond the store located near home would decrease by 26% if the NEMS-S score of the food store located near home increased by one standard deviation. Although the other study by Hillier et al. (2015) did not find a significant relation between “absolute price” and location of food store selection among
residents of Philadelphia, PA, USA, the interaction of price with distance as well as the interaction of availability of healthy food products with distance was reported significantly related to residents’ choices of food store. According to their study, choosing a high price food store was very unlikely for those who traveled further distances for food shopping. In other words, residents tended to travel farther if food stores located farther had a higher NEMS-S score.

3.2.2. Group 2: Locations of food purchasing and consumption among adolescents

Only two of the 17 selected studies specifically considered localities of food consumption and purchasing of adolescents (Shearer et al., 2015; Sadler et al., 2016). Both of these studies examined localities of food behavior of adolescents residing in two of cities in Canada. Among these two only one of them by Shearer et al. (2015) considered different types of food store venues including convenience store, fast food outlets, restaurants, and grocery stores whereas the other study conducted by Sadler et al. (2016) only focused on localities of junk food purchasing from fast food outlets, ice cream and pizza places. Similar to findings on travel distance to visit food stores among adults, Canadian adolescents (12 to 16 years old) were more likely to travel beyond the assigned walkable distance (around 1km) from their residencies to purchase food (Shearer et al., 2015). The other study by Sadler et al. (2016) examined the relation between adolescents’ gender, trip direction, exposure duration to junk food store, and travel mode on the likelihood of junk food purchasing among adolescents residing in London, ON. They only found that exposure to junk food stores had a significantly positive relation with the adolescent's likelihood of junk food purchasing. Their data showed that the effect of exposure to junk food is even higher among girls compared to boys, as well as during the trips from school to home compared to the trips from home to school.
4. Discussion

This review summarized the literature on the localities of food purchasing and consumption behaviors to determine future research directions. The number of published articles on this topic has increased since 2007 (Figure 2). This growth in publications corroborates the notion that there is an increasing interest in understanding the importance of activity spaces and movement across various geographic contexts in studies on food consumption and purchasing. Despite this increase, there remain a number of gaps and limitations in the current literature.

![Figure 2. Chronological chart of the sum of the number of published articles within past years.](image)

In general, there is a consensus that individuals (both adults and adolescents) often purchase or consume food not from the food store close to their residence, but rather they travel longer distances to visit their preferred food store. In addition to exploring localities of food behavior, some papers also examined associations between localities of food behavior with demographic and environmental factors. However, only a few of these papers found a significant relationship between these factors and individuals’ place of food purchasing and consumption. Even these findings were inconsistent for the influence of some of these factors, such as income and
employment status, on the localities of food behavior. These inconsistent findings might occur from limitations these papers had in data collection or analysis.

To date, studies on localities of food-related behavior faced several limitations regarding collecting data of actual place of food consumption and purchasing. These limitations included lack of access to up to date data on the food environment, lack of detailed data at the store level, the risk of using biased data of the location of food-related behaviors, limited sample size, limited data on the frequency of food location visits, and short study duration.

Lack of up to date data on retail food environments can result in misclassification of food stores or exclusion of some types of food stores in different settings. It is evident that some types of frequently visited food store venues have been excluded in most of the previous studies such as farmers markets, dollar stores, coffee shops, fish markets, bakeries, and butcheries that need to be included in further research on localities of food behavior. Most of the studies only reported the type of a food store where people buy or eat food, e.g. supermarket, grocery store, convenience store; however, it is not clear what types of food products these stores offer. There might be some cases that a store is reported as a grocery store, but in reality, it offers products at the same price, quality, and variety of a supermarket. Similarly, for some cases, two stores might both called convenience store but offer different types of food products with different quality and prices. Further research is required to report more accurate and detailed data on what they mean by the titles of food stores, e.g. grocery store versus convenience store. It might be better for further studies to explore the in-store features (e.g., size, products) and group the food stores based on size and products offered by stores rather than limiting to the name of the categories of food stores, e.g. grocery store or supermarkets. There are some literature assessing new ways of categorizing data on food store types. For example a study by Block and Kouba (2006) used “market basket price
“technique” in which they categorized food stores by the characteristics of different store types including product availability, price, and quality. They explained that the reason for this categorization was the various number of different food store types available in the study area (Block and Kouba, 2006).

