Associations and Interactions between Retail Food Environments, Food Gentrification, and Neighbourhood-level Intersectionality in Toronto, Canada

by

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A thesis
presented to the University of Waterloo
in fulfillment of the
thesis requirement for the degree of
Master of Environmental Studies
in
Planning

Waterloo, Ontario, Canada, 2021

Author's Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

Abstract

Diet-related disease and food insecurity are growing problems in Canada and globally. Over the last decade, prevalent rates of obesity and type 2 diabetes have increased across the country and Toronto currently has the largest absolute number of food insecure households of any metropolitan city in Canada. Evidence suggests that the retail food environment (RFE) may be an important determinant of population dietary intake, however, much of RFE research has centered on geographic access and *food deserts* – low-income areas with limited access to nutritious food sources, with few scholars exploring economic dimensions of food access and *food mirages* – areas where healthy food retailers appear plentiful but remain economically inaccessible for low-income households. Overwhelmingly, RFE research also tends to exclude ethnic grocery stores and other non-traditional food retailers from analyses despite being sources of affordable and cultural food and fostering a sense of place, community, and identity for racialized and low-income residents. Yet, the exact mechanisms which undermine healthy food access remain difficult to capture, especially during this current era of rapid urbanization. Despite a small subset of urban scholars exploring how broader socio-political, -cultural, and -economic implications of gentrification may affect and constrain food access, this particular area of research and phenomenon has not been given enough priority to date in Canadian literature and policy. Moreover, the effects of poverty often interact with race and ethnicity, thus, applying an intersectional framework to quantitative ecological planning research enables more profound analyses of neighbourhood healthy food access. Taken together, these findings point to the urgency of conducting transformative research that isolates urban effects of food access in Toronto and addresses issues of equity and social justice, as well as highlighting the importance of standardizing methodologies so that assessments may be applicable and reproducible across other Canadian cities.

To investigate these associations from a planning perspective, I employed an exploratory cross-sectional descriptive and correlational methods to answer several research questions across two manuscripts. First, I created a Social Equity Index (SEI) at the dissemination area (DA) level using 5 variables drawn from 2016 Census data related to food purchasing power. Next, I mapped food deserts and food mirages using the SEI and a categorized set of food retailers, and then observed where these RFEs intersected with gentrifying neighbourhoods (i.e., gentrifying census tracts) and gentrifying policy areas (i.e., Business Improvement Areas). I also derived the predominant

racial/ethnic composition of neighbourhoods (i.e., visible minority status) from Census data and organized DAs into social equity groups based on race/ethnicity and SEI score classes. Finally, I used these outcomes to measure differences in the spatial distributions of food retailers (i.e., proximity and density) and identify where food access may be constrained by gentrification processes through further spatial and statistical analyses.

My thesis findings reveal that both food deserts and food mirages exist in Toronto, and that Black neighbourhoods are significantly more likely to exist in food deserts. Business Improvement Areas may also be contributing to the presence of food mirages, but more longitudinal research is warranted. I also theorize that food deserts in gentrifying census tracts may be at risk of transforming into food mirages if urban revitalization efforts remain unchecked. After controlling for SEI, racial/ethnic differences for food access are significant for visible minority neighbourhoods to conventional, discount, and ethnic retailers. By illuminating intersectional differences in neighbourhood food access, my research responds to provincial and federal calls from professional planning bodies for Canadian planners to integrate food systems into land use plans and policies and proposes that municipalities engage with “food haven”-type interventions and policies to protect food retailer diversity and mitigate retailer and resident displacement.

Acknowledgements

First and foremost, thank you to my supervisor, Dr Leia Minaker, for making my experience as a graduate student remarkable and for your endless advice and inspiring guidance. Thank you for encouraging me to explore areas of interest to me, for providing me with opportunities to grow my skills and abilities as a researcher, and for establishing Minaker Lab friendships that I'll carry with me forever. You are a one-of-a-kind supervisor, and I am beyond grateful for having the privilege of working with you over the past two years and for the coming future too. Thank you for also being a friend.

Thank you to my committee members, Dr Brian Doucet and Dr Mark Seasons, for your contributions in shaping this thesis. Your commentaries are sincerely appreciated and insightful, and I am fortunate to have your perspectives reflected in the final draft. I am also thankful to have read your own research and shared other academic moments with you during my time in the School of Planning that inspired me to pursue this project amongst other scholarly achievements.

A loving thank you to my family. You never failed to ask how my thesis was going and were by my side throughout all the waves of anxiousness and excitement. Thank you to my parents, for your unconditional love and patience and for giving me all the tools and knowledge I needed to succeed. Thank you to my sister, Ola, for writing secret messages of support in my notebooks; I always found them on days I needed them most. Thank you to my brother, Matthew, for showing me what it takes to power through daily challenges and for making me finish each day laughing.

A very special thank you to my friends. Thank you for encouraging me to pursue graduate studies and for your emotional and social support over the past couple of years; you brought much needed balance to my life. Thank you to my planning gals, my academic experience would be far less than what it's been without our unwavering support for one another. Thank you to the Minaker Lab, I am so appreciative of your tremendous motivation in all that we've done together.

I also wish to thank the Emily Ruston Mann family and the Canadian Institute of Planners (CIP) for your confidence in my research and financial support. To be awarded scholarships in Emily's name and from the CIP is an incredible honour and I hope that I respected your expectancies

in my work. Further, a warm thank you to those who were a significant part of me entering this program. Finally, thank you to Markus Wieland and Kelly Ramsay from the University of Waterloo for your patience and teachings towards GIS and statistical analyses; your aid substantially strengthened my work.

Land Acknowledgement

I conceptualized and wrote this thesis on the University of Waterloo campus, in my home in Kitchener, and across several settings in Kitchener-Waterloo and Toronto. These lands are situated on the traditional territory of many nations, including the Attawandaron (Neutral), Anishinaabe, Haudenosaunee, Mississaugas of the Credit, the Chippewa, and the Wendat peoples. The University of Waterloo is situated on the Haldimand Tract, the land promised to the Six Nations that includes ten kilometres on each side of the Grand River. Toronto is also covered by Treaty 13 with the Mississaugas of the Credit. Today, this land is still the home to many Indigenous people from across Turtle Island, and I am grateful to have the opportunity to work on this land. I also acknowledge that this statement is only a small step in the process of decolonization, and I understand that reconciliation requires systemic change.

Dedication

I would like to dedicate this thesis to my parents, Monika and Jerzy Menko. Your support, love, and care for me and my siblings has never gone unnoticed. This achievement is a reflection of your bravery to immigrate to Canada from Poland in hopes of creating better lives and opportunities for yourselves and your children and the many days and nights you two assisted me with schoolwork throughout all my years of schooling that ultimately led me to writing this thesis. For that and more, I am forever grateful that you encouraged me to pursue a master's degree and follow my passions.

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Chapter 1
Introduction

1.1 Problem Context

Over the last two decades, scholars have paid unprecedented attention to the ways in which retail food environments (RFEs) influence population health and support nutritious eating. Once assumed that intrapersonal and household factors share the greatest responsibility for healthy food purchasing and consumption, many researchers have since demonstrated that a myriad of reciprocal macro-level and spatial contexts (e.g., political structures, land use policies, and economic systems) continually interact and convene to produce outcomes in the built environment that either support or constrain nutritious dietary intake (Winkler et al., 2020). This scholarly attention is both important and relevant because over the same time period, diet-related chronic disease and food insecurity trends persisted in Canada and globally. According to the latest estimates from the United Nations, over 2 billion people lack access to safe and healthy food globally, including 8% of people in North America and Europe (FAO, 2019). In 2000, the World Health Organization declared obesity to be a global epidemic (WHO, 2020). By 2017, the Canadian Health Measures Survey found that 60% of Canadian adults between the ages of 18 and 79 were either overweight or obese, and at greater risk for developing type 2 diabetes, heart disease, and high blood pressure (Statistics Canada, 2018). A substantial amount of literature links these findings to a poor diet with low consumption of fresh and minimally processed foods and a higher intake of sugar-laden and high-fat options (Afshin et al., 2017; Caspi et al., 2012; Kraft et al., 2020). Yet despite nuanced research and novel ecological RFE frameworks conveying how interdependent factors assemble to influence food purchasing and consumption (Winkler et al., 2020), the exact mechanisms which undergird healthy food access across neighbourhoods remain difficult to capture, and even more so during this particular era of rapid urbanization (Seto, 2016). Alternatively, there is a small set of critical urban scholars exploring economic dimensions of food access and leading food mirage and food gentrification research in the United States as distinct subsets of commercial gentrification; however, these areas have not been given much priority to date in Canadian literature and policy.

Nonetheless, extant food access research interests in Canada may be grounded in the fact that many communities and activists have expressed concern about how the RFEs impact population health (Widener, 2018) and interest in enabling consumer food environments that promote healthy

eating (Minaker, 2016). There are several interdisciplinary research teams ambitiously generating evidence for creative food interventions and effective policy approaches, such as PROOF: Food Insecurity and Policy Research, the L'Abbe Lab: Food and Nutrition Policy Research for Population Health, and the Institute for Sustainable Food Systems at Kwantlen Polytechnic University. There are also a plethora of grassroots organizations operating at the local level to improve food access and food insecurity in vulnerable communities. Several public-sector calls to action have also been issued to increase and sustain actions to improve food environments and promote healthy communities in Canada, including from professional planning bodies. In 2011, the Ontario Professional Planners Institute's (OPPI) issued a *Call to Action: Healthy Communities and Planning for Food* advocating for greater and more diversified territorial and provincial regulation within food systems planning (OPPI, 2011). In 2018, the Canadian Institute of Planners (CIP) issued a *Policy Statement on Healthy Communities*, recognizing that socially deprived communities face the greatest barriers to healthy food access. The CIP also stressed that poorly designed neighbourhoods and networks unquestionably fail to meet fundamental planning goals and nurture "vibrant environments and active lifestyles that increase equity and promote and enhance the health of all Canadians" (CIP, 2018, p. 2). In 2021, the CIP – Planning Student Trust Fund scholarship juries expressed that "the issue of food security to seniors and marginalized communities will become increasingly important with an aging population" (CIP-PSTF juries, personal communication, May 17, 2021).

However, applied solutions combating unsupportive RFEs have traditionally not been an explicit goal of public policies across Canada (Tarasuk et al., 2015). Despite some jurisdictions beginning to incorporate food policy into municipal agendas (Minaker, 2016), and recent momentum among federal initiatives, including the Healthy Eating Strategy (2016), National Food Policy (2019), and establishment of the Canadian Food Policy Advisory Council (2021), the Food-EPI Canada study (2017) found that, overall, RFE monitoring had been given little or no policy implementation across provincial and territorial governments (Vanderlee et al., 2017). Of note, a key recommendation for Ontario suggested implementing "policies including public procurement standards to provide and promote healthy food choices in public sector settings" (Vanderlee et al., 2017, p.10). Part of limited policy application at these levels can be attributed to the fact that navigating complex public-private partnerships remains challenging and politically contentious (Minaker, 2016). For instance, the achievability of some vanguard policy strategies may fail to continue beyond election cycles as "other policies are introduced, sociocultural norms and behaviors change, and political priorities shift"

(Vanderlee et al., 2019, p.14). Another might be due to the nature of variegated planning structures, socio-economic, and geographic contexts across Canada, thus, the political environment within some regions may not be conducive to applying research when developing practical and attainable food-based plans and may even lead to inconsistent outcomes of varying degrees of effectiveness. Taken together, these findings point to the significance of conducting contemporary, interdisciplinary, and transformative research that isolates urban effects of food access to address issues of equity and social justice across Canada. They also highlight the importance of standardizing methodologies so that assessments may be applicable and reproducible at broader scales. One approach may be to apply *intersectionality* as both a framework and as a methodology in research to more comprehensively understand how overlapping configurations of social identity and power relations are rooted in geographic RFE locations.

1.2 Study Purpose, Significance, and Objectives

The overarching goal of this thesis is to examine and explore whether the dynamics of food access in Toronto, Canada can be clearly captured through quantitative research using the variables outlined across the two manuscripts. Another goal is to contribute to a richer understanding of how place-based geographic and economic constraints influence population diet for low-income, low-equity, and racialized populations: the most important risk factor for Canadians in terms of mortality (Afshin et al., 2017). It rejects the traditional assumption that individuals are solely responsible for their health, and pays greater attention to the social, economic, and political structure around food access. Most importantly, it raises awareness of food access issues and the detrimental and cascading effects and threats of gentrification. This thesis is also among the first to incorporate intersectionality into food access studies through a planning lens, and through doing so, it sets a unique precedent for future exploratory studies and broadens the current state of food environment and food gentrification literature.

Given the increasing number of calls from the planning profession to address food system, a hopeful practical outcome of this research is that it will lead to build capacity among experts in the field, strengthen allyship between planners and other disciplines, and be used to inform decision-making in the creation of food-based plans, policies, and interventions, particularly across the most precise geographic areas in need of support and across provincial and territorial jurisdictions in Ontario. Ideally, this study will be reviewed by the Toronto Food Policy Council and Canadian Food

Policy Advisory Council as well and provide the infrastructure necessary for more coordinated action between jurisdictions and agencies towards achievable policies that foster healthy food environments.

This thesis involves the following four research objectives that will be answered through specific research questions across two manuscripts in Chapters 4 and 5:

1. To identify the extent to which healthy food access metaphors (i.e., food deserts and food mirages) accurately represent the retail food environment in Toronto, Ontario.
2. To better understand how the consideration of economic access to food, inclusion of non-traditional food retailers, and measures of gentrification change the interpretation of geographic food access measures.
3. To explore how intersectionality can be considered in quantitative analyses of neighbourhood differences in access to food resources.
4. To conceptualize and recommend how planning can address place-based food access inequities due to socio-economic and cultural power hierarchies, particularly through a "food haven" framework.

1.3 Study Area Context: Toronto, Ontario, Canada

Toronto, Ontario, Canada was selected as a suitable case study site for this thesis due to its dynamic and multicultural population demographic, diversity of food retailers and culture, rapidly changing urban form, and leadership in enabling a healthy sustainable food system albeit a growing food insecurity problem. Additionally, several datasets are freely available through the Toronto Open Data portal that were used to draw insights and evidence for food access and food gentrification, such as DineSafe food retailer data and Business Improvement Area data.

Toronto is situated along the northwest shores of Lake Ontario and is Canada's largest metropolitan city. In the last census, Toronto's population was recorded at 2.7 million, of which 51.5% of residents identify as part of a visible minority[1] community (Statistics Canada, 2017). Toronto's population has grown steadily over the last few decades, and between 2011 and 2016, nearly 200,000 immigrants settled in the city and Toronto experienced an overall growth rate of 4.5%

[1] The term "visible minority" is defined by Canada's Employment Equity Act (1995) as "persons, other than Aboriginal peoples, who are non-Caucasian in race or non-white in colour." We use the term "racialized" throughout this paper other than when we refer to "visible minorities" as assessed by the Canadian Census.

(Statistics Canada, 2017). Approximately 70% of Toronto's adult population maintains some level of post-secondary education and the median household after-tax income is $58,264. However, 36.6% of residents spend 30% or more of their income on housing costs (Statistics Canada, 2017), leaving less allocated purchasing power to food procurement. The cost of nutritious food in Toronto has also risen by 28.9% in the last decade and nearly 1 in 5 Toronto households are food insecure (Toronto Public Health, 2019). In 2017, Camden et al. (2017) completed an assessment on the consumer nutrition environment of 257 midsize to large supermarkets in Toronto and found that while supermarkets are widespread across Toronto, differences in nutritious food prices exist between discount, ethnic, conventional, and specialty food stores. Toronto is also composed of 3,702 dissemination areas, 570 census tracts, and 140 city-recognized social planning neighborhood areas.

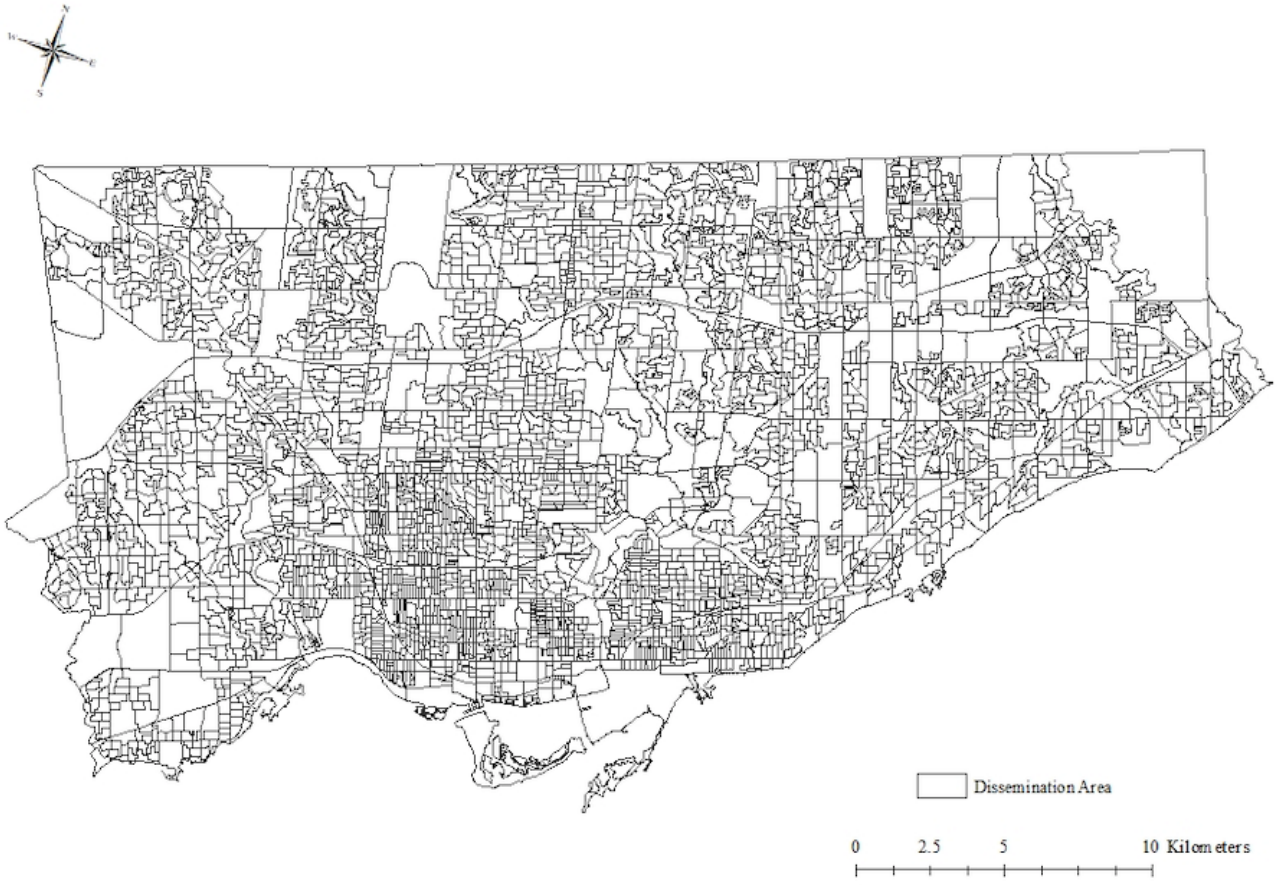

Figure 1.1: Map of dissemination areas in Toronto, Canada.

In 1991, the Toronto Food Policy Council (TFCP) was established as a subcommittee of the Board of Health to advise the City of Toronto on food policy issues (TFPC, n.d.). The TFPC is composed of councillors, communities, businesses, and urban farmers, and facilitates a forum for public-private sector partnerships to develop innovative and achievable policies and projects that promote healthy food access and sustainable food systems, including the development of the Toronto Food Charter (2001) (TFPC, n.d.). It is also cited as the "oldest food policy council in the world located in a major city" (City of Toronto, n.d., b). In 2010, the Board of Health approved a Food Strategy for Toronto and released the *Cultivating Food Connections: Toward a Healthy and Sustainable Food System for Toronto Report*, citing six priority areas for action, including supporting food-friendly neighbourhoods and urging federal and provincial governments in establishing food-focused policies (Toronto Public Health, 2010). The following year, the Toronto Strong Neighbourhoods Strategy (TSNS) (2020) began an equity strategy that applied the Urban HEART (Urban Health Equity Assessment and Response Tool) framework to measure how well Toronto's 140 city-recognized neighbourhoods are doing in terms of well-being across five domains, including healthy living (City of Toronto, n.d., d). 31 neighbourhoods were identified as Neighbourhood Improvement Areas (NIAs) in need of support and intervention, yet disparities within these large-scale regions exist. By 2018, the *Toronto Food Strategy Report* recognized food as an "important policy lever to promote health, well-being, and sustainability" (Toronto Public Health, 2018, p.3).

In the last decade, there have been several notable city and community initiatives at improving food access. In 2014, Toronto City Council adopted the Residential Apartment Commercial (RAC) zoning bylaw (approved by the Ontario Land Tribunal (previously the Ontario Municipal Board) in 2016), allowing for small-scale non-residential uses, such as food markets, shops, and cafes, among other community initiatives to operate on more than 400 apartment buildings sites that were previously residential-only (City of Toronto, n.d., a). Since 2015, Toronto Public Health's FoodReach program has increased healthy food procurement and collective purchasing power for vulnerable populations through two key initiatives: the Buying Portal (i.e., an online system for community organizations to order fresh fruit, vegetables, dairy, eggs and bread from a variety of suppliers at wholesale prices) and the Knowledge Exchange Portal (i.e., "a platform for community organizations to collaborate, share resources and menu ideas, access training materials, and learn more about healthy diets and the local food system" (Coleman, 2018, p.24)). Toronto also has mobile food markets serving low-income communities and strives to reduce food waste through

discounted “social supermarkets” (Toronto Public Health, 2018). Despite some significant contributions in achieving a more favourable food system, Toronto’s approach to food policy and intervention highlights the need for an evidence-based concrete action plan that addresses systemic and spatial inequities constraining food access at more precise geographic scales. Additionally, as RFEs evolve in gentrifying neighbourhoods, the potential effects on dietary health and displacement will require contemporary policy solutions that protect and enable residents’ ability to navigate and utilize food retailers in their communities.

Early examples of gentrification in Toronto occurred in the Cabbagetown, Riverdale, Player Estates, the Annex, and Yorkdale neighbourhood areas. These elite areas were in close proximity to rapid transit routes, large institutions, and urban amenities (Walks & Maaranen, 2008). By the 1970’s, gentrification processes in the city legitimized under Business Improvement Areas (BIAs), and by 2015, Toronto had the highest number of BIAs of any North American city (Takahashi, 2016). Among recent years, the latter effects of gentrification processes along *gentrification frontiers* (Walks & Maaranen, 2008) have been observed in neighborhoods including Little Portugal, South Parkdale, Leslieville, Little Italy, and Greektown on the Danforth, and in social mix project areas such as Regent Park (Epstein, 2018; Enright et al., 2019; Hackworth & Rekers, 2005; Komakech & Jackson, 2016; Takahashi, 2016). Researchers in Toronto have also found evidence of family-owned food shops, bodegas, and original grocery stores closing or being replaced by bar-based restaurants or cafes as a result of gentrification across several ethnic enclaves in the city (Epstein, 2018; Hackworth & Rekers, 2005; Enright et al., 2019; Takahashi, 2016). Taken together, these findings paint a picture of Toronto that is both progressive and concerned about the food system but still limited in understanding how urban processes can disrupt healthy food access.

Figure 1.2: Non-traditional food retailers across the west end of Toronto. Photos by Patrycia Menko.

1.4 Thesis Overview

This thesis is organized into six chapters, including this first one wherein the problem context, study area, and study purpose, significance, and objectives were introduced. Chapter 2 presents an overview of the literature review search strategy and a synthesis of extant scholarly work on RFEs, gentrification processes and the subset of food gentrification, and food access among different social identity groups (particularly of racialized and low-socio-economic status). Next, Chapter 3 details the philosophical worldviews that underpin this study, proposes intersectionality as the next progression in planning perspectives, and provides a high-level overview of the methods and ethical considerations undertaken across the two manuscripts. Chapters 4 and 5 are two contributing

manuscripts to this thesis; the former focused on identifying and mapping food deserts and food mirages in Toronto and exploring how gentrification processes constrain food access, and the latter investigating associations between neighbourhood-level intersectionality, healthy food access, and gentrifying areas using spatial and statistical analyses. Chapter 6 concludes by addressing the research objectives, offering a critical reflection on the data and findings from the research, and presenting recommendations for planning practice, theory, and research.

Chapter 2
Literature Review

2.1 Introduction

Both globally and in Canada, dietary risks comprise the largest share of morbidity and mortality risk factors (Afshin et al., 2017) and food insecurity is a continuously growing burden. Over the last decade, prevalence of obesity and type 2 diabetes have increased in Canada (Stevenson et al., 2019) and research has linked these outcomes to a poor diet with low fruit and vegetable consumption and high intake of sugary or high fat foods (Caspi et al., 2012; Kraft et al., 2020). When compounded by systemic barriers and place-based constraints over time, household food insecurity can also heighten mental health problems (Calloway et al., 2019; Tarasuk et al., 2019), create losses in economic productivity, and lead to greater health care expenditures (Ekwaru et al., 2017). While household food insecurity was unrelated to geographic food access in one study of low-income families in Toronto, Ontario (Kirkpatrick & Tarasuk, 2010), better understanding economic access to food from a geographic perspective and the link between the retail food environment (RFE) and population dietary intake may help to inform more nuanced food policy that support healthy, equitable, and sustainable food access for all households. RFE research is also useful in understanding how urban renewal moves through food retailers, particularly in a city like Toronto, Ontario where nearly 1 in 5 households are food insecure (Toronto Public Health, 2019) and the urban landscape is constantly changing (Hulchanski, 2010; Takahashi, 2016). For instance, Toronto experiences some of the greatest neighbourhood polarization consequences amongst Canadian cities, and mirrors global trends in heightened urbanization and metropolitan development – thus, understanding local geographies is established as important driver for reducing socio-spatial inequalities and achieving more just city outcomes (Bourne & Hulchanski, 2020). Moreover, the effects of poverty often interact with race/ethnicity and urban displacement and present additional barriers to food access. Recognizing intersecting spatial, socio-economic, and demographic interactions and power dynamics (i.e., intersectionality) can help identify true disparities when investigating food access inequities at the neighbourhood level.

The guiding objective of this literature review is to provide a synthesis of relevant scholarly research on the overarching topics of retail food environments, food gentrification, and intersectionality to better assess how interactions between these themes might constrain food access.

Where appropriate, findings are exemplified through research in Toronto to help frame the study site context. Following a section detailing the search strategy, literary findings are summarized and applied to broader questions of food access. Next, remaining gaps in knowledge are addressed, future research opportunities are debated, and a new RFE problem frame metaphor is proposed. This literature review concludes by justifying this thesis' research questions and by presenting a summary of the literature synthesis.

2.2 Literature Review Methodology

2.2.1 Search Strategy, Literary Sources, Screening Process, and Inclusion Criteria

The primary aim of the search strategy was to explore and review the current state of evidence and knowledge on RFEs, food gentrification, and intersectionality in food access studies to evaluate the impact of gentrification processes and mechanisms on food landscapes and population dietary outcomes. A second aim was to compare the methods used in previous research to better understand how RFEs are conceptualized and operationalized in a North American context, ideally within Canada. The third purpose was to assess differences in food access at the neighbourhood level through an intersectional lens, specifically considering the role of racial/ethnic and socio-economic power structures in the spatial distribution of food retailers. The final intention was to identify significant gaps in scholarship and research opportunities.

The predominant search engines and databases used to find a wide range of peer-reviewed journal articles include: the University of Waterloo library, Scopus, Google Scholar, and PubMed. A significant number of studies were found in journals from planning and public health disciplines, such as the Canadian Journal of Urban Research, International Journal of Urban and Regional Research, Journal of the American Planning Association, Journal of Planning Education and Research, Journal of Urban Health, Regional Science and Urban Economics, and BMC Public Health. Several other journals with a geographic lens were also considered, including Health and Place, International Journal of Health Geographics, and Urban Geography. Search query themes were that of retail food environments, food insecurity, food gentrification, gentrification, intersectionality. Search terms were organized by several search blocks (Table 2.1) and were often combined across themes to capture the breadth of literature and result in a comprehensive list of articles relevant to the topics. As the literature list grew, keywords used in relevant studies were also added to Table 2.1 and applied to

populate similar research. Several sources were also collected through peer recommendations, coursework, and from colleagues in the planning profession. Some studies were also found by reviewing the "Cited by" list of studies in databases that referenced key articles. Additional resources, such as municipal planning documents or the Business Improvement Area Handbook (Ministry of Municipal Affairs Ontario (MMAO), 2010), were found through Google searches to aid in understanding Toronto's land use structure and planning intervention and policy opportunities.

Table 2.1: Search blocks and search terms

Retail Food Environments	food environment OR retail food environment OR neighbourhood food environment OR food landscape OR food access OR store access OR food desert OR food mirage OR geographic access OR economic access OR neighborhood food environment OR healthy food OR nutritious food OR fresh food OR food consumption OR ethnic store OR grocery store OR supermarket OR food* store or outlet or retailer OR food shopping OR shopping patterns OR food* distance or proximity
Food Insecurity	household* food insecure or insecurity OR food secure or security OR diet OR dietary intake OR dietary outcome OR public health OR population health OR nutrition-related OR obesity OR diabetes OR BMI (body mass index) OR overweight OR cardiovascular disease OR fruit or vegetable intake
Gentrification / Food Gentrification	gentrification OR gentrified OR urban renewal OR urban change OR displacement OR food justice OR urban food OR social determinants OR spatial analysis OR geographic distribution OR urban form OR urban growth OR spatial patterning OR retail gentrification OR social mix OR ethnic neighbourhood OR Business Improvement Area OR ethnic enclave OR commercial gentrification OR retail gentrification OR race AND gentrification
Intersectionality	Intersectionality OR intersectional OR racial/ethnic* identity or status or composition OR socio-economic* identity or status or composition or factors OR low-income neighbourhoods OR Black food access OR Aboriginal or Indigenous food access OR racial food disparities OR poverty food disparities OR discrimination

Journal article titles and abstracts were reviewed from the search results during the initial screening stage. Articles were selected if they met any the following overarching considerations: the article was written in 2000 or later to support a contemporary synthesis of studies on a quickly evolving research area (however, older articles cited by scholars were referenced herein too); retail food environments or other local food contexts were discussed; dietary outcomes or nutrition-related diseases due to food access were measured; gentrification, food gentrification, commercial gentrification, urban renewal, or any other related terms were used to examine the potential of gentrification processes and mechanisms on food access; racial/ethnic, socio-economic, or social identities were considered, either collectively or as a unitary category; and/or if intersectionality at the population or neighbourhood scale was considered. Journal articles were also particularly of interest

if food desert or food mirages RFE problem frame metaphors were assessed to help make sense of healthy food access whereas food swamp focal studies were generally omitted considering that these marginalized areas are places saturated with unhealthy food retailers, such as fast-food outlets or convenience stores (Minaker, 2016).

2.2.2 Literature Review Matrix

Journal articles identified during the search process were reviewed in full, and additional studies were found by referencing in-text citations and reference lists in select studies. The search strategy was also applied several times and modified as needed to yield relevant articles as the thesis developed. A literature review matrix was created in MS Excel, wherein each column was a separate article and rows were different categories (or subtopics) of notes, to compile, synthesize, and document general characteristics of selected sources such as: article names, including author(s) names, year of publication, study location; study details, including methodologies and guiding research lenses; and study results, key findings, and conclusions. Any practical or theoretical implications of the studies, limitations, and future recommendations made by the authors were also noted in the matrix, as well as any personal notes or thoughts assumed by the researcher while conducting the review. When needed, a new subtopic row was added underneath the appropriate larger topic categorization section. The matrix was also organized into three themed Excel sheets – those being articles most relevant to the themed topic areas of RFEs, gentrification, and intersectionality. Naturally, there was some overlap across these themes, and thus, any interrelating articles were noted; however, this strategy helped control the research scope and ensured that the studies pertained and were specific to the overarching research questions and statements of inquiry. This method of organizing sources also provided a clear overview of each study and made drawing comparisons and areas of contention across articles efficient.

2.3 Key Findings in the Literature

2.3.1 Conceptualizing Food Insecurity and Retail Food Environments

Food insecurity is the limited, restricted, or uncertain ability to access adequate and nutritious foods, such as fruits, vegetables, and proteins, to support an active and healthy lifestyle and increase diet quality (Calloway et al., 2019; Willows et al., 2011). Food insecure populations often supplement their diets with greater intake of sugary or high fat foods (Caspi et al., 2012; Kraft et al., 2020) and in Canada, household food insecurity is distinguished by levels of severity, those being marginal,

moderate, and severe (Tarasuk et al., 2019). Food insecurity can be chronic or intermittent, and is disproportionately associated with poverty, low educational attainment, living in rental housing tenure, female lone-parent families with children under the age of 18 years, and reliance on social assistance, employment insurance, or workers compensation (Men et al., 2020; Tarasuk et al., 2019; Tarasuk & Mitchell, 2020; Stevenson et al., 2019; Wiebe & Distasio, 2016; Willows et al., 2011). Educational attainment is a particularly important risk factor, considering that individuals who've completed college degrees or higher studies have greater potential to acquire the financial resources necessary to afford healthier and more often expensive food items regularly (Anguelovski, 2016; Sullivan, 2014; Tarasuk et al., 2019).

While Tarasuk et al. (2019) and Tarasuk and Mitchell (2020) found that immigration is not an independent risk factor to food insecurity, Tarraf et al. (2017) previously contended that immigrant populations, notably recent newcomers, often experience high rates of food insecurity due to the enormous additional burdens of socio-cultural challenges and compromises they face and make. Some of these challenges include having limited English fluency and the lack of culturally appropriate food items available at conventional food retailers (Tarraf et al., 2017). Visible minority and Indigenous groups experience among the highest and persistent rates of food insecurity in Canada, particularly Black households (28.9%), followed by Indigenous (28.2%), Arab and West Indian (20.4%), other or multiple origin identities (16.7%), South Asian (15.2%), and East and Southeast Asian (11.3%) groups (Tarasuk & Mitchell, 2020). The probability of household food insecurity also depends on provincial or territorial political structures. According to the latest estimates from Tarasuk et al. (2019) and Fafard St-Germain and Tarasuk (2020), the prevalence of household food insecurity ranges from 11.8% in Ontario to 41.0% in Nunavut, however, Coleman et al. (2018) note that Toronto has the largest absolute number of food insecure households in any metropolitan city in Canada with approximately 12% of its population affected.

Previous research on population health and dietary intake largely assumed that intrapersonal factors, such as attitudes, knowledge, and lifestyle behaviours, are most responsible for influencing decisions about food purchasing and consumption (Winkler et al., 2020). While there is a large body of evidence to suggest these factors are important to food procurement and dietary intake, macro-level social and environmental contexts also profoundly shape, mediate, and even constrain food access, availability, adequacy, and intake across various population groups, and can even exacerbate

neighbourhood change (Moran, 2020; Raja et al., 2008; Winkler et al., 2020; Zenk et al., 2013). For instance, at the market and institutional level, regulations for commercial spaces can both valorize higher-end business development and burden smaller-scale ethnic retailer entrepreneurs (Sakızlıoğlu & Lees, 2020). To help make sense of these relationships, researchers embrace ecological conceptual frameworks that depict *community* and *consumer retail food environments* (RFEs), distinguished by the distribution and types of food sources within a community that result in the consumer experience while making food purchases (Glanz et al., 2005; Caspi et al., 2012; Koon et al., 2016; Winkler et al., 2020). Understanding trends and variations across neighbourhood RFEs is also critical to understanding urban socio-spatial divisions, inequalities, and inequities across cities. As Bourne and Hulchanski (2020) describe, neighbourhoods are subject to both rapid and gradual "exogenous (external) and internal (local) factors" (p.14) and strongly associated with many social, cultural, and economic networks. Collectively, these urban forces either stabilize spatial landscapes or lead to pervasive and wide-ranging physical and social transformations that ultimately affect all members of society, and consequently become defining emblems for how healthy, sustainable, and just a city is and reflective of how responsive and affirmative governments and structural systems are to addressing inequities (Bourne & Hulchanski, 2020).

Among recent scholarship, the *Retail Food Environment and Customer Interaction Model* by Winkler et al. (2020) captures different settings where food and drinks are purchased and consumed and conveys how multilevel components, actors, and processes, such as political structures and policies, economic systems, plus other built environment infrastructures mutually interact to produce important population outcomes, including food insecurity and food justice. For example, the authors also write that under the community RFE context, planning policies such as land use zones and transportation systems directly influence where food sources are located and how they are reached (Winkler et al., 2020). RFE frameworks also work to highlight gaps in knowledge and support robust cross-disciplinary research, particularly as urban landscapes change due to chronic metropolitan development, evolving housing and transportation patterns, and shifting sociodemographic characteristics of cities (Liadsky & Ceh, 2017; McKenzie, 2014; Moran et al., 2020; Winkler et al., 2020). Taken together, RFEs impact the availability (the spatial presence and number of food retailers, and the stock of nutritious food); accessibility (having the physical economic means to acquire food); adequacy (the cultural appropriateness of food stock); utilization (the ability to safely prepare healthy meals); and stability (the permanency of outlets and combination of food resources)

of food within a community or region (Calloway et al., 2019; Hillier et al., 2011; Minaker, 2016; Widener, 2018). RFEs are typically presented through "problem frame metaphors" that help operationalize and define RFE characteristics, distinguish conceptualizations from each other, and aid in quantitatively measuring and mapping these areas.

2.3.2 Measuring Retail Food Environments and Introducing RFE Problem Frames

To date, most food access research focuses on community RFEs (Liadsky & Ceh, 2017) and centres on the level of geographic (i.e., proximity and density) food access in an area (Minaker, 2016). Typically, researchers employ geographic information systems (GIS) techniques to assess network-based distances to conventional food retailers and map community RFEs based on one or both the following measures: (1) Density measures, the number of supermarkets or grocery stores within a defined radius (usually about 1000m); (2) Proximity measures, the mean distance from neighbourhood centroids to supermarkets or grocery stores (Apparicio et al., 2007; Behjat et al., 2013). Fewer scholars have explored economic dimensions of food access although some nuanced studies have linked area-level income and socio-economic status, food prices, and shelf space of healthy foods to spatial distribution patterns of different types of food retailers (Breyer & Voss-Andrea, 2013; Camden et al., 2017; Hillier et al., 2011; LeDoux & Vojnovic, 2013; Raja et al., 2008). Moreover, much of the food access research in North America homogenizes different types of food retailers and/or intentionally excludes non-traditional food retailers (e.g., speciality or ethnic grocery shops) from analyses on the presumption that food prices are relatively equivalent across retailers or that supermarkets and grocery stores offer the most competitive prices and therefore demand the most scholarly attention (Wiebe & Distasio, 2013).

In reality, however, ethnic shops are important sources of affordable and culturally acceptable foods (Anguelovski, 2016; Behjat et al., 2013; Komakech & Jackson, 2016; Ohri-Vachaspati et al., 2019). In one study of the consumer nutrition environment in Toronto by Camden et al. (2017), discount and ethnic stores had lower-priced fruits and vegetable prices compared to conventional or specialty stores, especially in areas with a greater proportion of lower-income residents. Several studies reveal that visible minority individuals face negative social interactions while shopping at non-ethnic shops, ranging from unfair treatment to discrimination and stigma (Odoms-Young et al., 2009; Winkler et al., 2020; Zenk et al., 2013); therefore, ethnic retailers also often moonlight as community hubs and help foster social bonds for immigrants, racialized, and low-income population

groups (Alkon & Cadji, 2018; Anguelovski, 2016; Komakech & Jackson, 2016; LeDoux & Vojnovic, 2013; Raja et al., 2007; Short et al., 2007; Tarraf et al., 2017). Furthermore, ethnic and other non-traditional food retailers, such as organic or local specialty stores, among other food retailers including cafes and restaurants, also manifest and anchor many urban transformations across neighbourhoods (Komakech & Jackson, 2016; Sakızlıoğlu & Lees, 2020; Zukin, 2008).

Whereas *healthy community RFEs* theoretically offer equitable access to affordable and adequate food retailers in a defined region (Minaker, 2016), and *food oases* describe neighbourhoods that have good access to a diversity of healthy food retailers (Short et al., 2007), two prominent problem frame metaphors exist that help in understanding how unfavourable and restricted localities can constrain healthy food access and contribute to forms of oppression. *Food deserts* are low-income neighbourhoods with inadequate geographic access to sources of nutritious foods (Apparicio et al., 2007; Breyer & Voss-Andreae, 2013; Minaker, 2016; Wiebe & Distasio, 2016). These areas generally have none, or very few, full-service grocery stores or food retailers that stock a diverse range of fresh and frozen foods, such as produce, dairy, and proteins, within their defined boundaries (Engler-Stringer et al., 2019; Widener, 2018). Conversely, *food mirages* are low-income or socio-economically disadvantaged neighbourhoods where grocery stores are abundant but costly, therefore economically unaffordable for households with low purchasing power (Breyer & Voss-Andreae, 2013; Minaker, 2016; Sullivan, 2014). The literature also finds that food mirages tend to have the highest rates of poverty, lowest household income levels, and highest evidence of social deprivation (Breyer & Voss-Andreae, 2013; Wiebe & Distasio, 2016) insinuating these areas would be of higher concern to researchers and municipal decision-makers, yet a literature review by Minaker et al. (2016) found that prior to 2016, Canadian literature on food mirages was non-existent. Similarly, both Rankin and McLean (2015) and Hubbard (2018) found scant research on commercial/retail gentrification and contend that this social problem has only recently been acknowledged in terms of its impact and influence in effecting neighbourhood change amongst planning and policy circles (as cited by Sakızlıoğlu & Lees, 2020).

Since 1998, food deserts were considered mechanisms by which poverty and social inequality could cause poor health (Cummins & McIntyre, 2002) and by the early 21st century, the phrase had been used variously by different researchers to describe inequitable food access (Walker et al., 2010). Most studies consider sociodemographic proxies to measure these RFEs, however, among recent

research, links between urban sprawl as a mechanism of food deserts were investigated in the USA (Hamidi, 2020). At both regional and neighbourhood (census tract) levels and controlling for sociodemographic characteristics, metropolitan compactness (i.e., urban density) decreased the odds of areas being food deserts, indicating that built environment characteristics and context are important indicators for RFE development (Hamidi, 2020). Widener (2018) also argues that the food desert metaphor is contemporarily limited and simplifies the issue of food accessibility to a binary. It remains popular in the literature because it is framed in a way that validates an actionable or policy solution, such as opening food stores in deprived neighbourhoods (Widener, 2018), yet this alternative does not always translate into improved healthy dietary consumption or increased use of that food resource (Bodor et al., 2008; Cannuscio et al., 2014; Cummins et al., 2014; Engler-Stringer et al., 2019; Larsen & Gilliland, 2008; Ma et al., 2018). At best, new supermarkets in food deserts may only increase awareness of food access rather than desired dietary intake and habit outcomes (Cummins et al., 2014; Engler-Stringer et al., 2019), and at worst, the semiotics of new or upscaled retail can even produce and intensify new areas of inequity (Anguelovski, 2016; Breyer & Voss-Andrea, 2013; Cohen, 2018; Sbicca, 2018). In response, nascent scholarly research has started to review the development and transformations of RFEs (Luan et al., 2015). In one study in Portland, Oregon, Breyer and Voss-Andreae (2013) theorized that gentrification processes directly contribute to the emergence of food mirages and that the extent of this process results in reconcentrated poverty in suburban areas and the beginnings of added suburban food deserts. Their considerations reveal how some RFE interventions can complicate and reinforce socio-spatial injustice and are similar to other commercial gentrification research findings on the premise that fewer affordable resources and constrained retail and housing choices in lower-income neighbourhoods lead to a "self-reinforcing process" (Bourne & Hulchanksi, 2020, p. 16) by which low-income populations eventually move and concentrate in more marginal locations with "fewer environmental and social amenities, often lower levels of accessibility and housing of lower quality" (Bourne & Hulchanski, 2020, p.16).

2.3.3 Gentrification: Commercial Gentrification and Food Gentrification

Gentrification has been central to Canadian planning and policy debates since the late 1990s (Takahashi, 2016). It operates under several mutually existing forms (i.e., commercial gentrification, residential gentrification, ethnic packaging, etc.) but is largely a ubiquitous phenomenon characterized by the rapid influx of resources, infrastructure upgrading, and sociodemographic shifts in traditionally disinvested neighbourhoods (Ding et al., 2016; Dixon, 2020; Takahashi, 2016).

Understanding the significance of gentrification as it relates to healthy food access relies on understanding Marxist political economy and how *creative classes* flow into urban centres (Sbicca, 2018; Florida, 2003). In the former system, political and economic actors (e.g., planners, politicians, developers, etc.) increase economic growth through land-use decisions and land-use commodities; in other words, neighbourhoods gentrify when a rent gap (i.e., a large gap between existing and potential land values due to policies that devalue land and allow denser development) attracts investors for revitalization and redevelopment in areas that historically faced disproportional decline and systemic segregation (Anguelovski, 2016; Hackworth & Rekers, 2005; Sbicca, 2018). As city enclaves or entire cities shift culturally, more talented, socially tolerable, and technologically savvy population groups (i.e., the creative class) move in and spur further regional economic growth resulting in a mixing of different, sometimes polarized, sociocultural and economic populations over residential spaces (Florida, 2003; Takahashi, 2016). In Canada, the term *social mix* is used to describe this process happening as a means to move away from the "negative" connotation that the term "gentrification" carries (Takahashi, 2016), yet critics stress that social mixing overlooks the value of communities with similar backgrounds creating prosperity and healthy relationships across urban space, particularly for non-dominant identity groups (Enright et al., 2019; Takahashi, 2016). The creative class and other incoming populations are also typically more affluent and privileged with higher household incomes, educational attainment, and social identity status, and can dominate and displace existing vulnerable residents when social relations become too divisive or when neighbourhood amenities and resources too expensive (Anguelovski, 2016; Ding et al., 2016; Dixon, 2020; Florida, 2003; Takahashi, 2016). That said, it becomes apparent and important to capture and discuss "revitalization" or "social mix" processes relative to what these processes accurately are – i.e., gentrification – to "effectively direct attention to class dynamics and the perspectives of those who are marginalized by upscaling processes" (Slater, 2006, as cited by Rankin & McLean, 2015, p.218).

Across North America, gentrification processes are also diffused through Business Improvement Areas (BIAs). BIAs are long-term planning solutions designed to strengthen partnerships between local entrepreneurs, businesses, property owners, and municipalities to promote economic development in a district and carry out physical improvements to help make an area cleaner, safer, and attractive (Ministry of Municipal Affairs Ontario (MMAO), 2010). BIAs were first established in the 1970s in Toronto, Canada (Takahashi, 2016) and Toronto now has the highest number of BIAs in North America with a total of 83 spatially distributed across the City (Takahashi,

2016; City of Toronto, 2021). While the functional strategies of these policy areas are conducive to economic gains, community building, and general beautification of neighbourhoods (MMAO, 2010), service revitalization projects and new developments can enunciate self-serving interests of entrepreneurs and property owners and reconfigure urban governance and surveillance (Enright et al., 2019; Hackworth & Rekers, 2005; Takahashi, 2016). Takahashi (2016) writes that "through BIA activities, especially on the BIA board, members of ethnic groups and gentrifiers inevitably come into contact with each other. Ideally, those from both groups are involved and establish harmony and consensus over various projects for neighborhood developments...[however,] according to Hackworth and Rekers (2005), some BIAs that have been recognized in ethnic neighborhoods in Toronto function as marketable branding mechanisms to produce nearby residential gentrification" (p.581), those specifically being Little Italy, Corso Italia, Greektown on the Danforth, and Gerrard India Bazaar (Hackworth & Rekers, 2005). Note that Hackworth and Rekers (2005) insist that these four BIAs are not the only BIAs in Toronto where an ethnic identity manifests through capitalism, but rather they are the only ones where a legal association of local businesses, property actors, and the City work collectively to serve in this capacity and catalyst a specific type of local character and system. These observations suggest that gentrification processes may not be exclusive to BIAs or any other intended zones. Indeed, gentrification effects and outcomes often spill over adjacent neighborhoods along *gentrification frontiers* as poverty reconcentrates into nearby pockets of the city (Enright et al., 2019; Walks & Maaranen, 2008; Smith, 1996). Taken together, regardless of the fact that BIA intentions and efforts are "rarely, if ever to promote the displacement of nearby residents" (Hackworth & Rekers, 2005, p.232), their outcomes may contribute to tense and unstable population dynamics (Hackworth & Rekers, 2005) if left unchecked to operate as deemed appropriate by entrepreneurs and non-local property owners.