Most of these studies had small sample sizes, and there was a chance that their findings might have selection bias. The selection bias might happen mostly to those studies that used phone surveys (n= 4) and self-reported diaries. Those studies that collected data by calling random landlines mostly sampled older and middle-aged women population. Therefore, findings from these studies could not represent the younger age population who exclusively used cell phones. For those studies that relied on self-reported diaries, there was a chance that participants forgot to report some places that they visited for purchasing or eating food. Additionally, in some cases, participants’ self-reported locations could not match correctly with real locations or saved GPS time points. Future research could employ the use of GPS tracking for obtaining more accurate data on the localities of food consumption and purchasing among different subpopulation groups. Further research, however, is required to evaluate and validate the benefits and drawbacks for data collection methodologies in this domain, including GPS tracking, recall questionnaires, and activity diaries.

Another selection bias happened for most of these studies is because of limiting their study participants to only those individuals who can speak English. Therefore, findings from these studies could not represent non-English speaker population localities of food behavior.

Additionally, current studies mostly examined the localities of food-related behaviors of individuals residing in urban areas. Far too little attention has been paid to how individuals residing outside of cities (i.e., rural or suburban areas) and how this affects their food procurement and
consumption. Future research needs to clarify the impact of residing in urban, suburban, or rural areas and note how these environment settings affect different subpopulations.

Limited data and limited duration of the study also resulted in limiting the ability of studies to make further analysis of examining the association between localities of food behavior with demographic and environmental characteristics. Most of the previous studies were descriptive studies and only reported the location of food-related behaviors; however, larger sample size and more data on the actual frequency of food location visits will enable future research to determine influential factors on the localities of food behaviors. It is important for further research to consider that factors such as exposure to different types of urban form, transit system, food environment or retail landscape would influence the localities of food-related behaviors to a different extent. Thus, future research needs to conduct twofold analysis: one for exploring existing food environments and a second for examining people’s food-related behavior and their preference and actual place of food consumption and purchasing. It is important for further research to explore the food environment of the selected study area before concluding why people are making choices to purchase or consume food at a specific food store location.

Finally, It is difficult to generalize these results, as most of these studies have examined residents in only a few countries around the world – with the majority conducted in the US. In addition to the narrow geographic scope of the reviewed papers, there are also limitations linked to the types of populations studied. Figure 3 shows the number of papers conducted on the locations of food shopping and consumption behaviors, categorized by each of the previously mentioned demographic groups. There is still a need for researchers to focus on a range of diverse subpopulations, including those with disabilities, immigrants, families of different sizes, active transport users, and youth. There have also been inconsistent findings on people with different
income levels or employment statuses (e.g., going beyond employed or unemployed and considering those with shift work or precarious employment) which needs further analysis. Although some research has been done on identifying predictors affecting localities of food purchasing and consumption behaviors among various sub-populations, more information on the interactions between individuals’ food store preferences, demographic characteristics, and food retail environment exposure would help researchers and policymakers disentangle the complexities of this process.

![Figure 3](image.png)

*Figure 3. Number of studies among all selected studies (n=17) reviewed food purchasing and consumption behaviors among adults and adolescents.*

5. Conclusion

This study set out to review the literature on the localities of food consumption and purchasing published from 1995 through 2017. Despite the aforementioned limitations, the current literature does provide researchers with the evidence that considering activity spaces is essential to
understanding where people shop for or eat food. Notably, the literature shows the important role of travel time and travel mode, in addition to factors such as race, age, gender, and income, on the locations of individuals’ food purchasing and consumption behaviors. Together, this body of work has driven forward our understanding of the food environment, and future work in this area will continue to clarify the complex and dynamic linkages between people and the foods they eat.
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