Under both guiding mechanisms of gentrification, food retailers can serve as proxies for gentrification and new RFE patterns by enhancing local access to healthy food while making marginalized neighbourhoods more desirable, attractive, and competitive (Anguelovski, 2016; Dixon, 2020). The development of chain, specialty, or "boutique" (Zukin, 2009, p.48) food retailers and upscaling of food establishments can also send market signals that communities are changing and that select neighbourhoods are trendy, safe, and ready for further redevelopment and commercial investment that will subsequently upgrade public services and raise rents (Cohen, 2018; Dixon, 2018; Zukin, 2009). Anguelovski (2016) explains that this process of *supermarket greenlining* occurs when

health- or environment-focused high-end supermarket or specialty stores locate in disinvested or gentrifying areas that were previously predominantly serviced by non-traditional, individually owned shops. In other terms, supermarket greenlining is a clear departure from *supermarket redlining*, that is the historical disinclination of supermarkets locating in, or deciding to withdraw from, impoverished areas and opting to locate in suburban and more affluent neighbourhoods with already higher spending power (McKenzie, 2014; Zhang & Debarchana, 2016). Although some literature suggests that conventional stores can stabilize low-income areas by providing new or "better" shopping opportunities (Zukin, 2009) or increase business volume for some ethnic entrepreneurs through the demand for exotic food products (Sakızlıog˘lu & Lees, 2020), overwhelmingly, higher-cost food retailers in marginalized neighborhoods steal food purchasing choices and product selection from long-term, vulnerable residents. This often happens when incoming retailers threaten or out-compete existing food businesses, force retailers to cater to wealthier newcomers and outside clientele, and prompt economic burdens for small-business owners through soaring rental prices (Anguelovski, 2016; Cohen, 2018; Enright et al., 2019; Meltzer, 2016; Ong, 2020; Sakızlıog˘lu & Lees, 2020; Sbicca, 2018; Takahashi, 2016; Zukin, 2009). These sentiments are often echoed through community members and entrepreneurs living through gentrification across North American cities (Doucet, 2020), and also point to the complexity and intersectionality of race/ethnicity, social class, and commercial gentrification (Sakızlıog˘lu & Lees, 2020). For instance, in one study led by Doucet (2020), a local business leader in Midtown, Detroit conveyed she was "intimately aware of the contradictions inherent to [commercially-driven] gentrification, as well as the role her business has played in shaping uneven social and spatial change" (p.643) despite her intentions to alleviate some of the division through grassroots services. Additionally, these collective notions illustrate how a changing retail landscape can be a "double-edged sword" (Doucet, 2020) for food retailers who manage to sustain themselves under gentrification pressures and through those same processes they risk losing old customers and contribute to a catalyst of other negative social effects (Doucet, 2020; Sakızlıog˘lu & Lees, 2020; Zukin, 2009).

Further, waves of commercial gentrification parallel waves of residential gentrification and jointly manipulate and enable authenticity for new residents' needs and demands (Zukin, 2008). For instance, Hackworth and Rekers (2005) found that *ethnic packaging* through commercial activities and retail food development in BIAs Little Italy and Greektown on the Danforth resulted in commodified cultures and dramatic changes and contestations in the composition of business,

housing, and people in the neighbourhoods. Huse (2014) and Hubbard (2018) add that white privilege and class power mobilize through ethnic packaging in neighbourhoods, particularly through vernacular "authentic" styles that cater to incoming affluent groups and seize upon new retail capital opportunities, and thus, do not actually bring about social and economic distribution to lower-class ethnic minorities (as cited by Sakızlıoğlu & Lees, 2020). Ethnic packaging can be conceptualized as neighbourhood branding catering to consumption by tourists and gentrifying, affluent, non-ethnic populations (Hackworth & Rekers, 2005) and speaks to the complexity of commercial and retail food development, food retailer survival, and food access for racialized population groups (Sakızlıoğlu & Lees, 2020; Rankin & McLean, 2015). Thus, investigating and interjecting these issues of commercial gentrification requires the recognition of the racialized dimensions of these processes, how they retain urban spatial inequality, and the extent to which they render dietary demands and needs of lower-class ethnic minorities to near invisibility (Rankin & McLean, 2015). Taken together, these sensibilities demonstrate *food gentrification* wherein low-income and minority residents are left with reduced access to reasonably priced food, nearby food retailers that feel "culturally alien" (Sullivan, 2014, p.31), and with heightened feelings of social exclusion (Anguelovski, 2016).

The term food gentrification was first coined by African American feminist writer Mikki Kendall in 2014 on the social media platform Twitter (Sbicca, 2014). Food gentrification research is an emerging subset of gentrification studies, particularly that of commercial gentrification, and is often applied through a food-justice lens. It has been typically thought of either the appropriation, commodification, or "upscaling" of select cultural food items by white middle- to upper-class customers to suit alternative healthy food practices whilst jeopardizing purchasing exclusion for low-income and racialized households (Sbicca, 2014), and in a 2020 literature review, Ong identified two other overarching conceptual and empirical theories linking to mechanisms of food gentrification: (1) increased costs of living resulting in decreased household expendable income allocated to food purchasing, and (2) the replacement of affordable food options (e.g., discount or ethnic grocers) with specialty stores, restaurants, and markets due to changing consumer demands. More generally, food gentrification illustrates how privileged and affluent residents discursively influence food access and contribute to the evolving spatial arrangement of wealth and resources across cities and demands new ways of exploring gentrification across metropolitan landscapes (Anguelovski, 2016; McKenzie, 2014; Sbicca, 2018). In light of these findings, Komakech and Jackson (2016) found that specifically protecting small ethnic retail grocery stores (SERGS) from redevelopment and closure can help

ameliorate gentrification impacts while also sustaining neighbourhood identity, yet issues specifically surrounding food gentrification have yet to be explicitly explored among Canadian contexts.

As suggested above through ethnic packaging, race and ethnicity are also major components of gentrification, as the communities that tend to get displaced are disproportionately racialized (Anguelovski, 2016; Komakech & Jackson, 2013; Sbicca, 2018; Zhang & Debarchana, 2016). Other social identity positions are also of significance within this realm. In a recent systematic review of intersectionality and consumer food purchasing, Singleton and colleagues (2020) found that few studies to date examined how intersecting socio-political and cultural factors, such as race/ethnicity, socio-economic status, and, geographic location, intersect to intercept consumer food purchasing but many studies consider these factors separately. Some of their future research recommendations include assessing the relationship between food purchasing and community-level factors, such as economic deprivation or gentrification displacement, determining how systemic and structural racism influence food purchasing, and measuring geographic differences in purchasing patterns and opportunities. Thus, known outcomes of gentrification and food gentrification reflect an insistent need to address how these processes constrain food access and respond to wider questions of social inequity, urban development, dimensions of spatiality, and even the salience and paradigms of intersectionality. As Doucet (2020) says: "the sentiment [is] less of 'how do you stop this change from happening', but rather how to manage it and ensure that the market remains a functioning food space where people from all walks of life can still get access to good quality, affordable food" (p. 642).

2.3.4 Intersectionality, Incorporating Intersectionality into Quantitative Research, and Food Access Findings

Intersectionality is an explanatory conceptual framework aimed at understanding the complexities surrounding social determinants of health, unequal and multilevel power distributions, and how these social constructs result in health inequities (Caiola et al., 2015; Crenshaw, 1989). First coined by African American scholar Kimberlé Crenshaw, intersectional research developed in the late 1980s and early 1990s to capture how intersecting social and economic identities, such as race, class, and gender, are rooted in history, geographic location, and macro-level contexts (i.e., policies, rules, or laws) that structurally, systemically, and interdependently amplify dissonance between groups (Bauer, 2014; Berger & Guidroz, 2009; Caiola et al., 2015; Crenshaw, 1989; Hankivsky, 2012). A core

epistemological assumption of intersectionality is that no one social category or identity takes primacy and resolutions should be from the perspectives of the oppressed and marginalized (Caiola et al., 2015). However, considering that intersectionality evolved from multiple disciplines (Caiola et al., 2015) and that its implementation largely lies within qualitative health research (Bauer, 2014), incorporating intersectionality into unchartered place-based food access quantitative research can result in methodological complexities. For example, Bauer (2014) writes that "without an emphasis on intervenable processes or policies, a quantitative intersectionality focused purely on intersecting identities or positions would run the risk of continuing to reinforce the intractability of inequity, albeit in a more detailed or nuanced way" (p.12). She continues to argue that members of marginalized groups cannot and do not easily stratify and pinpoint the types of oppression specific to each part of their identity or experience, and therefore, each assessment must be relevant and sensitive to population-scale questions in intersectionality research. Yet, policies and institutional practices that manifest privilege and discrimination also do not often reveal at the individual level, therefore, population-scale intersectionality approaches may very well contribute existing qualitative knowledge and can be compatible with ecological frameworks on food access if thoughtfully designed and implemented (Bauer, 2014; Singleton et al., 2020). Considering that planning decisions can also either emancipate or consolidate existing inequities in communities and regions (Broto & Alves, 2018; Martinez-Palacios, 2017), quantitative intersectional studies would also ideally promote evidence useful in neighbourhood-level interventions, such as policy changes, applicable to affected communities (Bauer, 2014).

Although there is limited conformity in terms of quantitative methodological approaches in intersectional research, there are several key findings among the studies that do exist that attempt to apply conceptualizations of intersectionality. McCall (2005), for example, is one of the earliest scholars to contemplate *how* to study intersectionality methodologically. She proposes three scaled research approaches in exploring the complexity of intersectionality in social life, two of which are best suited for qualitative research – the *anticategorical complexity* and the *intracategorical complexity* – and one that is most appropriate quantitative work – the *intercategorical (categorical) complexity*. The main premise of the intercategorical complexity is to "explicate" relationships of inequity among social groups through the provision of categories (McCall, 2005). Trygg et al. (2021) add that this approach focuses on interactions between groups and the consequences that uncover from belonging to one group over another. In their study, Trygg and colleagues (2021) applied the

"joint disparities" or "joint intersectionality equality" methodology by Jackson et al. (2016) (corresponding with the intercategorical approach) wherein intersectional inequalities in mental health were estimated across four mutually exclusive intersectional positions on an additive scale (obtained from different combinations of dimensions of inequality (i.e., gender, income, education, occupation, country of birth, and sexual orientation)). Other examples of intercategorical intersectionality approaches include Canadian research from Veenstra (2011), who contends that while some social identities may be more relevant under a specific social context or outcome than others, simultaneity in intersectionality implies that axis of inequality should not be reduced to individual measurable attributes, but rather, "multiplicativity" and "multiple jeopardy" should support additivity. Thus, Veenstra (2011) considered four intersecting identities (race/ethnicity, gender, class, and sexual orientation) across two analytical strategies, additive and multiplicative. Further, and among more novel approaches, Seng et al. (2012) modelled intersectionality across structural, contextual, *and* interpersonal levels, consistent with a social-ecological framework. Specifically, the scholars considered several interpersonal identities (e.g., race/ethnicity, gender, sexual orientation, pregnancy status, etc.), used low education and poverty as proxies for structural factors, and included neighbourhood crime rates, trauma exposure, and racial minority status as contextual outcomes to assess adverse population health effects due to discrimination and other social processes. In her review of challenges in intersectional methodologies, Bauer (2014) found several other scholars that applied quantitative strategies to intersectionality across various disciplines, including epidemiology and psychology. Nonetheless, these studies point to the frequency of quantitative intersectionality research across populations, while bypassing opportunities to address intersectionality at the neighbourhood level. Moreover, applying intersectionality to food access and gentrification research is novel despite disparities in healthy food access across different social groups being well documented in cross-sectional analyses (Ohri-Vachaspati et al., 2019).

Scholars in food access studies rarely explicitly use the term "intersectionality", yet it is reasonable to assume that studies that focus on neighbourhood-level associations between food access and identity, such as race/ethnicity or socio-economic position, fall under this category even though previous research had not yet elucidated this issue. Generally, scholars have found that non-white visible minority neighbourhoods, particularly predominantly Black and Latino or Hispanic areas, have poorer access to food, meaning lower density or longer distances to healthy food retailers and higher access to unhealthy food outlets (del Canto et al., 2015; Jeong & Lui, 2020; Powell et al.,

2007; Raja et al., 2008; Short et al., 2007; Ohri-Vachaspati et al., 2019). Across the US, chain supermarket availability in African American neighbourhoods was found to be about half that in white neighbourhoods (Powell et al., 2007). In one study by Lamichhane et al. (2013), predominantly black population census block groups had 60% lower odds of having supermarkets compared to predominantly white population block groups. Another by Raja et al. (2008) showed that Black neighbourhoods had nearly half the number of supermarkets and meat and fish markets compared to predominantly white neighbourhoods within a 5-minute walking distance, after adjusting for neighbourhood area, population, and median household income, highlighting exacerbated inequities in food access for this identity group. However, food access conditions in visible minority neighbourhoods are mixed, even among studies comparing similar urban forms, and disparate findings making it a complicated topic to generalize. For instance, Wang and Qiu (2016) found that visible minority neighbourhoods had higher access to food outlets in in Edmonton, Canada. Among other Canadian literature, Wang et al. (2016) found that in Regina, Saskatchewan, dissemination areas (DAs) with a high rate of minority groups have high access to fresh food retailers and local grocery stores but in Saskatoon, Saskatchewan, DAs with a high rate of minority groups scatter while fresh food retailers tend to cluster in certain regions, thus no patterns can be identified. A considerable number of studies also found that smaller non-chain supermarkets and grocery stores tend to be more prevalent in minority neighbourhoods (Powell et al., 2007; Raja et al., 2008; Wang & Qiu, 2016; Wang et al., 2016), yet the degree to which these food outlets are sufficient depends on the consumer nutrition environment and food prices within these retailers (Raja et al., 2008).

In contrast, some research has shown that the availability and/or accessibility of healthy food retailers does not vary by predominantly racial/ethnic minority neighbourhoods, but instead has to do with socio-economic means. Bower et al. (2014), for example, found that as neighborhood poverty increased, supermarket availability decreased and grocery and convenience stores increased, regardless of race/ethnicity. Among other studies that focus on socio-economic position and neighbourhood status, substantial research has demonstrated that lower socio-economic status neighbourhoods tend to have poorer access to healthy food retailers, particularly in terms of proximity and density resulting in food deserts (Apparicio et al., 2013; Bower et al., 2014; Breyer & Voss-Andrea, 2013; del Canto et al., 2015; Freedman & Bell, 2009; Kraft et al., 2020; Lamichhane et al., 2013; McKenzie, 2014; Wiebe & Distasio, 2013; Zenk et al., 2013). For example, Lamichhane et al. (2013) found that affluent census block groups characterized by higher household income, housing

value, proportion of an educated population, and a lower proportion of the population living below federally defined poverty had a greater number of supermarkets. Living in a neighbourhood with higher poverty and low socio-economic position is also associated with a lower quality of fresh produce (Zenk et al., 2013) and marginalized neighbourhoods are also more likely to be characterized as food swamps (McKenzie, 2014; Minaker, 2016). Typically, this means that disadvantaged groups must expend greater costs and resources to obtain healthy food (LeDoux & Vojnovic, 2013; McKenzie, 2014; Wiebe & Distasio, 2013), such as by spending more money on transit or taxi options (Larsen & Gilliland, 2008), relying on others for personal vehicle access to shop outside of their neighborhood food environment (Cannuscio et al., 2014; Ma et al., 2008), or by succumbing to purchasing unhealthy food at closer convenience stores (McKenzie, 2014). Food sources in high-poverty areas may also have short survival lengths (Filomena et al., 2013). In a longitudinal assessment of changes in the food environment in New Jersey by Ohri-Vachaspati et al. (2020), the prevalence of convenience stores declined in the lowest-income and highest-minority neighbourhoods, perhaps due to decreasing buying power of nearby residents, whereas supermarket development significantly increased in middle-income tracts. Their findings suggest that even amongst stores where snack foods are ubiquitous and healthy foods are scare, socio-economically marginalized social groups face worse overall food access.

In line with contentious findings from racial/ethnic perspectives, research examining socio-economic differences in food access have also found disparate results. Interestingly, in Canada, studies typically demonstrate comparable or better overall access to supermarkets in lower income neighbourhoods relative to affluent/predominantly white neighbourhoods (Minaker et al, 2016). For example, a study by Polsky et al. (2014), found that in 2008, the most deprived neighbourhoods in Toronto contained twice the number of expected healthy food retailers, including supermarkets, grocery stores, and fruit and vegetable shops after being adjusted for urban form factors, thus adding to the complexities in generalizing research and identifying patterns. Nonetheless, the effects of poverty and socio-economic status often interact with race/ethnicity, making it difficult to disentangle these social identities from each other in intersectional work. The benefits of using an intersectional lens in food environment research is that it provides a more comprehensive and sensitive understanding of complex region-wide issues under study and can lead to relevant community and political solutions (Odoms-Young et al., 2009).

2.4 Remaining Gaps in Knowledge and Future Research Opportunities

The literature review provided a comprehensive look at how unfavourable or inequitable RFEs can constrain healthy food access for vulnerable populations and the cascading effects of gentrification processes on food retail access. Considering that neighbourhood food environments are dynamic and reflect evolving local, provincial, and national trends, researchers and decision-makers may face significant challenges when considering practical and effective future study directions and mediations oriented at improving equity and poverty. This next section explores remaining gaps in knowledge, highlights recommendations suggested in extant research, and debates on the appropriateness of food access and food gentrification research in Toronto in tandem with planning practice. Three overarching themes guide this reflection, the first covering inconsistent methods in research, the second reviewing typologies of "healthy food environments", and the third addressing this research as a highly topical issue of the moment albeit subject to sudden urban changes.

While there are some distinct trends in food access across social identity groups, over 500 measures of the food environment exist (Minaker, 2016), thus the overall reproducibility and generalizability of research is limited in the absence of standardized measures (Caspi et al., 2012). Study areas vary in size and urbanity and a significant amount of research focuses on non-randomized strategically selected neighbourhoods rather than entire city landscapes (Behjat et al., 2013; Hackworth & Rekers, 2005; Epstein, 2018; Short et al., 2007; Sullivan, 2014; Takahashi, 2016). Scholars also alternate between different geographic boundaries, such as census tracts (Bower et al., 2014; Ohri-Vachaspati et al., 2019), dissemination areas (Wang et al., 2016), and even sinuous ethnic enclaves (Epstein, 2018; Hackworth & Rekers, 2005; Takahashi, 2016). Characterizing food price variation also requires careful measurement, given that food affordability is a difficult concept to capture, and Breyer and Voss-Andrea (2013) write that "no single price level captures the term's meaning for all demographics since affordability must be tied to incomes, budget constraints, and, to some extent, preferences" (p.137). Another area requiring attention is the different proxies of racial/ethnic composition in the literature. Consider, for example, that some studies define neighbourhood racial/ethnic predominancy as greater than 80% (Lamichhane et al., 2013), others as greater than 60% (Bower et al., 2014), and still others as greater than 50% (Ohri-Vachaspati et al., 2019). As such, differences in assessments cannot be overlooked given that they suggest inconsistent program or policy outcomes with varying degrees of observed effectiveness (Minaker, 2016). Accordingly, there is both room and need for more considerate methodologies that are relevant to

wider contexts, especially if the intended goals of research are to be applicable to other cities of both similar and different composition. Further, approaches to modelling intersectionality in quantitative studies are still emerging, and the substantial differences between approaches point to the complexity in conceptualizing and operationalizing best fit solutions to apply intersectionality at neighbourhood level.

Second, as mentioned above, extant RFE research tends to exclude non-traditional retailers from analyses despite being sources of affordable and cultural food for racialized groups and low-income residents and fostering a sense of place and identity for visible minorities (Alkon & Cadji, 2018; Anguelovski, 2016; Behjat et al., 2013; Komakech & Jackson, 2016; Ohri-Vachaspati et al., 2019; Raja et al., 2007; Short et al., 2007; Tarraf et al., 2017). Omitting these retailers underestimates the actual density of healthy food in a neighbourhood as well as possible food shopping patterns and homogenizing different types of outlets overlooks the social equity value of food retailers as important third places (LeDoux & Vojnovic, 2013; Enright et al., 2019; Kraft et al., 2020). These findings suggest more critical research and activism in support of small, low-cost, ethnic retailers and other specialty local food stores and how they assign meaning to places, especially as the risk of these retailers closing or displacing manifests under gentrification, and their ability to anchor urban transformations across neighbourhoods. Better understanding contrasts and relationships between traditional and non-traditional food retailers may also serve to better understand ethnic politics of commercial gentrification, as well as simply acknowledging the role non-traditional retailers play in effecting neighbourhood change and considering their disappearances and replacements as social problems (Zukin, 2009).

In one study by Anguelovski (2016), a Latino food venue in a multiracial neighbourhood represented “a community, a neighbourhood and a safe haven” (p. 1209) before being replaced by a Whole Foods. Anguelovski’s (2016) use of the word haven is rather ominous and can even be applied towards the conceptualization of a new RFE problem frame metaphor that I have termed as a *food haven.* Food havens differ from food oases in the sense that havens specifically benefit the most vulnerable members of society and where residents, local ethnic retailers, and other non-traditional food outlets are intentionally promoted and politically protected from displacement. Since I conceived the term food haven in 2020 whilst reflecting on extant literature, one article by Tonumaipe’a et al. (2021) was published that used the term and officially posited food havens as fluid places, settings,

and sanctuaries of food refuge and optimal well-being, including geographic areas, homes, schools, places of work, churches, and healthcare facilities. Tonumaipe'a et al. (2021) write:

> "[A food haven is] a space or place where people have high availability of healthy food and beverages that are accessible, convenient, affordable, and desirable. The food haven implies that for those most vulnerable to adverse effects found in food swamps, food deserts and food mirages, there may be places of sanctuary where healthy food options are accessible, convenient, affordable and desirable irrespective of socio-economic status. We recognize the important value of indigenous knowledge, particularly in encapsulating deeper meanings concerning what is meant by 'space' and 'place' within the food haven definition." (p.6).

The authors illuminate the importance of including non-dominant social identities in the process, much like intersectionality demands that resolutions be stated from the perspectives of the oppressed (Caiola et al., 2015). Applying an intersectional lens in planning and food access research can also, hopefully, situate equity and diversity more explicitly into practice and advance reconciliatory work through policies, regulations, and interventions while minimising future social repercussions of these decisions and actions. Moreover, Tonumaipe'a et al.'s (2021) critical review on food environment metaphors demonstrates that other researchers have also been critically reflecting on how to pursue this discipline of scholarship to provoke more sustainable and healthy food environments, yet in my use of the term, I explicitly include food gentrification as an important consideration, given that gentrification is of great planning concern.

Finally, food gentrification research is also contingent on the fact that urban landscapes are constantly evolving. Socio-economic shocks and waves, such as a recession and its subsequent recoveries, can accelerate gentrification processes and correspondingly changes to RFEs (Sbicca, 2018; Winkler et al., 2020). Without accounting for chronically evolving land-use and sociodemographic patterns, research like this might be too little too late for practitioners who wish to draw upon evidence to promote best practice. This criticism also admittedly underlines the slow and bureaucratic planning process and the challenges between the parallel worlds of academia and the public and private sector. In practice, these groups often find it difficult to connect despite shared goals, and the "significant barriers inhibiting easy [research] access and comprehension...the abstract and conceptual manner in which planning issues are discussed in academic forums...and the degree of convenience and expediency in being able to access research data and conclusions...affect how much

research is actually used in practice" (Goodman et al., 2017, p.3). Ong (2020) also writes that multiple authors, including Tornaghi & Van Dyck (2015), call food work a "talk-plus-walk" approach" (p.23) in which academics need to "stay engaged in the movement or practice on the ground as well... to fundamentally address urban food security issues... and unpack complex forms of privilege" (p.23). Considering the varied and complex ways that food issues are embedded in society and quality of urban life and the increasing number of calls for planners to address the food system and healthy equitable food access in urban areas (CIP, 2018; Lytle & Sokol, 2017; Mui et al., 2021; OPPI, 2011; Short et al., 2007), academic researchers needs to explore and focus on tangible and contemporary urban food issues so that scholarship effectively contributes to transformative planning agendas whilst avoiding creating a literary utopia.

2.5 Research Questions

As noted earlier in Chapter 1, this study is led by following four research objectives that will positively contribute to food planning scholarship and planning practice in the study context of Toronto, Ontario:

1. To identify the extent to which healthy food access metaphors (i.e., food deserts and food mirages) accurately represent the retail food environment in Toronto, Ontario.
2. To better understand how the consideration of economic access to food, inclusion of non-traditional food retailers, and measures of gentrification change the interpretation of geographic food access measures.
3. To explore how intersectionality can be considered in quantitative analyses of neighbourhood differences in access to food resources.
4. To conceptualize and recommend how planning can address place-based food access inequities due to socio-economic and cultural power hierarchies, particularly through a "food haven" framework.

Specific sub-questions will be addressed through the following two manuscripts:

- **Manuscript 1, Chapter 4: Food Deserts and Food Mirages in Toronto, Canada: Interactions between retail food environments and gentrifying areas**
    1. Which problem frame (food deserts or food mirages) seem most appropriate for the current retail food environment at the dissemination area level in Toronto?

2. What is the link between gentrification and food access in Toronto? To what extent does gentrification intersect with the retail food environment in Toronto, specifically with the existence of food mirages?

- **Manuscript 2, Chapter 5: Associations and Interactions between Neighbourhood-level Intersectionality, Healthy Food Access, and Gentrification in Toronto, Canada: Modelled using linear regression and binary logistic regression**
    1. What are the racial/ethnic and socio-economic differences in neighbourhood food access (proximity measured by mean distance in kilometres and density) to differently priced food retailers in Toronto?
    2. What are the differences in food access between gentrifying and non-gentrifying census tracts in Toronto? Do these disparities in access differ by racial/ethnic and socio-economic neighbourhood identity?
    3. What are the racial/ethnic compositions of food deserts and food mirages in Toronto? Are racialized populations more likely than non-racialized populations to live in food deserts and food mirages?

2.6 Summary

This section reviewed conceptual and empirical links between food insecurity, retail food environments, food gentrification, and intersectionality. Literary conclusions emphasize the value of standardized methodologies, the inclusion of a diversity of types of food retailers, and a continued consideration for racial/ethnic and socio-economic identity differences in food access. At the local level, continuing urban change in North American cities validate the need for more nuanced food gentrification studies to mitigate displacement effects and to impede on power differentials rooted in geographic locations. Remaining gaps in knowledge within the topic areas were discussed and applications for the newly posited food haven RFE metaphor were debated. Reflecting on the literature, several critical research questions were proposed through an intersectional lens to better understanding how food gentrification processes facilitate food access in Toronto, Canada.

Chapter 3
Research Methods Overview

3.1 Introduction

This chapter describes the research approach taken to assess the retail food environment, food gentrification, and healthy food access among different social identity groups in Toronto, Ontario. A predominantly postpositivist and transformative quantitative approach was chosen as the most appropriate and effective exploration and execution of scholarship, and this thesis is designed with an intersectional lens in mind. The approach involved several methodology decisions at different periods of the study, including thinking about the philosophical assumptions about research I brought to the study and the critical philosophies and planning perspectives I chose to guide the work in the early stages. In the research methods section, an overview of the research design and data generation are described accordingly, followed by a discussion on the analysis techniques used to answer the statements of inquiry and corresponding research questions within each manuscript. Next, ethical implications and limitations of the research are provided, supported by a reflection about my efforts to address them and my concerns as a non-visible minority individual leading this project. The methods chapter concludes by highlighting strengths of the study and introducing the two manuscripts.

As noted in the previous chapters, the research objectives are: 1) To identify the extent to which healthy food access metaphor (i.e., food deserts and food mirages) are accurately reflected in Toronto, Canada: 2) To better understand how the consideration of economic access to food, gentrification, and inclusion of non-traditional food retailers change the interpretation of geographic food access measures: 3) To explore how intersectionality can be considered in quantitative analyses of neighbourhood differences in access to food resources: and 4) To conceptualize and recommend how planning can address place-based food access inequities due to socioeconomic and cultural power hierarchies, particularly through a “food haven” framework.

3.2 Philosophical Paradigms and Perspectives

3.2.1 Guiding Philosophical Paradigms: The Postpositivist and Transformative Worldviews, supported by the Pragmatic Worldview

Creswell & Creswell (2018) use the term *philosophical worldview* to describe a set of beliefs and values about the world (i.e., paradigms) that influence the types of research that researcher's conduct. They contend that worldviews develop based on discipline orientations and help explain why researchers employ and justify certain research methods. Farthing (2016) also writes on paradigms, adding that in recent years, planning scholarship has evolved to focus on "achieving certain environmental and social goals rather than on research and theory building per se" (p.16). Overwhelmingly, planning research now exists in a "post-positivist or post-empiricist phase" (Farthing, 2016, p.16) in which academics acknowledge the significance and role of values in research and wherein research can powerfully contribute to political discourse. In light of these theories, two major worldviews shepherd this thesis albeit they are also considerably supported by a third: the *postpositivist* and *transformative* worldviews are braced by the *pragmatic* worldview. In the sections below, basic ideas of all three paradigms are made clear and then later connected to the research approach.

Creswell & Creswell (2018) write that postpositivism challenges "the traditional notion of the absolute truth of knowledge" (p.6). Planning researchers now recognize that we cannot be certain about our claims of the social world, especially if the interpretation of data is subject to fallacies and skepticism and if knowledge and reason are socially constructed (Creswell & Creswell, 2018; Farthing, 2016). Considering that urban environments are fluid and unstable, postpositivist research is also "the process of making claims and then refining or abandoning some of them for other claims more strongly warranted" (Creswell & Creswell, 2017, p.7). This worldview contends that causes *probably* determine effects or outcomes but the laws and theories that govern the social world demand constant revision.

By the 1980's, the transformative worldview arose to address and confront issues of power and social justice, discrimination, and oppression (Creswell & Creswell, 2018). It holds that research inquiry should place central importance on advancing a social change agenda, particularly for marginalized and disenfranchised groups and individuals in society facing issues of inequality,

suppression, and alienation (Farthing, 2016). In studying systemic power relationships among these groups, researchers posit that people live in "multiple social realities" and accordingly, there are "multiple truths" (Farthing, 2016, p.20) that warrant investigation and a voice in policy debates. However, there remains some disenchantment and concern among planning academics that powerful groups and decision-makers can ultimately underpin research by discrediting methodologies or by distorting results to divert from solutions (Farthing, 2016). Thus, another paradigm stands that also considers how urban phenomena can be explored.

The pragmatic worldview conveys the importance of pluralistic approaches to derive knowledge. There are many forms of this philosophy but a basis for its research is that it "truth is what works at the time...[and] research always occurs in "social, historical, political, and other contexts" (Creswell & Creswell, 2018, p.11). In this way, pragmatic research is "reflective of social justice and political aims" (Creswell & Creswell, 2018, p.11) and can accurately explain social issues from the perspectives of the people who live the experiences. Although pragmatism is typically integrated into mixed-methods studies, quantitative research (like the research described in this thesis) can benefit from this worldview by employing a variety of methods and techniques that help to best explain the manifestation of social problems, a stronger ability to analyze complex outcomes, and the opportunity to devise informed and practical solutions (Creswell & Creswell, 2018).

3.2.1.1 Intersectionality as a Research Lens and Planning Perspective

As mentioned in Chapter 2, intersectionality is a conceptual framework aimed at understanding how particularly identities and conditions are located within structures of power, history, and geography (Caiola et al., 2015). Intersectionality is rooted in critical feminist theory and its philosophical underpinnings make it a transformative paradigm. Bauer (2014) explains that recent quantitative studies have worked to address challenges in incorporating intersectionality into population health research methodology, largely citing issues in linguistics, measurements, and analysis. However, she further states that "each challenge also presents an opportunity to improve the quality of research, particularly with regard to its potential to more accurately document health inequalities, and to identify causes of these inequalities and their potential solutions" (Bauer, 2014, p.12). Much unrealized potential also exists in bridging intersectionality and planning research and creating a methods template for future food access studies.

Intersectionality can also be thought of as the next progression in planning perspectives, closely following advocacy, equity, and humanist models. While no one planning theory is a substitute for another, Whittemore (2015) describes that advocacy planning developed in the mid 1960's as a countermovement to the radical comprehensive approach. He describes advocacy planning as the "most evident in calls for planners to question their conventional habit of thinking about the public in the abstract" (p.80) and through doing so, reflect on the real effects planning decisions have on real people. Advocacy planning swiftly evolved into equity planning, wherein planners specifically advocate for the interests of marginalized groups and individuals. By the mid-1970's, humanist planning had widespread, however, some evidence suggests the humanist mainstream was already well deployed by then. Indeed, Jane Jacobs is regarded as the first "humanist" in academic planning circles given her influence by the late 1960's (Whittemore, 2015). The humanist model is sometimes referred to as the phenomenological approach, and its premise is that notions of progress in cities should orient to people and fundamentally address human needs (Good et al., 2017). However, urban systems and city needs are complex. Competition for resources and amenities, social cohesion, and political and public space between actors and population groups are ubiquitous, and as urban landscapes shift, new patterns of disproportionate inequity can spawn or consolidate. Thus, for the quantitative planning researcher, intersectionality as a perspective opens the door to more profound analyses of socio-spatial inequity and oppression in cities. This lens of research is also in line with contextually evaluating urban forces that lead to differences in access and exclusion and lends a voice and platform to the marginalized and vulnerable.

3.2.2 Ontology and Epistemology

In accordance with these perspectives, this body of RFE and food gentrification research engages with socio-economic issues of inequity and food injustice. It has several theoretical and practical implications for planning research and practice by capturing the complex ways multilevel power dynamics at the population and neighbourhood level relate to healthy food access. Specifically, the ontology of this study is that current food access studies do not go far enough to advocate and support healthy food access and food security in mixed-use, mixed-income communities because the issue of food gentrification has not yet been properly explored in Canada. Current RFE problem frames should also be reviewed, enhanced, and broadened to provoke more critical thinking, particularly towards the recently posited food haven metaphor. Food gentrification research is likewise currently limited in understanding how gentrification processes contribute to the emergence of inequitable

retail food environments and may subvert economic food access for low-income, racialized, and visible minority residents. Further, there is a window of opportunity to strengthen partnerships between the planning profession and public health by examining conceptual and empirical links between environment-health issues through assessing food purchasing opportunities.

In terms of epistemology, this study binds intersectional research to the perspectives of the oppressed and marginalized rather than the dominant social group. It investigates differences in food access across racial/ethnic and socio-economic neighbourhoods and explores how retail development and urban revitalization challenge and constrain food access opportunities. Across both manuscripts, the results are constructed to comprehensively unpack power dynamics in Toronto, recommend actionable solutions towards poverty reduction and systemic barriers to food insecurity at appropriate scales, and explore how the food policy and planning agenda can evolve in Canada. Moreover, this research is rigorously designed to explore disharmony over urban space in Toronto while sustaining application to cities beyond the research scope. Finally, this thesis welcomes future revision as city landscapes change and social norms evolve due to social action, political progression, and urban development and leaves room for future executions of meaningful qualitative, quantitative, and mixed methods scholarship.

3.3 Research Design: A Cross-Sectional Descriptive and Correlational Methods Approach

This thesis employs an exploratory cross-sectional descriptive and correlational methods approach to answer the research questions and contribute to a deeper contextual understanding of healthy food access in Toronto from a planning perspective. It is made of many layers, and in doing so, it assumes a practice-oriented and critical model of research. Justification for this orientation of research is embedded in Section 4.0. This strategy of inquiry was selected because it fits assumptions held in both the postpositivist and transformative worldviews and is practically suited to observe or measure the degree of association between variables within each manuscript. Moreover, it employs survey research methods to quantitatively describe food access experiences across different population groups. Sections 3.3.1 and 3.3.2 below provide an overview of the research methods undertaken for each respective study, including a summary of primary and secondary data collection, data generation, and data analysis and interpretation techniques. The method sections in Chapters 4 and 5 provide a more exhaustive description of methods used to achieve results and objectives.

3.3.1 Manuscript 1, Chapter 4: Food Deserts and Food Mirages in Toronto, Canada: Interactions between retail food environments and gentrifying areas

This manuscript collected primary data from butcher shops and fish shops in Toronto and secondary data from multiple sources to examine the extent to which food deserts and food mirages exist in Toronto and explore the link between gentrification and both geographic (food desert) and economic (food mirage) food access.

3.3.1.1 Software

ArcMap (version 10.8.1) was the Geographic Information Systems software package used to derive food desert and food mirage measures. ArcMap was used for data preparation and analysis, including creating a road network dataset and creating 1000m RFE buffers from the population-weighted centroids of select dissemination areas (DAs). MS Excel was used for some data preparation and generation, largely for organizing food retailer types and recording butcher shop and fish shop interview responses. Principal Components Analysis on RStudio (version 4.0.0) was used to create the Social Equity Index.

3.3.1.2 Data Collection

Geographic boundary area shapefiles at the DA and census tract levels for Toronto were accessed through Statistics Canada for the years 2016. DA representative points (i.e., population weighted centroids) came from Statistics Canada Geographic Attribute File. A research contract was signed between the Geospatial Centre at the University of Waterloo and the researchers to access 2006 and 2016 Census data at the DA and census tract levels on a variety of topics, including education, family household and marital status, housing, immigration, and income. Road network files were provided by DMTI Spatial. The City of Toronto Open Data was the primary source to obtain DineSafe food retailer data, the Business Improvement Area data shapefile, and the Neighbourhood Improvement Area (NIA) shapefile for policy and planning area neighbourhoods in Toronto.

3.3.1.3 Data Generation

To identify potential food desert and food mirage DAs, a Social Equity Index (SEI) was created at the dissemination area (DA) level using five indicator variables drawn from the 2016 Canadian Census. The SEI built on work by Wiebe and Distasio (2016) and was modelled after the TSNS 2020 Neighborhood Equity Index (2014) (City of Toronto, 2014) and was developed using Principal

Components Analysis on RStudio. The criterion for variables were socioeconomic indicators or outcomes that would collectively result in unjust food purchasing power, including: (1) median after-tax household income, (2) unemployment rate, (3) completion of postsecondary certificate, diploma or degree for the population aged 25 to 64 years in private households, (4) total number of lone parent census families in private households, and (5) recent immigrants arriving between 2011 and 2016. All DAs in Toronto (n=3,702) were given an equity score from 0-100, with 0 being the most theoretically inequitable score and 100 being the most theoretically equitable score. SEI scores ranged from 26.20 to 82.54 and were geocoded into the DA boundary dataset on ArcMap. Using Jenks Natural Classification Method on ArcMap, DAs were organized into index classes and a benchmark value of 63.14 was determined to delineate DAs facing greater inequities than other neighbourhoods. DAs below the benchmark score were called Inequitable Dissemination Areas (IDAs) (n=1,127) and were used as proxies to identify food deserts and food mirages. Descriptions about statistical methods and equations used towards the SEI can be found in the technical appendix. As an added layer of analysis, NIA data from the City of Toronto was used to capture differences in inequity between larger and smaller neighbourhood areas.

Census data was also used to operationalize gentrifying census tracts in Toronto. The gentrification measure was applied from Ding et al. (2016) to show changes in the socioeconomic status of residents and housing costs in Toronto over a 10-year period from 2006 to 2016. A census tract was considered gentrifiable if it had a median household income below the citywide median in 2006. A census tract was considered gentrifying if it was gentrifiable and experienced both an above citywide median percentage increase between 2006 and 2016 in either its median gross rent or median home value and an above citywide median increase between 2006 and 2016 in its share of university-educated residents (i.e., holding a bachelor or above). A total of 59 gentrifying census tracts (GCTs) were identified and were geocoded into the census tract boundary dataset on ArcMap. Remaining census tracst were considered to be non-gentrifying. In accordance with gentrification literature on Business Improvement Areas, BIA data was also collected from the City of Toronto Open Data portal and added to ArcMap to explore how historical, but still ongoing, urban revitalization projects and policy areas disturb retail food environments.

Finally, this study used the DineSafe food retailer data from the City of Toronto to help map the retail food environment. DineSafe is Toronto Public Health's food safety and inspection data for

all retailers selling food in the Toronto and is updated in real time. DineSafe data for the study was accessed from the Open Data portal in July 2020. All food retailers classified as 'Supermarkets' (n=457) were validated using websites and online directories and organized into the following 4 groups of low- to high-cost food retailers based on food price research in Toronto by Camden et al. (2017): (1) discount supermarkets (e.g., Food Basics), (2) conventional or national chain supermarkets (e.g., Loblaws), (3) ethnic grocers (i.e., stores that cater to specific ethnic, immigrant, or cultural groups), and (4) other or specialty stores (e.g., Farm Boy). A total of 439 supermarkets met the criteria for inclusion whereas 18 did not due to several reasons, including closures, potential misclassification by DineSafe, or had extremely limited or missing information online. All food retailers classified as 'Butcher Shops' (n=154) and 'Fish shops' (n=41) were consulted by phone in August and September 2020 to assess if they regularly offered a diversity of nutritious food beyond simply selling meat or fish, including fruits and vegetables, whole grain products, or milk or dairy products. Ethics approval was not required for the phone calls because only publicly available information was collected. Of the 195 butcher and fish shops approached, 57 butcher and fish shops met the criteria for inclusion, while 138 did not, resulting in 30% of butcher shops and fish shops being included in the food desert analysis. A final total of 496 food retailers were added and geocoded into the DA boundary dataset on ArcMap and used towards mapping food deserts and food mirages.

3.3.1.4 Data Analysis

To compare results with other North American, particularly Canadian, studies, we created 1000m street-network buffers (i.e., service areas) from the population-weighted centroids of IDAs and assessed the proximity and diversity of healthy food retailers within these buffers on ArcMap. Food deserts were considered IDAs that did not intersect with any supermarket or butcher shop or fish shop within service areas. Food mirages were considered IDAs that *only* intersected with conventional supermarkets or other and specialty stores (i.e., high-cost retailers) within service areas. We then observed where food deserts, food mirages, GCTs, BIAs, and NIAs intersected to identify the spatial patterning of these interactions and the distribution of food retailers in gentrifying areas. Moreover, we used Census data to summarize the sociodemographic characteristics of households living in food deserts and food mirages to add to the discourse. Maps and tables were produced to illustrate findings.

3.3.2 Manuscript 2, Chapter 5: Associations and Interactions between Neighbourhood-level Intersectionality, Healthy Food Access, and Gentrification in Toronto, Canada: Modelled using linear regression and binary logistic regression

This manuscript applied the SEI, categorization of DineSafe 'Supermarket' retailers, and findings on food deserts, food mirages, and gentrifying census tracts from Chapter 4 to further understand and assess disparities in healthy food access across racial/ethnic and socio-economic neighbourhoods in Toronto.

3.3.2.1 Software

ArcMap was used again to support with data analysis, particularly to determine distances from DAs to differently priced food retailers and to identify food retailer counts within DAs. SPSS (version 27.0.1.0) was purchased in May 2020 from the Information & Systems Technology webstore at the University of Waterloo and used to conduct descriptive statistics and ordinary least squares regression analysis.

3.3.2.2 Data Collection

No additional data was collected towards this manuscript. However, 2016 Census data on visible minorities[2] in Toronto at the DA level was not previously used in Chapter 4 but used towards deriving the racial/ethnic composition of DAs in this study.

3.3.2.3 Data Generation

The SEI from Chapter 4 was applied to this study and combined with the racial/ethnic composition of DAs to create an intersectional representation of the socio-demographic status of neighbourhoods in Toronto. A total of 3683 DAs had visible minority data available and were categorized into one of five racial/ethnic category types. The racial/ethnic composition of a DA was found by dividing the population counts of Visible Minority respondents (i.e., Black, Chinese, South Asian, and Mixed Visible Minority) and Not Visible Minority respondents by the total count of a visible minority for the population in private households. Black, Chinese, and South Asian category types were selected because they are the three most population visible minority populations in Toronto. The Mixed Visible Minority category type is reflective of the sum of all the remaining visible minority groups.

[2] The term "visible minority" is defined by Canada's Employment Equity Act (1995) as "persons, other than Aboriginal peoples, who are non-Caucasian in race or non-white in colour." We use the term "racialized" throughout this paper other than when we refer to "visible minorities" as assessed by the Canadian Census.

The Not Visible Minority category is considered persons who are non-Caucasian in race or non-white in colour, including Aboriginal-identity respondents (Employment Equity Act, 1995). The predominant racial/ethnic identity of a DA was considered as the identity group with the highest percentage or share of representation within that DA. Put together, each DA had an SEI score and a racial/ethnic composition, which also resulted in defining the racial/ethnic composition of food deserts and food mirages.

Only conventional, discount, and ethnic food retailers from Chapter 4's DineSafe reclassification method were considered in this manuscript. Other and specialty stores and butcher and fish shops were excluded from this study to retain focus on food access to traditional food retailers and ethnic shops that largely service visible minority population groups. For practical and methodological reasons, only gentrifying census tracts were used to measure differences in food access between gentrifying and non-gentrifying areas. BIAs are not strongly tied to geographic boundaries in the same way Census socio-demographic characteristics can be measured across stable census tracts; thus, this decision led to more objective interpretations of socio-spatial patterns.

3.3.2.4 Data Analysis

The Network Analyst Origins-Destination (OD) Cost Matrix analysis tool on ArcMap was used to determine the mean street-network distance in metres from the population-weighted centroids of DAs to the nearest conventional and discount supermarkets and to ethnic retailers. Food retailer density was calculated using the Spatial Join feature on ArcMap. Distances and counts were exported from ArcMap to MS Excel and then reformatted for SPSS analyses.

SPSS analyses were used to determine the significance and odds of differences in food access distance and density among and between varying racial/ethnic and socioeconomic DAs. Linear regression was used to assess the significance of racial/ethnic and SEI differences in neighbourhood food access (mean distance) to conventional, discount and ethnic retailers, and differences in food access between and among gentrifying and non-gentrifying census tracts. Binary logistic regression was used to predict the odds of visible minority racial/ethnic neighbourhoods being located within food deserts and food mirages. Maps and tables were produced to illustrate findings.

3.4 Ethical Considerations, Limitations, and Strengths of the Study

Although ethics approval from the University of Waterloo Research Ethics Board was not necessary for this study, significant efforts were taken in the development and planning of this thesis to minimize the risk of ethical issues, taking into account how the research might develop and what values underpin this study.

This thesis was designed with the goals of exploring progressive social change and policy development in mind. By illuminating differences in geographic and economic food access, and how these differences range across urban space and amongst different social identity groups, this study deals with "real world problems" and "problems that matter to groups in the local, national, and global communities" (Farthing, 2016, p.185). In doing so, it pays attention to those whose food access opportunities may be constrained, bestows actionable accountability to practitioners and decision-makers, and amalgamates Flyvbjerg's (2004) questions of *phronetic planning research*:

> "Where are we going with planning? Who gains and loses, and by which mechanisms of power? Is this development desirable? What, if anything, should we do about it?" (as cited by Farthing, 2016, p.186).

However, it was beyond the scope of this research to collaborate with residents or include a qualitative or mixed methods component to deepen the work. Additionally, there is no "standard" way of incorporating intersectionality at the population level, much less across food access planning research. Thus, in an attempt to build knowledge, stay informed about the different approaches in intersectional research, and remain sensitive to documenting and understanding the experiences of low-income, racialized, marginalized, and immigrant groups, several efforts were exhausted in endeavor of this thesis.

Upon commencing this study, I turned to researchers and social policy groups in Canada who had experience using Census data to create equity indexes, including Wiebe & Distasio (2016) and the TSNS 2020 (City of Toronto, 2014). I also connected with the Statistical Consulting and Collaborative Research Unit "Stats Help" at the University of Waterloo and with consulting agents at Statistics Canada for statistical guidance, data clarity, and support as needed. When speaking with butcher shop and fish shop interviewees, I introduced myself as a planning student researcher at the University of Waterloo, respected the anonymity and time of participants, communicated participation was voluntary, and provided further information about the study upon request. In April

2021, I also completed the Gender Based Analysis+ (GBA+) course offered by the Government of Canada which resulted in an Intersectional Job Aid certificate. GBA+ is a rigorous analytical framework, processes, and tool designed to challenge assumptions about systemic inequalities and examine how various intersecting identity factors impact the effectiveness of research, policy, and government initiatives and programs. The collective outcomes of these experiences led to me reflect on my position leading this thesis as a non-visible minority student, with no strong ties to grocery food retailers in Toronto, and who has not faced the consequences of gentrification in her neighbourhood. Despite my goals of dismantling systemic barriers embedded in current urban policies and practice and in bettering the communities of which I hope to become part of upon graduation, this work is not only limited in amplifying visible minority voices, but also impartial to my personal values and thus sustained in the complex system and institution of power.

Other ethical considerations and limitations of this thesis are detailed within each manuscript, particularly that of the food retailer categorization method and lack of primary food costs data collection, issues of confidentiality using Census data at the DA level, and the absence of Aboriginal identity groups as a separate racial/ethnic category type in Chapter 5. This research is also tied to the City of Toronto and DineSafe data, however, these boundaries do not necessarily restrict food purchasing and raises the question of what happens at the edges (i.e., there may be healthy food retailers just over the border). Additionally, my work centres at the DA administrative boundary level which does not necessarily translate to social understandings and definitions of neighbourhoods, but rather localized areas. DAs are the smallest geographic areas for which census data are disseminated are composed of one or more neighbouring dissemination blocks. Population sizes range from 400 to 700 persons however, socially defined neighbourhoods can be much larger. Consider, for example, that the City of Toronto's 140 social planning neighbourhoods are made up of several adjacent census tracts and neighbourhood populations are of least 7000 to 10,000 persons. However, Hulchanksi (2010) argues that Toronto's city-recognized neighbourhoods are much too large to represent the lived experiences of residents. In his work, neighbourhoods are interchangeably used with Statistics Canada's census tract boundaries which are "neighbourhood-like" areas (Hulchanski, 2010). Even still, this definition shows that DAs are pockets within larger social urban landscapes and thus, disparities in food access should be reviewed at the most finite scale to identify the most vulnerable areas at risk. Considering the rise of e-commerce and grocery delivery services expanding, healthy food and groceries may also become more accessible for populations living in inequitable RFEs and

change how households define and experience their local food environments. Finally, this research is cross-sectional and did not account for longitudinal changes of food retailers in Toronto; however, this would've been an excellent avenue of research alongside the 10-year gentrification measure period. It also did not consider whether RFE were unique to suburban or urban areas of the city, and the degree to which density and sprawl influence whether a DA was considered to be a food desert or food mirage; further longitudinal research would benefit from understanding healthy food access across these contexts, as well as considering neighbourhood decline in additional to gentrification processes and mechanisms.

That said, strengths of this study are in tandem with what is most useful from a planning perspective. DA boundaries were used to create the SEI and measure food retailer access, providing a method that is meaningful and sensitive to real differences across neighbourhoods rather than larger spatial boundaries. The population-weighted centroid was also used to capture the heterogeneity across DAs rather than the true centroid of an area. All DAs in Toronto were considered towards RFE typologies and 99.4% of DAs had a racial/ethnic and socio-economic composition assigned, contributing to a comprehensive spatial picture of the food environment and food access. Both sociodemographic and policy-based changes were considered as gentrification measures. Recent food price data by Camden et al. (2017) was utilized, and phone checks with butcher shops and fish shops accurately categorized and included as additional healthy food retailers. Because the SEI was derived from Canadian census data, it can also be applied to other major cities in Canada and increases the reliability and comparability of research across provinces. Finally, this study lays the groundwork for intersectional food access and food gentrification planning research and has created a robust research design that future studies can build upon.

3.5 Summary

This chapter provided an overview of the methodology and methods employed throughout this thesis, including the postpositivist and transformative worldviews. Planning scholarship was reflected upon, and intersectionality was proposed as the next natural progression in planning perspectives. Ontological and epistemological assumptions were described accordingly, followed by a transparent reflection of the efforts taken to sustain ethics in this thesis. Limitations of this research were also noted followed by a highlight of strengths and contributions to research. The subsequent chapters are the two manuscripts that jointly make up the greatest contribution of this thesis and a conclusion.

Chapter 4

Food Deserts and Food Mirages in Toronto, Canada: Interactions between retail food environments and gentrifying areas

4.1 Introduction

In Canada, dietary risks comprise the largest share of morbidity and mortality risk factors (Afshin et al., 2019), and inadequate fruit and vegetable consumption costs an estimated $3.3 billion per year between direct healthcare costs and losses in economic productivity (Ekwaru et al., 2017). Evidence suggests that the retail food environment (RFE) may be an important determinant of population health, however, much of the research has centered on geographic access to food and identifying *food deserts* – low-income areas with limited access to nutritious food sources (Minaker, 2016). Fewer studies have explored economic dimensions of food access, such as *food mirages* – areas in which healthy food retailers appear plentiful but remain economically inaccessible for low-income households (Breyer and Voss-Andreae, 2013; Cohen, 2018; Short, 2017; Sullivan, 2014; Wiebe & Distasio, 2016). Until 2016, Canadian literature on food mirages was non-existent (Minaker et al., 2016), and much of the Canadian (and international) food environments literature excludes non-traditional grocers (e.g., ethnic or specialty stores) despite some being important sources of affordable and culturally acceptable food (Behjat et al., 2013).

Development patterns and sociodemographic shifts evolve across cities and can lead to the emergence of distinct types of retail food environments. Breyer and Voss-Andreae (2013) suggest that gentrification processes contribute to the development of food mirages, suggesting that healthy food access may be constrained by urban renewal. Within the contexts of rapid global urbanization and the importance of dietary impacts on human health, understanding processes by which urbanization and food access (both geographic and economic access) are linked is a worthwhile endeavor (Seto, 2016). This notion is especially relevant for a rapidly changing city like Toronto, Canada, where no studies to date have described both economic and geographic food access as these concepts relate to gentrification (Behjat et al, 2013; Perry et al., 2020; Lo, 2009; Widener et al., 2017). Further, “problem frames” or metaphors are important given that they help people make sense of daily experiences and determine which solutions are explored (Koon et al., 2016). For example, a “food desert” problem implies a solution in which nutritious foods should be made more available by,

for example, opening a supermarket in an underserved area. Conversely, “food mirage” problems are economic in nature rather than geographic, and thus solutions may lie in increasing lower-income residents’ purchasing power to afford nutritious foods (Minaker, 2016). Considering the increasing number of calls for planners to address the food system and healthy and equitable food access in urban areas (CIP, 2018; Lytle & Sokol, 2017; Mui et al., 2021; OPPI, 2011; Short et al., 2007), this paper contributes to emerging community food planning literature by asking the following questions: (1) Which problem frame (food deserts or food mirages) seem most appropriate for the current retail food environment at the dissemination area level in Toronto? and (2) What is the link between gentrification and food access in Toronto? To what extent does gentrification intersect with the retail food environment in Toronto, and specifically with the existence of food mirages?

The following sections synthesize and expand upon previous retail food environment and food gentrification literature, describe our methodology, and present and discuss results of our analysis. We found that while both food deserts and food mirages are evident across suburban areas in Toronto, no food deserts exist in the downtown core. A significant number of food deserts and food mirages were found within or adjacent to Neighbourhood Improvement Areas, suggesting varying levels of food access across larger marginalized neighbourhoods identified by the City of Toronto. We also theorize that municipal-led development policies, such as Business Improvement Areas, may result in gentrification processes that contribute to the emergence of food mirages, and that current food deserts in gentrifying census tracts may be at risk of transforming into food mirages through continued urban change, however, further longitudinal research is needed to test these theories. This paper concludes by discussing opportunities in creating equitable food environments and considers the strategies to resist food gentrification through “food haven” policies protect ethnic food retailers and promote a diversity of nutritious food options (Tonumaipe’a et al., 2021). We contribute to the literature by providing a more comprehensive understanding of “healthy food density” by including non-traditional food retailers in analysis, identifying how food access may be economically constrained by urban renewal, and suggesting how healthy food retailer access can be integrated into municipal land use decisions and policies.

4.2 Background

4.2.1 Retail Food Environments and Food Gentrification

The retail food environment impacts the availability, accessibility, and adequacy of nutritious food within a community or region (Apparicio et al., 2007; Calloway et al., 2019; Hillier et al., 2011; Minaker, 2016). If inequitable, spatial distributions and patterning of food retailers can subvert a household's means of acquiring food, especially when compounded by systemic barriers to food security such as poverty and social deprivation (Anguelovski, 2016; Calloway et al., 2019; Hillier et al., 2011; Short et al., 2007; Sullivan, 2014). Food insecurity also disproportionately impacts vulnerable groups including newcomers, households with lower educational attainment, lone-parent families, and Indigenous communities (Coleman et al., 2018; Stevenson et al., 2019; Tarasuk et al., 2019; Willows et al., 2011), and is closely linked to a series of health concerns, such as obesity, type 2 diabetes, major types of heart disease, and poor mental health and wellbeing (Calloway et al., 2019; Fafard St-Germain & Tarasuk, 2020; Men et al., 2020; Tarasuk et al., 2019). While household food insecurity was unrelated to geographic food access in one study of low-income families in Toronto (Kirkpatrick & Tarasuk, 2010), better understanding economic access to food from a geographic perspective may help to inform more nuanced food policy that supports healthy food access for all households, particularly in the context of urban renewal.

Food mirages exist in areas with adequate *geographic* food access, but in neighbourhoods that exhibit low household incomes and high rates of poverty and social deprivation: thus, food mirages can be considered places with adequate *geographic* and inadequate *economic* access to food (Breyer & Voss-Andreae, 2013; Calloway et al., 2019; Sullivan, 2014; Wiebe & Distasio, 2016). Over the last several years, a growing, but still relatively small, body of literature has also framed the link between food access and urban change, specifically gentrification (Breyer & Voss-Andreae, 2013; Cohen, 2018; Komakech & Jackson, 2016; Ong, 2020; Meltzer, 2016; Sbicca, 2018; Sullivan, 2014). *Gentrification* is a complex process and urban revitalization phenomenon driven by allyship between investors and public-sector policies. It can be characterized by the rapid influx of resources, upgrading of physical infrastructure, and phased changes in the socio-economic and demographic status of residents in traditionally disinvested neighbourhoods due to systemic and historical segregation (Anguelovski, 2016; Takahashi, 2016; Ding et al., 2016). Incoming populations are usually more affluent and privileged – demonstrated by higher household incomes, higher levels of

education, and higher social status, and they often dominate and displace existing vulnerable residents (Anguelovski, 2016; Takahashi, 2016; Ding et al., 2016; Dixon, 2020).

In North America, gentrification processes can be legitimized and employed across Business Improvement Areas (BIAs) (Takahashi, 2016). BIAs are neighbourhood alliances between business and property owners and municipal governments for economic development and promotion, service revitalization projects, social mix interventions, and general beautification and physical improvements in their district (Enright et al., 2019; Hackworth & Rekers, 2005; Ministry of Municipal Affairs Ontario (MMAO), 2010; Takahashi, 2016). Although conducive to economic growth and community building, some evidence assumes that investment across BIAs can alter food access for low-income, racialized populations (Enright et al., 2019; Hackworth & Rekers, 2005; Takahashi, 2016), however, this issue remains to be explored more in Canada. Gentrification processes can also displace vulnerable residents along *gentrification frontiers* – the lines beyond which gentrification encroaches through additional and continued development and investment – a term first coined by Smith (1996) (Walks & Maaranen, 2008). This would suggest that gentrification effects are not contained within BIA boundaries and can spill over into adjacent neighborhoods as poverty re-concentrates into nearby pockets of the city (Enright et al., 2019). Within the context of food environments, the term *food gentrification* is often used in discourse and typically applied from the perspective of food or environmental justice (Ong, 2020). Few studies have specifically explored the politics and processes of this subset of commercial gentrification in modifying or creating inequitable retail food environments (Breyer & Voss-Andreae, 2013; Cohen, 2018; Komakech & Jackson, 2016; Meltzer, 2016; Sbicca, 2018; Sullivan, 2014), especially within a Canadian context or considering BIAs (Komakech & Jackson, 2016; Takahashi, 2016; Enright et al., 2019; Epstein, 2018; Hackworth & Rekers, 2005). Further, Breyer and Voss-Andreae (2013) theorize that gentrification processes directly contribute to the emergence of food mirages and argue that food mirages are functionally equivalent to food deserts in that they both result in long travel times to obtain affordable, nutritious food, especially for low-income residents, thus justifying that exploring these relationships is a worthwhile endeavor.

In 2020, Ong identified three conceptual and empirical theories linking mechanisms of food gentrification: (1) increases in cultural or local food prices, (2) increased costs of living resulting in decreased household expendable income allocated to food purchasing, and (3) the replacement of

affordable food options (e.g., discount or ethnic grocers) with conventional or specialty stores due to changing consumer demands. Not only can high-cost food retailers in marginalized neighborhoods out-compete existing food businesses, force retailers to adjust amenities and products to accommodate wealthier customers, or prompt economic burdens for small-business owners through soaring rental prices (Cohen, 2018; Enright et al., 2019; Meltzer, 2016; Sbicca, 2018; Takahashi, 2016), but arrival of high-cost grocers can also signal the "readiness" of traditionally disinvested neighborhoods for further redevelopment (Anguelovski, 2016; Cohen, 2018; Ong, 2020). Anguelovski (2016) and Sbicca (2018) explain that this process of *supermarket greenlining* (i.e., 'healthy' high-end supermarket or specialty store development in disinvested areas) often leads to decreased access to reasonably priced food for minority and low-income communities, as well as heightened feelings of exclusion among vulnerable residents, and is a clear departure from supermarket redlining (i.e., the disinclination of supermarkets in locating in, or withdrawing from, impoverished areas) (Zhang & Debarchana, 2016). Congruently, Breyer & Voss-Andreae (2013) stress that similar shifts are underway across North America.

Extant retail food environment research also typically excludes non-traditional food retailers from analysis. Indeed, most research focuses on supermarkets and convenience stores and ignores food stores that cater to ethnic sub-populations, despite their contributions in understanding diet-related health and social outcomes across the food landscape, especially for these sub-populations (Behjat et al., 2013; Camden et al., 2017; Mahendra et al., 2017; Widener, 2018). Including ethnic food retailers is also important to better capture the actual density of healthy food outlets and level of food insecurity in an area (Behjat et al., 2013). For example, Behjat et al. (2013) contested previous evidence of food deserts in Toronto by including ethnic food stores in their study. Omitting ethnic retailers from research also ignores them as significant spaces for socialization and identity, particularly for newcomers (Alkon & Cadji, 2018; Anguelovski, 2016; Camden et al., 2017; Short et al., 2007), as cultural amenities that contribute to the local economy (Cohen, 2018), and generally underestimates neighbourhood access to affordable and culturally accessible food sources, especially for racialized and low-income residents (Behjat et al., 2013; Komakech & Jackson, 2016). However, it is equally as important to consider that other types of non-traditional food retailers, such as organic or specialty stores, can adversely affect economic food access by selling food at high prices comparable to, or more than at, conventional supermarkets (Anguelovski, 2016; Camden et al., 2017). Moreover, quantitative food environment research also tends to only consider income as a

neighbourhood determinant in food access, largely measures geographic access at census tract level, and often focuses on non-randomized strategically selected neighbourhoods in a region (Behjat et al., 2013; Hackworth & Rekers, 2005; Raja et al., 2008; Short et al., 2007; Sullivan, 2014; Takahashi, 2016). Therefore, in tandem with what would be most useful from a planning perspective, it is important to examine the food environment at the smallest geographic scale possible (i.e., the dissemination area) and consider all suburban and urban areas within a city to offer the most comprehensive spatial picture of the food environment.

In summary, food retailer distribution and gentrification are politically entangled and together play a prominent role in equitable food access and healthy food consumption. However, much of the recent discussion around equitable food environments is still largely limited to examinations of geographic (rather than economic) access to nutritious foods and there is an evident need for more nuanced studies that link income, food prices, and shelf-space of healthy food to consumption patterns across entire cities (Behjat et al., 2013; Perry et al., 2020; Lo, 2009; Widener, 2018; Widener et al., 2018). Behjat et al. (2013) also caution that failing to use an inclusive set of food retailers, such as ethnic supermarkets, and appropriate methodologies in food environment research make it difficult to conceptualize actual health food density and identify where food access is most constrained. They also warn that such limitations and gaps in knowledge can mislead planners and policymakers in decision-making. Given that food access is becoming particularly relevant to planning politics and policies (Cohen, 2018; CIP, 2018; OPPI, 2011), this scope of research warrants greater scholarly attention, especially as these concepts relate to urban change and dietary impacts on health, and within the context of Canadian cities. Particularly, Toronto, Canada serves as a suitable study site considering its reputation as the world's most multicultural city, a slate of international food retailers, a rapidly changing urban environment, and a growing food insecurity problem.

4.2.2 Study Area: Toronto, Canada

Toronto is Canada's largest metropolitan city with a population of 2.7 million residents recorded in the last census (2016) and a 4.5% growth rate since 2011 (Statistics Canada, 2017). The City is made up of 3,702 dissemination areas, 570 census tracts, and 140 city-recognized neighborhood areas. Toronto's unemployment rate was 8.2% in 2016 and the median after-tax household income was $58,264 ($47,830 for lone-parent families). Between 2011 and 2016, a total of 152,760 lone-parent families were recorded, and Toronto saw an increase of 187,950 immigrants, most of whom came

from Asia. Toronto is also an educated city, with nearly 70% of its population aged 25 to 64 years holding a post-secondary certificate, diploma, or degree (Statistics Canada, 2017). In 2014, the City of Toronto developed a Neighborhood Equity Index under the Toronto Strong Neighborhoods Strategy 2020 (TSNS 2020) to measure well-being and deprivation across neighborhoods and to assist with local planning strategies. About a fifth (31 of 140) of Toronto's neighborhoods were identified as *Neighborhood Improvement Areas* (NIAs), where a high proportion of lower-income residents face serious inequities. NIAs are present across the Toronto but mostly in areas north-west and north-east of the downtown core. Toronto also has the highest number of Business Improvement Areas of any North American city, some of which were established in the 1970's (Takahashi, 2016). Chapter 19 of the Toronto Municipal Code also lists additional BIA functions, including undertaking strategic planning necessary to address BIA issues (City of Toronto, 2021).

In 2017, Camden et al. (2017) assessed the consumer nutrition environment of 257 midsize to large supermarkets in Toronto and measured food availability, price, and linear shelf-space dedicated to fruits and vegetables versus energy-dense snack foods across different categorizations of grocers. Findings from the study suggest nutritious foods are widely available across supermarkets in Toronto, but discount and ethnic stores tend to have lower-priced fruits and vegetable prices compared to conventional or specialty stores. Even still, the cost of nutritious food in Toronto is rising. Between 2018 and 2019, food prices increased by 7.6% – the largest yearly increase in the last decade and compounded by an overall 28.9% increase since 2009 (Toronto Public Health, 2019). Nearly 1 in 5 in Toronto households are food insecure, and the use of food banks grew by 12% overall and by 38% in the inner suburbs between 2008 and 2016 (Toronto Public Health, 2019; Coleman et al., 2018; City of Toronto, 2019).

4.3 Methods

4.3.1 Data Collection and Generation

This study uses data from the 2016 Statistics Canada census (at the dissemination area (DA) level) to create a Social Equity Index using Principal Components Analysis on RStudio. It also used two datasets, DineSafe data and Business Improvement Area data, from the City of Toronto Open Data portal to map the retail food environment. The SEI built on work by Wiebe and Distasio (2016) and was modelled after the TSNS 2020 Neighborhood Equity Index (2014) (City of Toronto, 2014).

Neighbourhood Improvement Area data was also accessed from the Toronto Open Data portal and geocoded into ArcMap 10.8.1 to evaluate spatial food access disparities across larger neighborhood areas identified by Toronto Public Health as an additional layer of analysis.

4.3.1.1 Social Equity Index

The Social Equity Index (SEI) measured broad inequity at the DA level using five variable indicators and outcomes drawn from 2016 Statistics Canada census data, including: (1) median after-tax household income, (2) unemployment rate, (3) completion of postsecondary certificate, diploma or degree for the population aged 25 to 64 years in private households, (4) total number of lone parent census families in private households, and (5) recent immigrants arriving between 2011 and 2016. In this case, inequitable refers to how the socio-economic indicators or outcomes would collectively result in unfair or unjust variances in food access. For the following indicators, high values signaled inequity: (2) unemployment rate, (4) total number of lone parent census families in private households, and (5) recent immigrants arriving between 2011 and 2016. For the following indicators, low values signaled inequity: (1) median after-tax household income and (3) completion of postsecondary certificate, diploma or degree for the population aged 25 to 64 years in private households. SEI scores were geocoded into ArcMap 10.8.1 and a benchmark value was used in determining the selection of DAs considered to face the most significant socio-economic barriers to food access and that would be used to identify food deserts and food mirages.

Social Equity Index score classes and counts are summarized in Table 4.1. SEI scores ranged from 26.20 to 82.54, with 0 being the most theoretically inequitable score and 100 being the most theoretically equitable score. To organize the data into index classes, SEI scores were first plotted on a line graph by rank order to approximate the number of data clusters (i.e., index classes) using the data elbow method, and then class cut-off points were defined using the Jenks natural breaks classification method on ArcMap to reduce variance within classes and maximize variance between classes (Jenks, 1967). Data elbow clusters symbolize natural breaks in the data sets, thus justifying the wide range in terms of numbers of DAs per SEI class. Given that four distinct data elbows were visible on the line graph, four index classes were accepted and used towards the Jenks method. To determine the benchmark value, we looked at where variance between classes was most significant. Considering that SEI index class 2 dropped sharply from SEI index class 3 on the line graph, the bottom two classes were considered to face the most serious inequities to food access, resulting in a

benchmark score of 63.14. Dissemination areas below the benchmark were referred to as Inequitable Dissemination Areas (IDAs) (n=1,127). Further descriptions about statistical methods and equations used towards the SEI, including the SEI score line graph, can be found in Appendix A: Technical Appendix.

Table 4.1: Social Equity Index classes, ranges, and dissemination area counts

Index Class	Score Range	*n*
1 (More Inequitable)	26.20 – 55.37	224
2	55.43 – 63.13	903
3	63.14 – 68.48	1623
4 (More Equitable)	68.48 – 82.54	952

4.3.1.2 Classifying "Healthy" Food Retailers

DineSafe food retailer data was accessed through the City of Toronto Open Data portal in July 2020. DineSafe is Toronto Public Health's food safety and inspection data for all retailers selling food in the Toronto and is updated in real time. All DineSafe food retailers classified as 'Supermarkets' (n=457), 'Butcher Shops' (n=154), and 'Fish Shops' (n=41) were considered "healthy food retailers" in the study. Supermarkets were organized into 4 category types based on food price research in Toronto by Camden et al. (2017) and validated using websites and online directories: (1) discount supermarkets (e.g., Food Basics, No Frills), (2) conventional or national chain supermarkets (e.g., Loblaws, Metro), (3) ethnic grocers (e.g., stores that catered to specific ethnic, immigrant, or cultural groups, or had signs or flyers in another language, and/or had a social media page that advertised in a different language), and (4) other or specialty stores (e.g., Farm Boy, Organic Garage). A total of 439 supermarkets met the criteria for inclusion and used in the food desert and food mirage analyses. A total of 18 supermarkets were excluded because they were member-based supermarkets closed to the general public (e.g., Costco), had permanently closed since data were collected, or had extremely limited or missing information online.

Butcher and fish shops were consulted by phone in August and September 2020 to assess if they offered a diversity of nutritious food beyond simply selling meat or fish. Retailers were included in the final dataset if they carried food in at least 3 of the 4 categories: (1) both fruits and vegetables (fresh or frozen), (2) whole grain products, (3) milk, cheese, or dairy products, (4) meats, fish, eggs, or other proteins. Ethics approval was not required for the phone calls because only publicly available

information was collected. Information about the research study was provided to participants upon request. Of the 195 butcher and fish shops approached, 57 butcher and fish shops met the criteria for inclusion, while 138 did not. Of the five category types of food retailers, butcher and fish shops were only considered in food desert analysis because food prices from these food retailers are unknown, cannot be reasonably assumed, and were not considered in the Camden et al (2017) study. A final total of 496 food retailers were geocoded into ArcMap. Table 4.2 describes the total counts of food retailers by type.

Table 4.2: Total counts of food retailers meeting inclusion for criteria organized by type

Food Retailer Type	***n***
Conventional or Chain Supermarket	91
Discount Supermarket	77
Ethnic Grocer	155
Other and Specialty Store	116
Butcher and Fish Shop	57
Total	496

4.3.1.3 Defining Gentrification Measures and Operationalizing Gentrifying Census Tracts

Both sociodemographic and policy-based changes were considered as gentrification measures. Business Improvement Area data (n=85) was collected from the City of Toronto Open Data portal and used to explore how historical, but still ongoing, urban revitalization projects and gentrifying policy areas disturb retail food environments. To operationalize gentrifying census tracts, a measure by Ding et al. (2016) was applied using 2006 and 2016 Census data to show changes in the socio-economic status of residents and housing costs over a 10-year period. A census tract was considered *gentrifiable* if it had a median household income below the citywide median in 2006. A census tract was considered *gentrifying* if it was gentrifiable and experienced both an above citywide median percentage increase between 2006 and 2016 in either its median gross rent or median home value and an above citywide median increase between 2006 and 2016 in its share of university-educated residents (i.e., holding bachelor or above). A total of 59 gentrifying census tracts (GCTs) were identified and were geocoded into ArcMap. All other census tracts were considered *non-gentrified*.[3]

[3] Although there are several other methodologies to operationalize gentrification at the neighbourhood level (Landis, 2015) some of which Ding et al. (2016) acknowledge themselves (Ellen & O'Regan, 2011; McKintosh et al., 2010), Ding et al.'s application of gentrifying census tracts was selected for use in this study for two key reasons. First, the authors conceptualize gentrification as the "the socioeconomic upgrading of a previously low-income, central city neighborhood, characterized by the influx of higher **[CONTINUED BELOW]**

4.3.2 Operationalizing Food Deserts and Food Mirages

As Behjat et al. (2013) suggest, determining food environment thresholds is one of the most important elements of operationalizing food access given that measures vary among North American studies. To compare results with other Canadian studies, we created 1000m street-network buffers (i.e., service areas) from the population-weighted centroids of IDAs to assess the proximity and diversity of food retailers within this radius on ArcMap. Population-weighted centroids were provided by Statistics Canada and the street-network dataset was provided by DMTI Spatial. Food deserts were considered IDAs that did not intersect with any supermarket or butcher shop or fish shop within service areas, suggesting that *geographic* access to grocery food was significantly limited or non-existent in these areas. Food mirages were considered IDAs that only intersected with conventional supermarkets or other and specialty stores within service areas, suggesting that these areas lacked *economic* access grocery food (i.e., food mirage DAs had geographic access to healthy food but lacked economic access to affordable grocers, specifically discount or ethnic supermarkets).

4.4 Results

4.4.1 Sociodemographic Composition of Residents Living in Food Deserts and Food Mirages

Food deserts (n=346 DAs) and food mirages (n=155 DAs) were identified and mapped on ArcMap (Figure 4.1). A substantial number of residents (n=346,766) reside within food deserts, while about half of that number (n=169,078) reside in food mirages, collectively accounting for about 19% of Toronto's total population. In terms of household demographic characteristics of residents living in these unsupportive retail food environments, the median after-tax household income in food deserts is $58,496 (compared to a city-wide median of $58,264) and the unemployment rate is 12.6%

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socioeconomic status residents and an increase in housing prices" (p. 42), which is not only most consistent with other definitions in the literature, but also most appropriate relative to food purchasing power. Doing so allowed us to observe aggregate sociodemographic and economic changes in Toronto. Second, the variables used to derive gentrification measures track both mobility patterns of affluent residents and housing prices (both ownership and rentals) and stem from available data from Statistics Canada. Thus, this methodology is reproducible across other Canadian cities and addresses previous issues of generalizability and comparability of research in the absence of standardized measures. Conversely, we recognize that no single measure is robust enough to capture all the intricacies, processes, and dynamics of gentrification. Bourne and Hulchanski (2021), for example, would possibly even argue that these parameters are too narrow and more deemed to represent neighbourhood change. Yet, the authors acknowledge that "the processes that drive neighbourhood and community change are many and varied, as are the lenses through which we observe and interpret the outcomes" (Bourne & Hulchanski, 2021, p.14).

(compared to a city-wide mean of 8.2%). In food mirages, the unemployment rate is nearly the same at 12.5%, but the median after-tax household income is lower at $50,773.

Collectively, 27% of lone-parent families live in food desert or food mirage DAs in Toronto, of which 20% (29,985 families out of 152,760 families) live in food deserts and the remaining 7% (11,110 families) live in food mirage DAs. One-third (33%) of food desert residents aged 25 to 64 years and a slightly larger proportion of food mirage residents aged 25 to 64 years (39%) hold post-secondary educations, revealing that both food environment populations are below the city-wide percentage of educated residents (70% between 25 and 64 years). Finally, mean SEI scores for food desert DAs and food mirage DAs are nearly the same (food deserts average 58.88 and food mirages average 58.73), however, the range of SEI scores was larger among food deserts (26.20 to 63.11) than in food mirages (34.39 to 63.12). The sociodemographic characteristics of both retail food environments are summarized in Table 4.3.

Table 4.3: Characteristics of retail food environments in Toronto, Canada

	City of Toronto	**Food desert DA**	**Food mirage DA**
Total Number *n* (%)	3702	346 (9.3%)	155 (4.2%)
Total Population *n* (%)	2,731,571	346,766 (12.7%)	169,078 (6.2%)
Sociodemographic characteristics of residents			
Median after-tax household income ($)	$58,264	$58,496	$50,773
Unemployment rate (%)	8.2%	12.6%	12.5%
Lone parent family-headed households	152,760 households	29,985 households	11,110 households
Hold a post-secondary education	70%	33%	39%
Mean SEI Scores	64.94	58.88	58.73
SEI Score Range	26.20 to 82.54	26.20 to 63.11	34.39 to 63.12
Neighbourhood Characteristics			
Intersected with a BIA (%)		9%	25%
Intersected with a BIA that does not overlap with a GCT		4%	17%
Intersected with a GCT (%)		30%	28%
Intersected with a GCT that does not overlap with a BIA		24%	16%
Intersected with an NIA (%)		31%	19%

4.4.2 Spatial Distributions of Retail Food Environments and Gentrifying Areas

Figure 4.1 illustrates that both food deserts and food mirages were observed across Toronto, however, no food deserts were found in the downtown core. About a third (31%) of food deserts and 19% of food mirages exist within or directly adjacent to Neighborhood Improvement Areas, suggesting varying levels of food access across larger neighborhood areas identified by the City. Figure 4.2 illustrates food deserts and food mirages relative to all IDAs in Toronto.

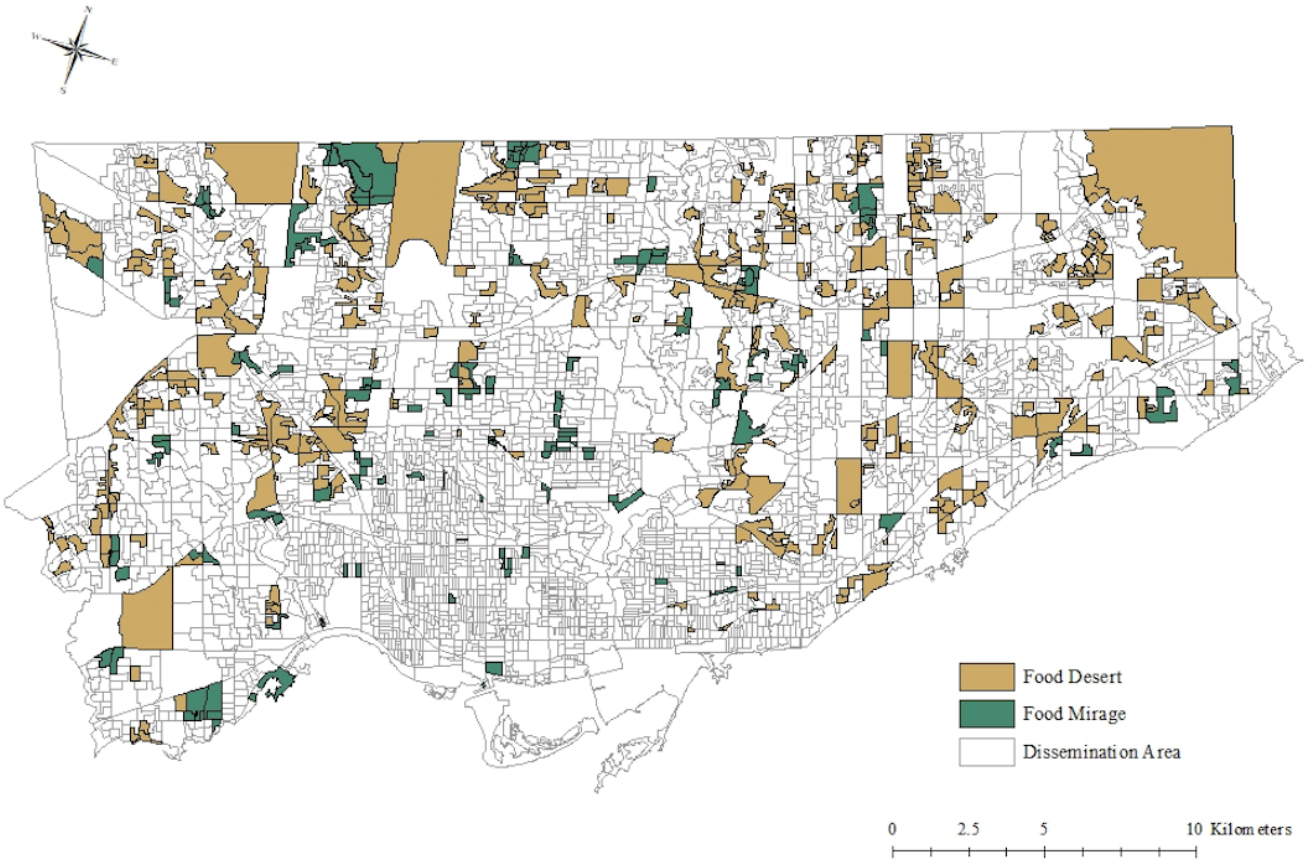

Figure 4.1: Food deserts and food mirages at the dissemination area level in Toronto, Canada

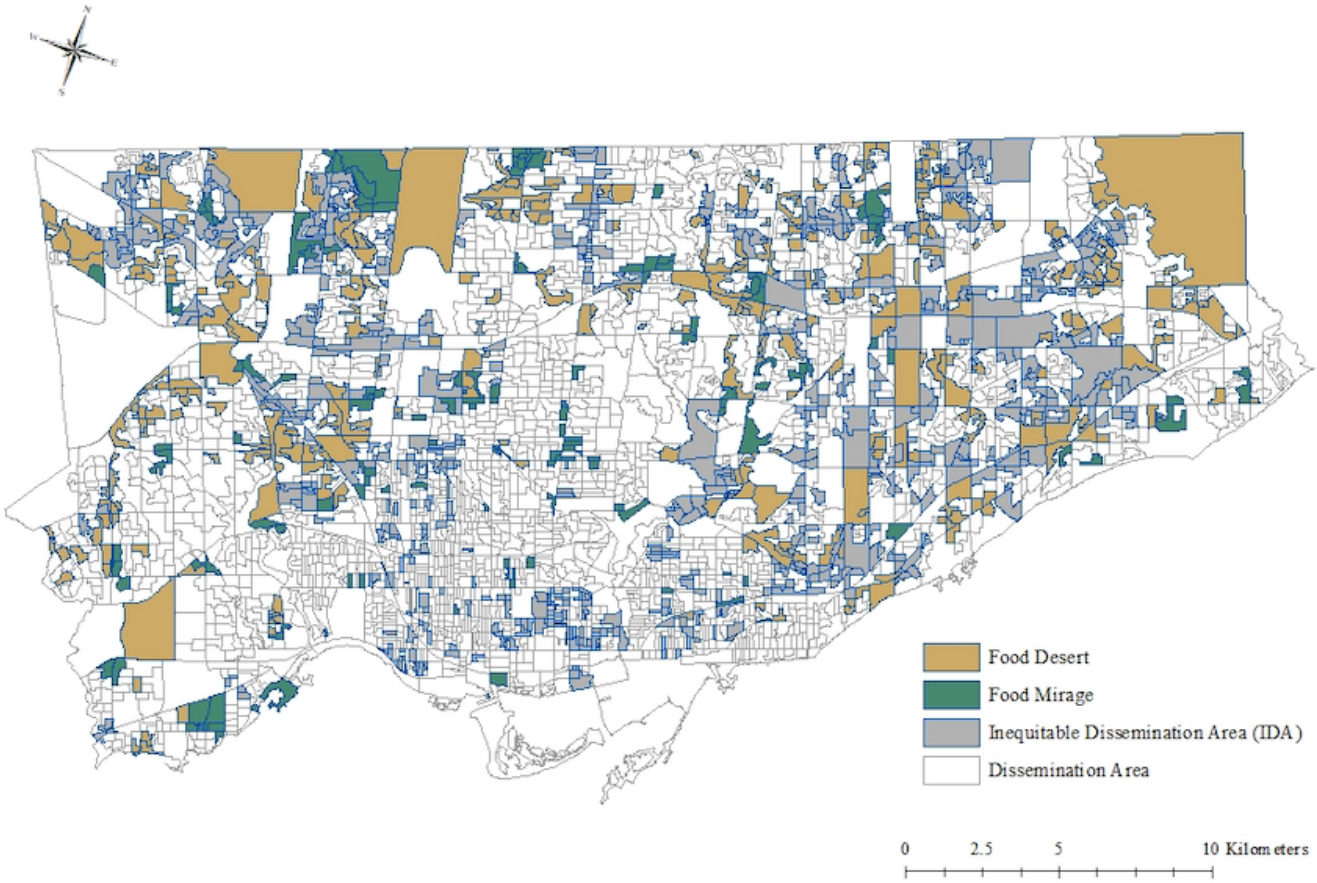

Figure 4.2: Food deserts and food mirages relative to IDAs in Toronto, Canada

Figures 4.3 and 4.4 illustrate where gentrifying census tracts (n=59) and BIAs (n=85) were observed across Toronto and how they follow similar spatial distributions. About 30% (n=104) of food deserts and 28% (n=43) of food mirages intersected with or were adjacent to gentrifying census tracts, affecting 104,549 food desert residents and 54,728 food mirages residents. Comparatively, 9% (n=30) of food deserts and 25% (n=39) of food mirages intersected with or were adjacent to BIAs, affecting 50,529 food desert residents and 42,230 food mirage residents. Collectively, food deserts and food mirages intersected with 48 gentrifying census tracts and 29 BIAs.

However, half of all gentrifying census tracts (n=29) intersected or bordered BIAs, suggesting overlap in these observations. In areas where gentrifying census tracts did not overlap with BIAs, 24% (n=82) of food deserts and 16% (n=25) of food mirages intersected with or were adjacent to gentrifying census tracts. In areas where BIAs did not overlap with gentrifying census tracts, 4% (n=13) of food deserts and 17% (n=26) of food mirages intersected with or were adjacent to BIAs. In other words, food deserts were observed more with gentrifying census tracts and food mirages were observed more with BIAs in terms of both percentages and absolute numbers.

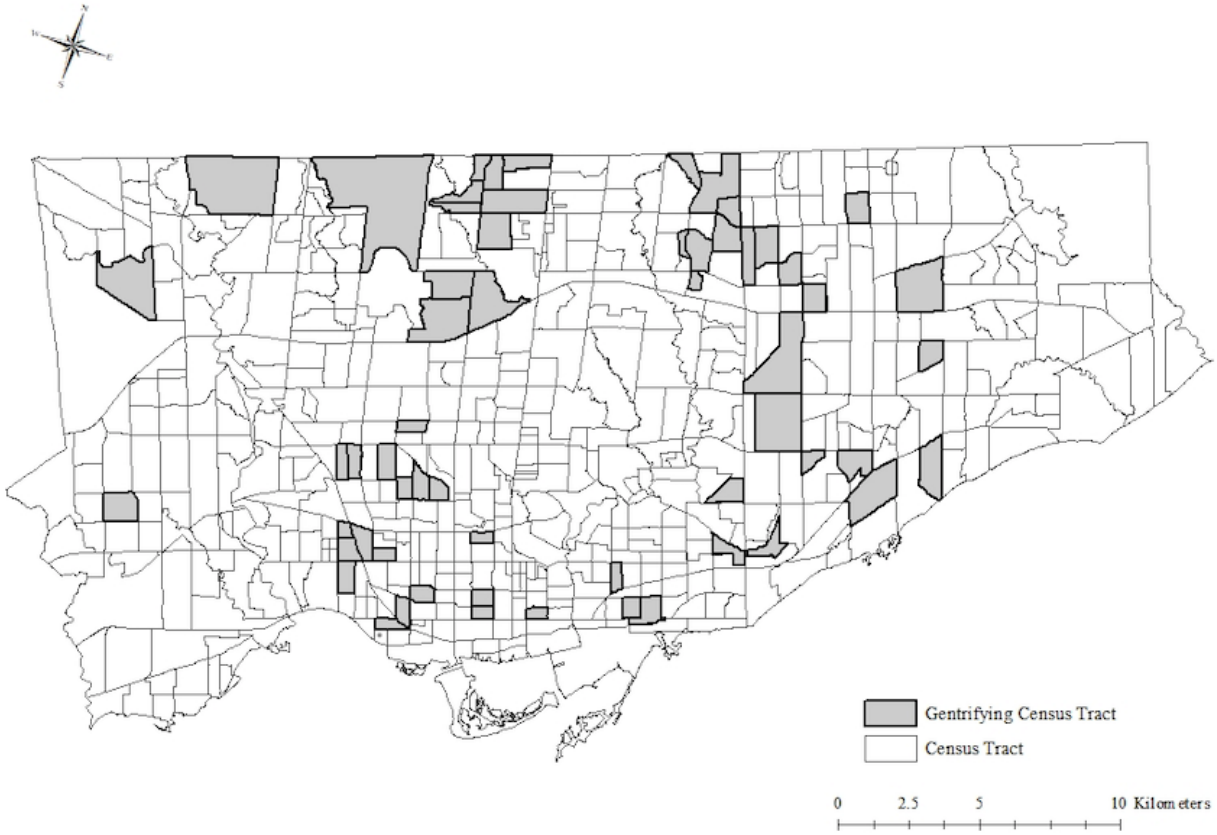

Figure 4.3: Gentrifying census tracts in Toronto, Canada

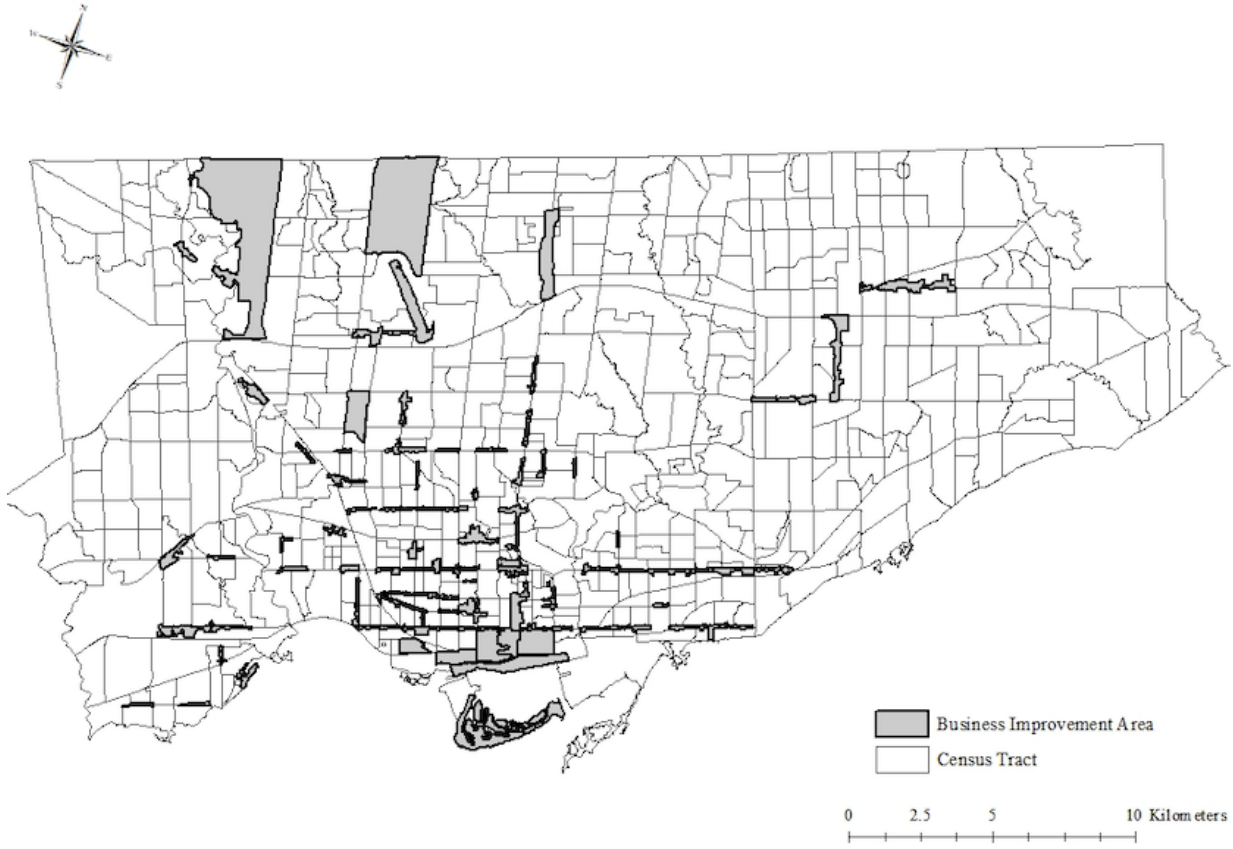

Figure 4.4: Business Improvement Areas across census tracts in Toronto, Canada

4.4.3 Spatial Distributions of Food Retailers

Food retailers are relatively evenly distributed across Toronto with the greatest concentration of all types in the downtown core and along popular retail corridors. More prominent spatial distributions were evident when organized by group type. Of all retailer types, discount supermarkets and ethnic grocers were mostly found within and along gentrifying census tracts and within suburban areas. In BIAs, specialty stores and "other" stores were most common, followed by conventional supermarkets. These two types of retailers were also frequently concentrated nearby each other, with few found in northern-Toronto suburban neighborhoods. The spatial distribution of ethnic grocers interestingly closely mirrored that of IDAs. Similarly, butcher and fish shops were located near IDAs across the Toronto.

4.5 Discussion

4.5.1 Summary of Key Findings

This paper comprehensively examined the extent to which food deserts and food mirages exist at the dissemination area level in Toronto and explored intersections between gentrification and both geographic (food desert) and economic (food mirage) food access. Below, we discuss major findings with respect to planning practice and policy, outline strengths and limitations of our study, and provide suggestions for future research.

In Toronto, both food desert and food mirage problem frames seem to fit; food deserts and mirages are both evident across suburban areas, while only food mirages are found in the urban downtown core. The substantial number of DAs locating within NIA social planning areas also proves how effectively measures at the DA level can pick up small pockets of inequity and disparity within broader areas. With respect to gentrification and food access, our research captured similar patterns to those observed by Breyer and Voss-Andreae (2013), Sullivan (2013), and Wiebe and Distasio (2016). Approximately one-third of both food deserts and food mirages intersected with gentrifying census tracts. In terms of absolute numbers, however, there were over twice as many food desert dissemination areas as food mirage dissemination areas intersecting with gentrifying census tracts. Gentrifying census tracts had more discount supermarkets and ethnic grocers than conventional supermarkets or other and specialty stores. Alternatively, in BIAs, the percentage of food mirages was significantly higher than food deserts, and specialty grocery stores and conventional supermarkets

were plentiful, suggesting that these DAs experience the benefits of BIA processes, projects, and developments. Moreover, SEI scores were most inequitable in food deserts, similar to observations in Winnipeg, Canada by Wiebe and Distasio (2016). This could be attributed to the greater number of lone-parent families and uneducated residents in those areas. Finally, it can be speculated that gentrifying census tracts are gentrification frontiers to BIAs given that half of the census tracts intersect with these historically revitalized policy areas.

Our observations suggest three key hypotheses about retail food environments and gentrification in Toronto that warrant further exploration: (1) Business Improvement Areas may be linked to food mirages through the development of high-cost food retailers in socially inequitable areas, (2) gentrification processes and effects on the food environment may have encroached from Business Improvement Areas into bordering neighbourhoods, and (3) food deserts in gentrifying census tracts may be at risk of transforming into food mirages through continued urban revitalization.

4.5.2 Planning Policy Implications to Toronto and Broader Contexts Beyond

Understanding implications of different food environment "problem frames" or metaphors is important, given that they help make sense of daily experiences and determine which solutions are explored (Koon et al., 2016). An important limitation of current RFE policies is that solutions are often framed in ways that understand food access as a binary outcome and disregard the complexity of food shopping (Widener, 2018). For example, a "food desert" problem implies a solution in which nutritious foods should be made more available through increasing food retailer density to improve *geographic* access. Conversely, a "food mirage" problem suggests that the problem is *economic* in nature, and thus, solutions may lie in poverty reduction strategies and dismantling systemic barriers to food insecurity (e.g., increasing lower-income residents' purchasing power to afford nutritious foods) (Minaker, 2016). Food mirage discourse additionally captures otherwise invisible barriers to population food consumption and dietary intake by exploring interactions among income, equity, price, and proximity to food retailers (Breyer and Voss-Andreae, 2013).

By including these additional variables, our research highlights several social equity issues, including social exclusion through third places and the loss of significant sociocultural food items, which can be heightened through urban change and gentrification processes (Anguelovski, 2016; Alkon & Cadji, 2018; Breyer & Voss-Andreae, 2013; Epstein, 2018; Hackworth & Rekers, 2006;

Komakech & Jackson, 2016; Short et al., 2007). For example, researchers in Toronto have revealed evidence of family-owned food shops, bodegas, and original grocery stores closing or being replaced by bar-based restaurants or cafes due to gentrification, especially within BIA boundaries (Enright et al., 2019; Epstein, 2018; Hackworth & Rekers, 2005; Takahashi, 2016). Komakech and Jackson (2016) also found that protecting small ethnic retail grocery stores is important for ameliorating gentrification impacts and increasing food security in mixed-use, mixed-income communities. Despite discussions and initiatives in some jurisdictions, applied solutions to address unsupportive food environments have not been an explicit goal of public policies across Canada (Tarasuk et al., 2015).

Currently, planners typically use zoning policies to incentivize and attract supermarkets to low-income neighborhoods, thus risking the possibility of supermarket greenlining (Cohen, 2018). Increasing supermarket development also raises land values, making it progressively more challenging for small-scale and ethnic retailers to find affordable commercial space (Cohen, 2018). Instead, planners should develop and recommend 'food haven' policies and zoning that protect low-cost, discount, and ethnic food retailers to promote greater retailer diversity and improve healthy food access for low-income and vulnerable residents (Tonumaipe'a et al., 2021). The concept of a 'food haven' posits a focus on a healthy, equitable, prosperous, and sustainable food environment and challenges limitations within current food environment metaphors (Tonumaipe'a et al., 2021). One approach could be to divide retail or mixed-use land into small parcels to advantage non-traditional small-scale retailers (Cohen, 2018). Another suggests that municipal planners develop an impact study and implement a standardized tool that evaluate direct and secondary displacement effects on nearby businesses and tenants of proposed food retail developments, unique to any general market impact studies that already exist within cities. A third proposes that municipalities with BIAs undertake longitudinal assessments of food retailers and review social stabilities within BIA neighbourhoods to make more informed and strategic planning decisions about competing BIA issues, including BIA expansions and revitalization projects. Such policies might discourage high-end, high-cost supermarkets and specialty stores from selecting marginalized areas for growth and profit opportunities at the expense of vulnerable residents and businesses. Such planning policies could also fight the threat of cultivating unsupportive retail food environments through gentrification, or at least intercept and influence urban renewal processes towards greater equity. Figure 4.5 illustrates our conceptual understanding, based on existing literature and our own results, of the

processes by which food deserts can transform into food mirages through gentrification mechanisms, including retail development and population migration, and shows the outcomes of development and displacement. It also shows that food deserts and food mirages can turn into food havens if appropriate and effective planning policies and interventions are employed.

However, zoning is not the only planning tool that could address food desert and food mirage problems, and "food haven" policies intrinsically suggest allyship between the planning profession and policy makers, public health practitioners, communities, and businesses to target poverty intervention strategies. Therefore, we, along with other researchers like Cohen (2018), Komakech and Jackson (2016), Sbicca (2018), Tonumaipe'a et al. (2021), Widener (2018), and Wiebe and Distasio (2016) stress the importance of formulating these policies in combination with efforts that promote food skills and food sovereignty or concern themselves with other gentrification effects, particularly with racialized communities and with Aboriginal populations. For instance, planners could advocate for affordable housing developments that include the development of appropriate food retail or ally with housing organizations to protect the displacement of tenants in gentrifying neighborhoods (Sbicca, 2018; Cohen, 2018). There are also mounting opportunities for planners to protect urban agricultural sites through long-term tenure and adopt "just green enough" strategies that balance environmental threats in gentrifying communities with input from citizen advisory groups (Cohen, 2018). As the retail food environment concept becomes more important for land use planning decisions and politics, planners have an important role to play as advocates for healthy, prosperous, and sustainable food environments, especially as these concepts relate to urban change processes.

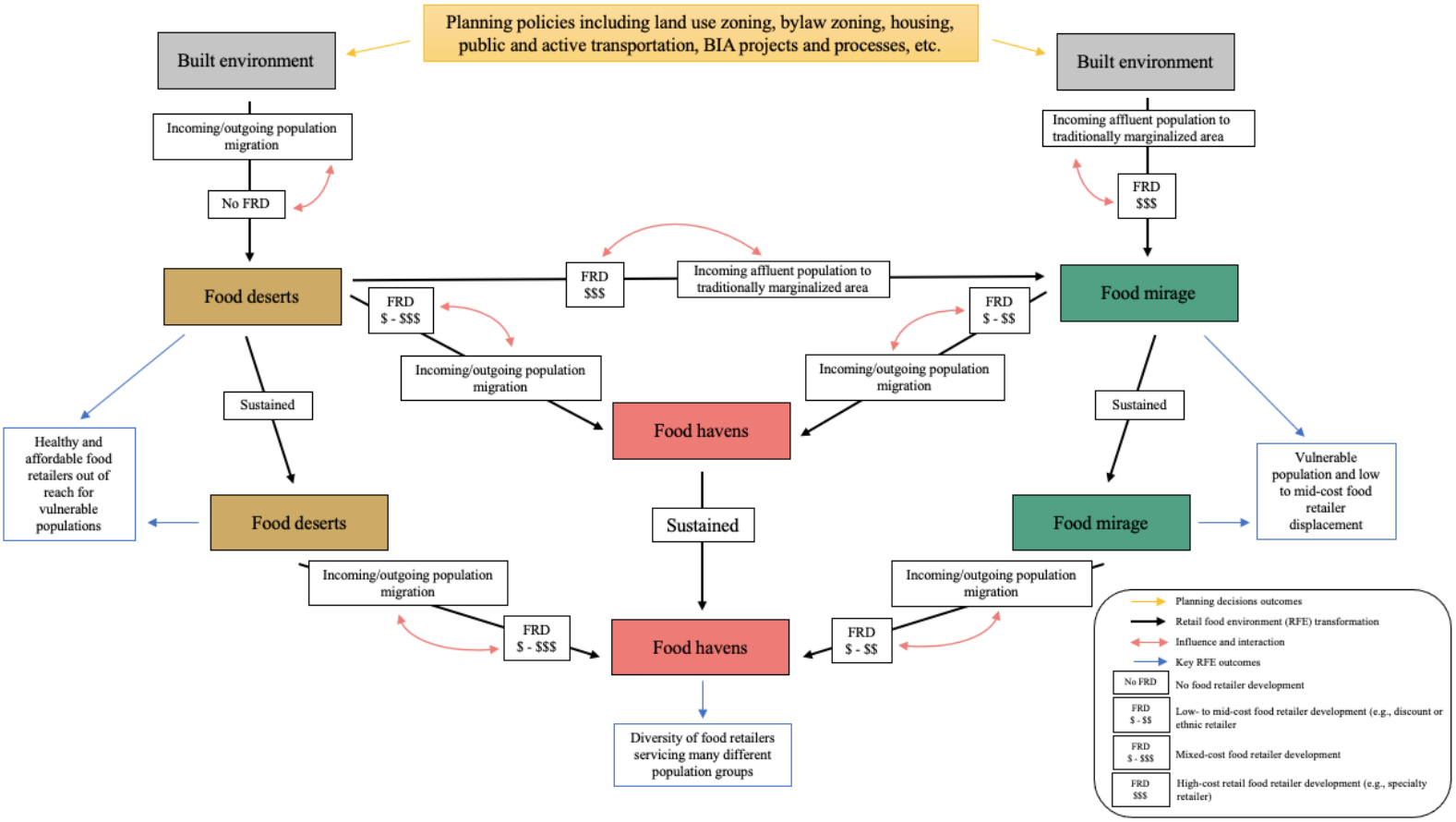

Figure 4.5: Conceptual processes and outcomes of retail food environments transforming due to food retail development and population migration

4.6 Conclusion

4.6.1 Study Limitations

One of the key limitations of this study is that it is a cross-sectional analysis on the retail food environment in Toronto and did not account for longitudinal changes of food retailers or complex determinants of grocery shopping at the household level. Because retail change data over an extended time frame was not examined, it is difficult to determine whether gentrification has historically or is actively contributing the emergence of specific RFEs. Future research should apply longitudinal data from DineSafe to assess whether causes and outcomes of retail development led to present food deserts and food mirages in Toronto, and also whether these findings are statistically significant. Additionally, we did not consider neighbourhood decline or residential displacement in our methodology of gentrifying census tracts, except to maintain that displacement is a real threat to

racialized and low-income communities living in revitalizing neighbourhoods. Bourne and Hulchanski (2021) stress that the population dynamics of neighbourhood change are dependent on both in- and out-migration, thus, there are also opportunities to expand on Ding et al.'s (2016) operationalization of gentrification. Moreover, several food mirages are located within relatively affluent areas, which may be a reflection of how sensitive the Principal Components Analysis statistics reduction technique used to derive the SEI is in terms of how heavily weighed indicators are in proportion to their actual contribution to socio-economic inequity (as detailed in the Technical Appendix).

We also assumed grocery shopping trips originate from home, however, the reality is that this is not always the case, and the closest food retailer may not be a consumer's preferred choice due to brand loyalty, personal preference, or seasonal motive. It was also beyond the scope of the current study to focus on alternative types of urban mobility (i.e., public transit and vehicle access), as well as novel options for grocery food delivery, but these are both excellent avenues for future research. Further, the current study also does not address individuals' potential mobility restrictions (due to disability status, for example), which can influence experiences with food consumption and perspectives of the food environment (Breyer & Voss-Andreae, 2013; Hillier et al., 2011; Luan et al., 2015; Ma et al., 2018; Tarasuk et al., 2019). Moreover, food retailer prices were not verified through primary data collection or in-store audits. We similarly did not take into account actual food costs, frequent flyer promotions, or coupons, nor did we consider food retailers that exist beyond Toronto's borders. Considering the rise of e-commerce and grocery delivery services expanding, healthy food and groceries may also become more accessible for populations living in food deserts and food mirages, and especially given that in some places, delivery charges are comparable to bus fare or ride hailing rates. That said, a strength of the study was using recent food price data published by Camden et al. (2017) from a census of Toronto supermarkets to categorize stores, as well as phone checks with butcher shops and fish shops to accurately categorize and include them as healthy food retailers. We also included BIAs as a secondary operationalization of gentrification as they are known to cause substantial commercial and residential shifts (Epstein, 2018; Hackworth & Rekers, 2005; Rankin & McLean, 2015; Takahashi, 2016).

4.6.2 Concluding Remarks

This study assessed the retail food environment in Toronto based on social inequities and both traditional and non-traditional food retailers. We observed how different RFE "problem frames" fit with gentrifying census tracts and Business Improvement Areas. Our findings suggest that BIAs in Toronto may have contributed to the emergence of food mirages based on the frequency to which BIAs intersect with this RFE. We also conclude that food deserts in Toronto may be at risk of becoming food mirages if policy interventions fail to protect existing low-cost food retailers. Planners are encouraged to implement 'food haven' policies to support municipal land use planning strategies and build upon this study with qualitative and non-spatial food access research.

4.6.3 Acknowledgements

This study was funded in part by the Emily Ruston Mann Memorial Graduate Scholarship and the Canadian Institute of Planners President's Scholarship awarded to Patrycia Menko. We are grateful to the butcher shops and fish shops in Toronto who took the time to answer our questions and support our research.

Chapter 5

Associations and Interactions between Neighbourhood-level Intersectionality, Healthy Food Access, and Gentrification in Toronto, Canada: Modelled using linear regression and binary logistic regression

5.1 Introduction

Over the last several years, a substantial number of studies emerged across North America examining the effect of race/ethnicity and socio-economic position on healthy food access (de Canto et al., 2015; Freedman & Bell, 2009; Jeong & Lui, 2020; Ohri-Vachaspati et al., 2019; Peng et al., 2019; Powell et al., 2007; Raja et al., 2007; Wang & Qui, 2016; Wang et al., 2016). Whereas past research largely focused on racial/ethnic or socio-economic disparities at an individual or household level, studies assessing neighbourhood-level position and the role of environmental contexts in shaping food purchasing opportunities are growing. Indeed, intersectionality is a popularizing framework (Caiola et al., 2015), however, it has yet to be employed well within quantitative research (Bauer, 2014) and within a Canadian context to determine how gentrification mechanisms affect food access and food equity to differently priced retailers for different population groups despite food gentrification and food mirage literature gaining prominence (Anguelovski, 2016; Breyer & Voss-Andreae, 2013; ; Cohen, 2018; Ong, 2020; Sbicca, 2018; Wiebe & Distasio, 2016). Moreover, Canadian literature remains mixed on the effects of poverty and race/ethnicity as barriers to healthy food access and tends to focus on measuring access to traditional food retailers (i.e., chain grocers) despite the mounting calls for researchers to include non-traditional outlets (e.g., local, ethnic shops) in analyses, both from a socio-cultural and economic standpoint (Behjat et al., 2013; Komkech & Jackson, 2016; Tarraf et al., 2017). Considering that planning decisions can either ameliorate or consolidate existing food access inequities in communities and regions (Broto & Alves, 2018; Martinez-Palacios, 2017), planning researchers have an obligation to study these relations and how the spatial distributions of retailers across cities can undermine healthy food access when compounded with other social and political forces.

To investigate these associations from a planning perspective, we applied an intersectional lens to our research and sought to assess disparities in healthy food access to a diversity of food retailers across racial/ethnic and socio-economic neighbourhoods in Toronto, and how gentrifying

census tracts may disturb food access by looking at where these interactions intersect. We also broadened previous understandings of retail food environments (RFEs) by Menko and Minaker (2021) by predicting the odds of visible minority neighbourhoods being located within food deserts and food mirages. The following sections synthesize relevant background information on intersectionality, retail food environments, racial/ethnic and socio-economic barriers to food access, and food gentrification and detail our specific research questions and methodology. Next, results and findings are presented. We conclude by discussing whether supermarket redlining may be happening (or has historically happened), examining how well serviced visible minority neighbourhoods are by affordable and ethnic retailers, contemplating differences in food access between gentrifying and non-gentrifying areas, and by highlighting the broader implications of our work to planning practice, theory, and research.

5.2 Background

5.2.1 Area-level Intersectionality, Retail Food Environments, and Planning Perspectives

Population health research has traditionally focused on a single social determinant of health, such as socio-economic position (SEP), race/ethnicity, or sex and/or gender, to examine health inequities while largely missing the significance of a conceptual intersectional framework in research, or intersectionality (Bauer, 2014; Caiola et al., 2015; Veenstra, 2011). First coined by African American scholar Kimberlé Crenshaw, intersectionality is a transformative paradigm rooted in critical and feminist theory and can be particularly useful for addressing how different social identities and conditions are rooted in structures of power, history, and geographic location (Caiola et al., 2015; Berger & Guidroz, 2009; Hankivsky, 2012; Crenshaw, 1989). Intersectional research is usually qualitative in nature, but recent quantitative studies aim to address complexities in methodology and distinguish intersectionality as mutually constituted social inequities between identity, position, and external processes that amplify dissonance and health inequity between certain social groups, manifested at both the individual and the population level (Bauer, 2014; Caiola et al., 2015; Veenstra, 2011). For instance, certain neighbourhoods in a city might fail to offer material and social resources to support and sustain healthy food access and procurement, leading to certain social groups being marginalized and having different experiences across the built environment (Larsen & Gilliland, 2008). The persistence of these types of experiences and interactions is fashioned by a socially determined dominant group from which all group comparisons are made and from which power

hierarchies persist (Caiola et al., 2015; Weber, 2006). The explicit and careful application of intersectionality in research has the potential to address some of these types of multilevel power relations (Bauer, 2014). Moreover, intersectional research can reduce measurement bias by providing multi-axis analyses in which heterogeneity is implicit (Bauer, 2014; Caiola et al., 2015), thus improving construct validity and ensuring more appropriate, culturally sensitive, and practical community-based public health plans and policies.

The retail food environment (RFE) is a modifiable element of the built environment that describes both geographic and economic food access in an area and can help describe the level of food equity, justice, sovereignty, and security within a neighbourhood (Moran, 2020; Winkler et al., 2020). It exists within mutual relations and interactions between retailers and customers, as well as macro-level contexts, such as policies and economic systems, that influence and impede these exchanges and important population health behaviours and disparities (Moran, 2020; Winkler et al., 2020). Three principal RFE problem frames applicable to healthy food access exist, those being *food deserts* – low-income areas where healthy food is non-existent or where geographic access is severely constrained, *food mirages* – low-income areas where healthy food is present but economically inaccessible due to the sole presence of high-cost food retailers, and *food havens* – an emerging metaphor wherein people have a high availability of healthy food options that are accessible, convenient, affordable, and desirable (Tonumaipe'a et al., 2021) and where a diversity of food retailers exist, particularly discount, and ethnic food retailers among conventional supermarkets and specialty stores, so that affordable healthy food access is protected and sustained for low-income, racialized, marginalized, and immigrant communities (Menko & Minaker, 2021). A *food swamp* is another popular RFE problem frame, but these marginalized areas are the result of high unhealthy food access and characterized by a high density of fast-food outlets and convenience stores (Minaker, 2016).

Within the scope of RFEs and healthy food access, intersectionality can enable more profound analyses of neighbourhood differences in access and exclusion to resources and food outlets. An intersectional approach may help illuminate how these inequities perpetuate disparities in dietary intake at the population level and reveal opportunities in planning to address place-based inequities. Applying intersectionality in planning research is also a direct evolution from advocacy, equity, and humanist planning perspectives – all of which are concerned about systems change and

reducing social costs of urban decline and displacement, advocating for the interests of marginalized groups and neighbourhoods, and closely linked to improving population health and wellbeing (Whittemore, 2015). Intersectionality thus appears to be the next natural progression in planning perspectives and can help make room for more remedial, sensitive, and thoughtful practices. Moreover, the increasing number of provincial and federal calls for Canadian planners to pay attention to the role of local food environments and food systems (CIP, 2018; OPPI, 2017) may very well be the catapult for more intersectional work in planning research and practice.

5.2.2 Food Retailers and Neighbourhood Food Access Among Different Population Groups

Previously, RFE studies tended to focus on the absence or presence of supermarkets (Breyer & Voss-Andrea, 2013; Wiebe & Distasio, 2013) or those plus convenience stores (Peng et al., 2019). More recent research suggests that including independent and ethnic shops better captures the actual density of healthy food in an area and that these retailers are significant sources of affordable food items (Anguelovski, 2016; Behjat et al., 2013; Komakech & Jackson, 2016; Menko & Minaker, 2021; Ohri-Vachaspati et al., 2019). Ethnic shops also sell culturally appropriate food items for ethnic residents, accommodate immigrants and newcomers with a limited literacy in English (Tarraf et al., 2017), and provide the bedrock of community life for these groups as distinctive spaces for socialization (Alkon & Cadji, 2018; Anguelovski, 2016; Komakech & Jackson, 2016; LeDoux & Vojnovic, 2013; Short et al., 2007; Raja et al., 2007). These features of ethnic food stores can be particularly liberating for racialized people who may encounter discrimination or unfair treatment while food shopping in non-ethnic shops (Odoms-Young et al., 2009; Zenk et al., 2013). Considering a broad diversity of food retailers is also important because households tend to shop for food at places close to their residence (Peng et al., 2019) and the distribution of outlets varies across neighbourhoods. Moreover, dietary patterns are influenced by compounded purchasing factors, such as the availability, quality, and price of items within stores (Ball et al., 2009; Camden et al., 2009; Zukin, 2009). For example, nutritious foods like fruits and vegetables are often more expensive than less nutritious options (Camden et al., 2017), thus healthier food may be overlooked in favour of lower-cost options (del Canto et al., 2020), and this can be particularly problematic for low-income households, who are often price-sensitive shoppers (Breyer & Voss-Andrea, 2013).

The effects of poverty also often interact with race and ethnicity and mutually present additional barriers to food access. In general, research from the United States (US) that compares

racial/ethnic and SEP population group food access finds that low-income and predominantly Black communities face worse overall geographic access to healthy food retailers, both in terms of longer distance and lower density, than affluent and predominantly white neighbourhood counterparts (Freedman & Bell, 2009; Jeong & Lui, 2020; Kraft et al., 2020; Lamichhane et al., 2013; Ohri-Vachaspati et al., 2019; Peng et al., 2019; Powell et al., 2007; Raja et al., 2007; Walker et al., 2010; Zenk et al., 2013). Visible minorities, racialized, and low-income populations facing poor geographic food access also experience the highest rates food insecurity, obesity, and other diet-related health conditions, such as type 2 diabetes and heart disease, because insufficient access to quality nutritious foods over time can adversely affect dietary intake (Freedman & Bell, 2009; Heewon et al., 2020). These groups are typically less likely to own a personal vehicle and therefore expend greater resources to obtain healthy food, such as by spending more money on transit or taxi options (Larsen & Gilliland, 2008) or by relying on others to travel to further grocery stores (Ma et al., 2018). Also in the US, low-income and racialized neighbourhoods also have fewer supermarkets and are more often serviced by small non-chain grocery stores and convenience stores, which are sometimes supplemented by fruit and vegetable markets (del Canto et al., 2015; Jeong & Lui, 2020; Powell et al., 2007; Raja et al., 2007; Ohri-Vachaspati et al., 2019). That said, other research shows no difference in healthy food availability and/or accessibility by racial/ethnic composition of a neighbourhood, and instead differences exist only by area-level income or other social positions (Bower et al., 2014). For example, Bower et al. (2014) found that as neighborhood poverty increased, supermarket availability decreased and grocery and convenience stores increased, regardless of race/ethnicity. Some studies even go so far as to suggest that associations between broader built environment context factors and healthy food purchasing is almost nil (Peng et al., 2019) or that the availability of healthy foods only slightly favours advantaged areas (Ball et al., 2009).

To date, however, little Canadian research has examined how race/ethnicity and SEP is associated with neighbourhood food access; and of the extant studies that have, findings are mixed across cities and some even contradict the bulk of the literature on this topic. For example, Wang et al. (2014) and Wang and Qiu (2016) found that low-income, unemployed, and minority population neighbourhoods have higher access to fresh food outlets in Edmonton, Canada, and that fresh food providers tend to offer services in areas with a relatively low median income (below $30,000). These findings are consistent with earlier research by Smoyer-Tomic et al. (2008) who found that neighbourhood socio-economic status is not an independent factor in Edmonton's supermarket

distribution. However, in another study led by Wang et al. (2016), the effects of neighbourhood race/ethnicity on food access were mixed across two cities in Saskatchewan, Canada: in Regina, dissemination areas (DAs) with a high rate of minority groups have high access to fresh food retailers and local grocery stores but in Saskatoon, Saskatchewan, DAs with a high rate of minority groups scatter while fresh food retailers tend to cluster in certain regions, thus no spatial patterns could be identified. Moreover, in Saskatoon, low-income neighbourhoods are not located along major roads, pointing to transportation as a crucial element that influences food access (Wang et al., 2016). In fact, in a 2015 study on healthy food access in Waterloo, Ontario by Luan et al., one DA transitioned from a food swamp to a food desert due to road network reconstructions that made supermarkets and superstores inaccessible. Thus, it remains difficult to broadly infer food access patterns for low-income and racialized neighbourhoods for several reasons, including that study areas vary in size and urbanity and differences can exist even between cities of similar composition (Wang et al., 2016). Mixed findings also make it challenging to generalize local contexts and patterns within a province or across the country when responding to calls from the planning profession in developing practical and equitable food-related plans and policies and in seeking collaboration from other regions, suggesting researchers ought to continuously study cities relative to their own unique urban positions.

Methodological differences exist in the literature too, including varying neighbourhood boundaries and/or using different proxies of racial/ethnic composition. For example, some food access studies occur within census tracts (Bower et al., 2014; Ohri-Vachaspati et al., 2019) whereas others measure food access within DAs (Wang et al., 2016; Wiebe & Distasio, 2016). Studies also define neighbourhood racial/ethnic composition differently, with some considering predominancy as greater than 80% of the population of a given neighbourhood (Lamichhane et al., 2013), others as greater than 60% (Bower et al., 2014), and even others as greater than 50% (Ohri-Vachaspati et al., 2019). Research in this area also still too often looks at race/ethnicity and SEP as non-overlapping variables (Ball et al., 2009; del Canto et al., 2015; Larsen & Gilliland, 2008; McKenzie, 2015; Wong et al., 2018) rather than as mutually constituted social positions. In doing so, researchers may miss important opportunities to understand intersectional neighbourhood identity perspectives and whether the quality of these relationships differs by different predominant neighbourhood identities. Ignoring these intersecting spatial, socio-economic, and demographic interactions can also lead to overestimates or underestimates of true disparities when investigating food access inequities at the population level, and even more so as these concepts relate to urban change and revitalization.

5.2.3 Food Gentrification

Food access and the distribution of food retailers are also politically entangled with gentrification processes and rooted in residential patterns. Gentrification is a complex and deliberate planning and socio-economic phenomenon, often revealed through the rapid influx of resources and the in-moving of more affluent people into traditionally disinvested neighbourhoods (Anguelovski, 2016; Takahashi, 2016; Ding et al., 2016). Gentrification takes place over many years, operates under many distinct but interrelated forms (e.g., commercial gentrification, residential gentrification, etc.), and creates uncertainties about displacement for existing food retailers and low-income residents (Anguelovski, 2016; Komakech & Jackson, 2016; Zhang & Debarchana, 2016). For instance, Zukin (2008; 2009) found that the arrival of chain stores in marginalized neighbourhoods led to impersonal shopping experiences, an increase in alternative consumption practices that are predominantly championed by affluent, white residents, and the replacement of local, ethnic shops. Further, in terms of *food gentrification* and the mechanisms of retail food investment practices, or commercial gentrification, the arrival of high-cost or boutique food retailers can also signal the "readiness" of marginalized neighbourhoods for further redevelopment (Anguelovski, 2016; Cohen, 2018; Ong, 2020; Zukin, 2009) and/or out-compete or replace affordable food options (Cohen, 2018; Enright et al., 2019; Epstein, 2018; Hackworth & Rekers, 2005; Meltzer, 2016; Sakızlıoğlu & Lees, 2020; Sbicca, 2018; Takahashi, 2016; Zukin, 2008; Zukin, 2009). This process of *supermarket greenlining* (Anguelovski, 2016; Sbicca, 2018) is a clear departure from *supermarket redlining* – the alternate process by which chain and traditional supermarkets and grocery stores avoid or withdraw from impoverished areas and opt to favour and locate in suburban and affluent neighbourhoods with higher spending power (McKenzie, 2014; Zhang & Debarchana, 2016).

Thus, gentrification is theorized to directly contribute to creating inequitable RFEs, specifically food mirages, resulting in potentially longer travel times to obtain affordable healthy food for low-income residents (Breyer &Voss-Andrea, 2013; Cohen, 2013; Sbicca, 2018; Menko & Minaker, 2021). In a 2020 study in Toronto, Canada, Menko and Minaker (2021) findings suggested that food deserts in and adjacent to gentrifying census tracts may be at risk of transforming into food mirages through continued urban redevelopment, such as through urban revitalization projects in policy-led Business Improvement Areas. Gentrification processes also negatively impact racialized and lower SEP populations more than non-racialized or higher SEP populations and often lead to heightened feelings of exclusion among vulnerable residents (Anguelovski, 2016; Doucet, 2020;

Komakech & Jackson, 2013; Sbicca, 2018; Zhang & Debarchana, 2016). For instance, Doucet (2020) found that gentrification incentives and policies are known to benefit some residents while excluding others, and can exacerbate existing social, spatial, and racial inequities across cities. One particular local entrepreneur expressed that they were "intimately aware" (p. 643) of how the incoming businesses can threaten communities and livelihoods despite being seen as successful outcomes for planners and policy makers. Conversely, Komakech and Jackson (2016) found that protecting small ethnic retail grocery stores (SERGS) is important for ameliorating such gentrification impacts, in shaping and sustaining neighbourhood and household identities for low-income and racialized population groups in neighbourhoods, and to support healthy food access and food security in mixed-use, mixed-income communities. Considering that gentrification processes can constrain food access and negatively impact racialized and lower SEP populations more than non-racialized or higher SEP populations (Anguelovski, 2016; Komakech & Jackson, 2013; Sbicca, 2018; Zhang & Debarchana, 2016), exploring food access and food retail price variation over urban space is a valuable and ambitious venture in research to help understand and alleviate intersectional inequities related to population dietary intake, especially within a Canadian context. Additionally, further research on food access in Canada, especially at the dissemination area level, can help formulate planning-based interventions at a small geographical unit and capture indications of neighbourhood-level food inequity which can ultimately help direct efforts to unfavourable areas while maintaining sensitivity to racial and ethnic groups and cultural food practices.

5.3 Methods

5.3.1 Study Objective and Research Questions

This exploratory quantitative ecological study measures and compares food access in diverse neighbourhoods at the dissemination area level by predominant race/ethnicity and SEP, and between gentrifying and non-gentrifying census tracts in Toronto, Canada. Specific research questions are:

1. What are the racial/ethnic and socio-economic differences in neighbourhood food access (proximity measured by mean distance in kilometres and density) to differently priced food retailers in Toronto?
2. What are the differences in food access between gentrifying and non-gentrifying census tracts in Toronto? Do these disparities in access differ by racial/ethnic and socio-economic neighbourhood identity?

3. What are the racial/ethnic compositions of food deserts and food mirages in Toronto? Are racialized populations more likely than non-racialized minority populations to live in food deserts and food mirages? Are racialized populations more likely to existing in food deserts and food mirages in gentrifying versus non-gentrifying areas, respectively?

5.3.2 Study Area: Toronto, Canada

Toronto is the world's most multicultural city and Canada's largest metropolitan city with a total population of 2.7 million, of which visible minority[4] was measured at 51.5% in the last census (Statistics Canada, 2017). Toronto's visible minority population is largely represented by South Asian, Black, and Chinese residents, and nearly 190,000 immigrants arrived between 2011 and 2016 (Statistics Canada, 2017). Toronto also has a broad diversity of retail food options and a rapidly changing and urbanizing landscape, presenting a suitable context for which to assess food access and food gentrification. Toronto has a serious food insecurity problem and contributes to Canada's high rates of food insecurity (Coleman et al., 2018; Toronto Public Health, 2019). Across Canada, Black households experience the highest rates of food insecurity (28.9%), followed by Indigenous, Arab and West Indian, other or multiple origins, South Asia, and East and Southeast Asian minority groups (Tarasuk and Mitchell, 2020). In 2021, Menko and Minaker found that Toronto has 346 food deserts and 155 food mirages at the dissemination area level, collectively affecting 19% of Toronto's population. Food deserts and mirages are also both evident across the city, predominantly away from the core, while only food mirages are found in more densely populated corridors of the downtown core and surrounding area.

5.3.3 Data Collection and Generation

This study relies on secondary data from the 2016 Canadian Census at the dissemination area (DA) level and DineSafe (Toronto Public Health's health and safety inspection data for all retailers selling food in Toronto). It applies Menko and Minaker's (2021) Social Equity Index (SEI), categorization of DineSafe 'Supermarket' retailers based on Camden et al.'s (2017) study on food prices among different supermarket types in Toronto, and findings on food deserts, food mirages, and gentrifying census tracts in Toronto to understand disparities in food access across different racial/ethnic and SEP

[4] Of note, the term "visible minority", which is contentious, is defined by Canada's Employment Equity Act (1995) as "persons, other than Aboriginal peoples, who are non-Caucasian in race or non-white in colour." We use the term "racialized" throughout this paper other than when we refer to "visible minorities" as assessed by the Canadian Census.

groups. Intersectionality was incorporated into this study by disentangling SEI scores from the racial/ethnic composition of dissemination areas to make up intersectional profiles of neighbourhoods.

5.3.3.1 Identifying and Classifying Healthy Food Retailers

Menko and Minaker (2021) accessed DineSafe data through the City of Toronto Open Data portal in July 2020. All retailers under the 'Supermarket' category were classified using website and online directories into one of four differently-priced food retailer groups based on findings from Camden et al.'s (2017) assessment of the consumer nutrition environment, wherein discount and ethnic stores tend to have lower-priced fruits and vegetables compared to conventional or specialty stores.

The four groups in order of lower- to higher-cost food retailer are: (1) ethnic grocers (i.e., stores that cater to specific ethnic, immigrant, or cultural groups, and/or had a name, signs, or flyers in another language, and/or had a social media page that advertised in a different language), (2) discount supermarkets (e.g., Food Basics, No Frills), (3) conventional or chain supermarkets (e.g., Sobeys, Metro), and (4) other or speciality stores. Even though other and specialty stores were classified from the DineSafe 'Supermarket' category (n=134), they were excluded from this study to better compare distance and density measures of food access with other North American studies that largely focus on food access to traditional retailers (i.e., conventional and discount), while also contributing to the growing body of research that consider food access to ethnic retailers. Supermarkets were also excluded if they were member-based and closed to the public (e.g., Costco), had permanently closed since data was collected, or had extremely limited or missing information online and could not be verified. A total of 323 food retailers met the inclusion for criteria (Table 5.1) and were geocoded into ArcMap (version 10.8.1).

Table 5.1: Total counts of food retailers meeting inclusion for criteria organized by type

Food Retailer Type	***n***
Conventional or Chain Supermarket	91
Discount Supermarket	77
Ethnic Grocer	155
Total	323

5.3.3.2 Operationalizing Intersectionality at the Dissemination Area Level: Intersectional Profile Neighbourhoods

One of the most important and critical components of this study was operationalizing intersectionality at the neighbourhood level. To do so, each dissemination area was assigned a racial/ethnic composition and an SEI score from Menko and Minaker (2021) to make up an intersectional profile. This ensured that when assessing food retailer proximity and density across different neighbourhoods, we also disentangled overlapping categories of identity and socio-economic indicators that would mutually result in unfair and unjust food purchasing power and food access.

Racial/ethnic compositions of DAs were identified using 2016 Census data on visible minority populations. Visible minorities refer to person's identifying as "persons, other than Aboriginal peoples, who are non-Caucasian in race or non-white in colour" (Employment Equity Act, 1995). A total of 5 racial/ethnic category types were derived based on the three most populous visible minority populations in Toronto (Black, Chinese, and South Asian), a Mixed Visible Minority (MVM) category (the sum of the remaining visible minority groups), and a Not Visible Minority (NVM) category based on Statistics Canada visible minority variables. The NVM category also includes Aboriginal identity respondents as well as non-Indigenous respondents who were not considered to be members of another visible minority group.

The racial/ethnic composition of a DA was found by dividing the population counts of Black, Chinese, South Asian, MVM, and NVM respondents by the total count of a visible minority for the population in private households. The predominant racial/ethnic identity of a DA was considered as the identity group with the highest percentage or share of representation within that DA[5]. A total of 19 DAs did not have racial/ethnic data available and were excluded from the study, resulting in 3683 DAs out of 3702 DAs with racial/ethnic composition profiles (Figure 5.1). Racial/ethnic profiles also helped in identifying the racial/ethnic composition of food deserts and food mirages from Menko and Minaker (2021).

[5] Note that long form Census data (i.e., the version in which visible minority data is collected) requires random rounding to be applied in multiples of 5 or 10 to each individual value (i.e., all counts greater than 10 are rounded to base 5 and all counts less than 10 are rounded to base 0 or 10). This ensures confidentiality at the dissemination area level; however, this also means that some visible minority counts in our study may not sum to exactly 100%.

DAs were further organized into social identity groups by applying the Social Equity Index (SEI) from Menko and Minaker (2021) (Figure 5.2). The SEI is representative of socio-economic barriers to food access, such as purchasing power, and measures broad inequity at the dissemination area (DA) level using five variable indicators and outcomes drawn from 2016 Census data, including: (1) median after-tax household income, (2) unemployment rate, (3) completion of postsecondary certificate, diploma or degree for the population aged 25 to 64 years in private households, (4) total number of lone parent census families in private households, and (5) recent immigrants arriving between 2011 and 2016. Each DA was assigned an SEI score, with 0 being the most theoretically inequitable score and 100 being the most theoretically equitable score. Scores ranged from 26.20 to 82.54 and DAs were organized into four index classes by score rank order on ArcMap using the Jenks natural breaks classification method. Jenks natural breaks classification method, also called Jenks optimization method, is a data clustering method that seeks to reduce the variance within classes and maximize the variance between classes (Jenks, 1967). Four index classes were chosen because approximately four distinctive data clusters (i.e., data elbows) were evident on a line graph when SEI scores were plotted on a line graph to visualize the data distribution. Table 5.2 details the distribution of intersectional profile neighbourhoods as well as SEI class score ranges. Further descriptions about statistical methods and equations used towards the SEI, including the SEI score line graph, can be found in Appendix A: Technical Appendix.

Table 5.2: Intersectional profile neighbourhoods

Predominant Race/Ethnicity	**SEI Class 1 26.20 – 55.37**	**SEI Class 2 55.38 – 63.13**	**SEI Class 3 63.14 – 68.48**	**SEI Class 4 68.49 – 82.54**	***n***
NVM	65	488	1227	854	2634
Black	64	48	10	2	124
Chinese	14	125	162	41	342
South Asian	41	113	123	19	296
MVM	40	129	101	17	287
n	224	903	1623	933	3683

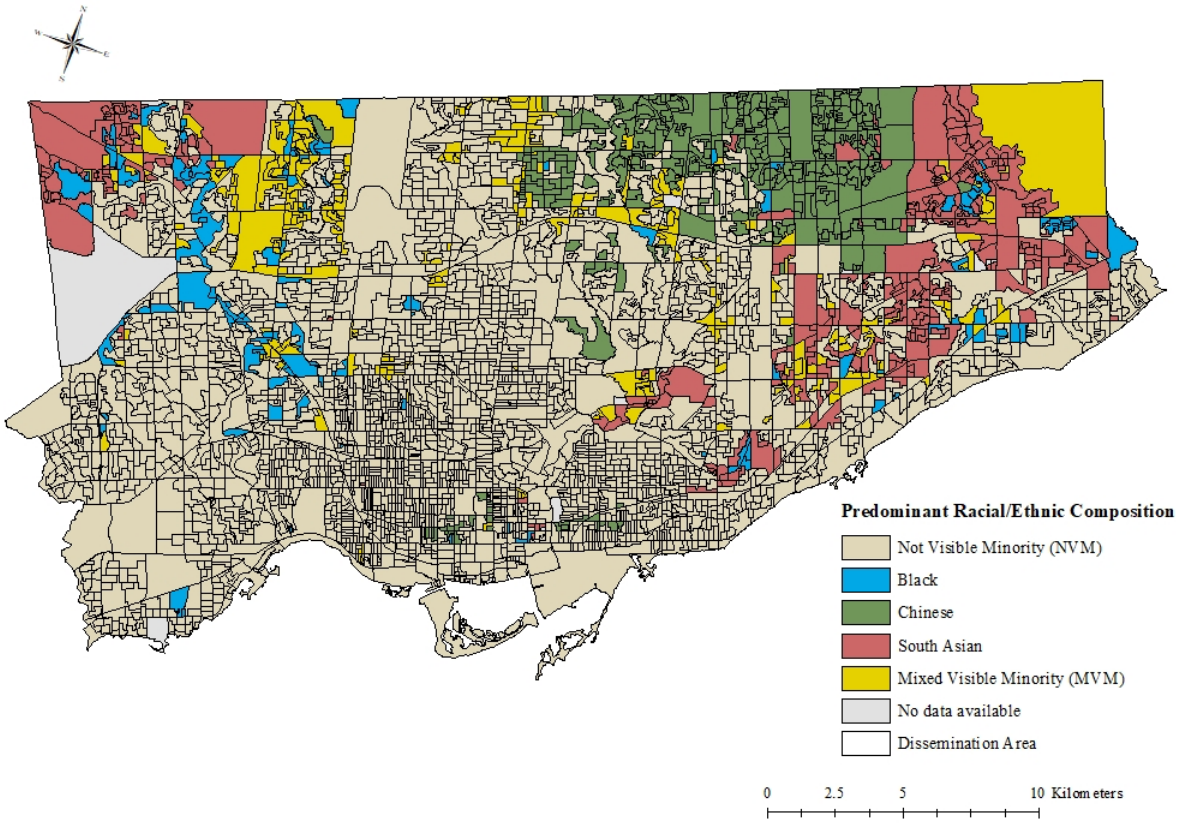

Figure 5.1: Predominant racial/ethnic compositions of dissemination areas in Toronto, Canada

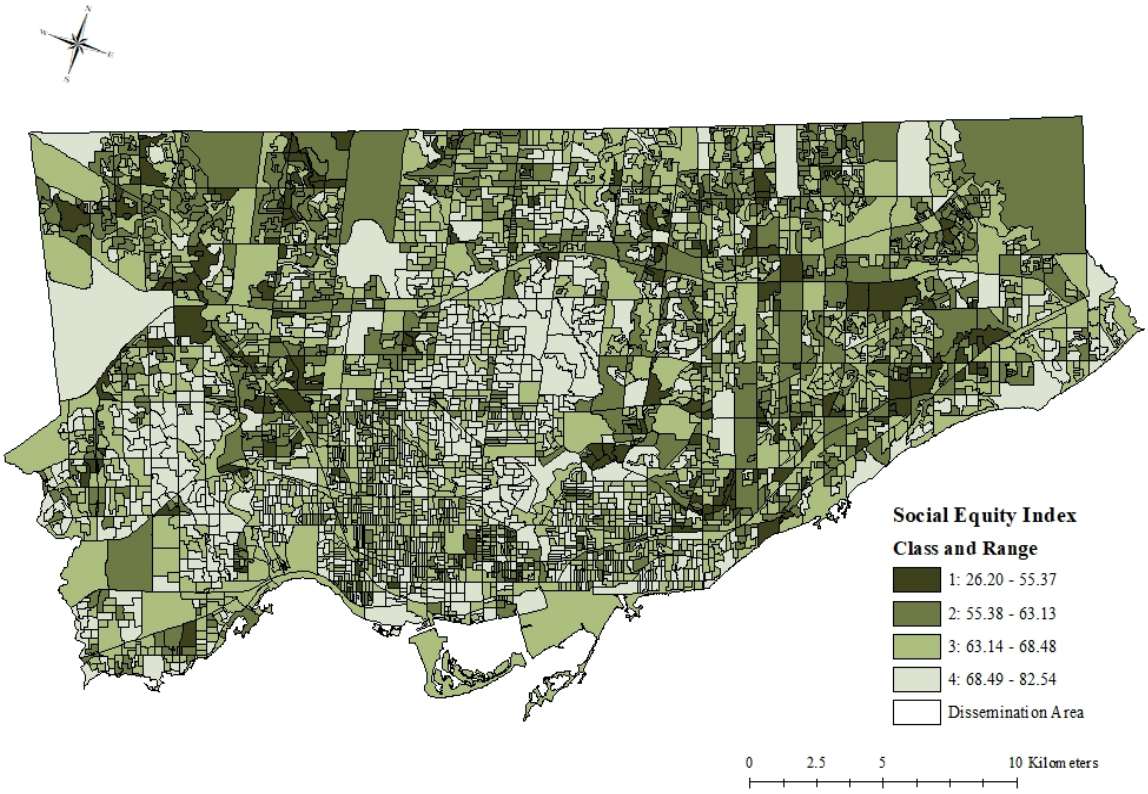

Figure 5.2: Social Equity Index classes and ranges across Toronto, Canada

5.3.3.3 Applications from Menko and Minaker (2021)

Both RFE findings and gentrification census tracts findings were applied from Menko and Minaker (2021). Menko and Minaker (2021) considered food deserts (n=346 DAs) as DAs below the SEI benchmark score of 63.14 and had no DineSafe 'Supermarket' retailers or additional DineSafe 'Butcher shops' or 'Fish shops' retailers within a 1km street network buffer from their population-weighted centroid, suggesting healthy food access is non-existent or severely constrained by geographic measures within those areas. Food mirages (n=155 DAs) were considered as DAs below the benchmark score of 63.14 and only had higher-priced 'Supermarket' retailers (e.g., conventional chain supermarkets or specialty grocery stores) within a 1km street network buffer from their population-weighted centroid, suggesting food access is constrained by both geographic and economic measures.

Menko and Minaker (2021) applied a gentrification measure by Ding et al. (2016) to show changes over a 10-year period in the socio-economic status of residents and housing costs using 2006 and 2016 Census data. A census tract was considered *gentrifiable* if it had a median household income below the citywide median in 2006. A census tract was considered *gentrifying* if it was gentrifiable in 2006 and experienced both an above citywide median percentage increased between 2006 and 2016 in either its median gross rent or median home value and an above citywide median increase between 2006 and 2016 in its share of university-educated residents (i.e., holding a bachelor's degree or above). All other census tracts were considered *non-gentrified*. A total of 59 gentrifying census tracts (GCTs) were identified and were geocoded into ArcMap.

5.3.3.4 Sourcing Population Weighted-Centroids of Dissemination Areas and Street-Network Files

Population-weighted centroids of DAs were accessed through the Statistics Canada Geographic Attribute File, which contains geographic data at the dissemination area level. DAs are the smallest geographic units defined by Statistics Canada for which census data are disseminated across Canada and have populations of 400 to 700 people. Population-weighted centroids are weighed using the population mean centre within a DA boundary and provide a more accurate and realistic indication of where populations live compared to the true mean centre of a DA. The street-network dataset used to derive street-network distances from the population-weighted centroids of DAs to different food retailers was provided by DMTI Spatial.

5.3.4 Calculating Proximity to and Density of Healthy Food Retailers

The Network Analyst Origins-Destination (OD) Cost Matrix analysis was used on ArcMap to determine the mean street-network distance in metres from the population-weighted centroids of DAs to the nearest conventional and discount supermarkets and to ethnic retailers. Determining a poor access threshold distance to food retailers was one of the most important and essential elements of this study. To compare with other retail food environment research, good or reasonable distance was considered as 1000m or less along the street-network to represent a 10-to-15-minute walking distance. Food retailer counts by type were recorded for each DA using the Spatial Join feature on ArcMap (i.e., joined outputs reflected the number of food retailers point features within the DA polygon layer).

5.3.5 Statistical Analyses

This study consists of descriptive statistics and ordinary least squares regression analysis. Linear regression was used to assess the significance of racial/ethnic and SEI differences in neighbourhood food access (mean distance in metres) to conventional, discount and ethnic retailers, and differences in food access between and among gentrifying and non-gentrifying census tracts. Binary logistic regression was used to predict the odds of visible minority racial/ethnic neighbourhoods being located within food deserts and food mirages. SPSS (version 27.0.1.0) was used to conduct all analyses. Statistical significance was set at $p<0.05$ for all analyses.

5.4 Results

5.4.1 Characteristics of Intersectional Profile Neighbourhoods

Table 5.3 summarizes socio-demographic characteristics of the intersectional profile neighbourhoods. Although two of the five descriptive variables were used in the creation of the SEI (i.e., median after-tax household income and recent immigrants arriving between 2011 and 2016), the absolute values amongst racial/ethnic neighbourhoods grouped by SEI differ substantially and warrant examination. For instance, median household after-tax income consistently increases for all racial/ethnic groups as SEI increases in equity, and correspondingly, the percentage of income spent on shelter costs decreases for all racial/ethnic groups as SEI increases in equity. However, median household after-tax income for SEI class 4 ranges from $63,001 in MVM neighbourhoods to $99,480 in NVM neighbourhoods – a stark $36,479 difference – yet these MVM neighbourhoods incessantly spend a greater proportion of their income on housing (34.7%) compared to their NVM neighbourhood

counterparts (27.9%). More can be said for the remaining characteristics, including that visible minority neighbourhoods have a higher percentage of female headed lone-parent families, particularly in Black neighbourhoods of low social equity, and a greater proportion of the overall immigrant population and of recent newcomers.

Table 5.3: Characteristics of intersectional profile neighbourhoods

			Variables used in creating the SEI		**Variables not used in creating the SEI**		
Race/ Ethnicity	**SEI Class**	***n* of DAs**	**$ Median Household After-tax Income**	**% Recent Immigrants (2011-2016)**	**% Female Lone-parent Families**	**% Total Immigrants**	**% Households Spending >=30% on Shelter**
NVM	1	65	39,157	9.7	28.0	53.4	44.3
	2	488	55,486	7.4	20.4	47.8	41.1
	3	1227	69,920	4.4	14.3	38.6	34.2
	4	854	99,480	2.9	10.3	30.6	27.9
Black	1	64	36,239	9.1	45.4	52.9	38.6
	2	48	48,472	7.5	36.82	53.3	38.8
	3	10	66,534	6.3	24.6	54.7	36.0
	4	2	83,456	0	16.3	51.1	22.6
Chinese	1	14	43,991	12.2	20.5	65.2	50.9
	2	125	59,270	9.7	16.8	64.3	46.4
	3	162	71,730	7.3	13.9	64.5	33.7
	4	41	87,501	6.6	11.5	63.4	35.2
South Asian	1	41	41,239	16.6	24.8	61.4	44.5
	2	113	61,139	8.4	17.4	63.0	39.1
	3	123	72,973	5.8	14.3	61.2	30.5
	4	19	81,514	5.0	12.5	61.9	28.9
MVM	1	40	45,194	17.1	29.1	63.8	47.0
	2	129	52,091	14.7	23.4	62.4	44.2
	3	101	60,783	10.6	20.5	61.0	37.6
	4	17	63,001	7.0	19.1	54.6	34.7

5.4.2 Food Retailer Density and Distribution Among Racial/Ethnic and SEI Neighbourhoods

Conventional, discount, and ethnic shops are relatively widespread across suburban and urban areas in Toronto. Considering the racial/ethnic composition of neighbourhoods, most food retailers of any classification type are located in NVM neighbourhoods (Table 5.4). No conventional retailers are located in Black and South Asian neighbourhoods. Collectively, visible minority neighbourhoods have the greatest share of ethnic retailers located within them (Table 4). Discount retailers have

between 1.29 times (95% CI 0.57, 2.89) and 3.69 times (95% CI 1.62, 8.39) higher odds of being located in a visible minority neighbourhood compared to an NVM neighbourhood, and these findings are especially significant for Black neighbourhoods. Ethnic retailers have between 2.14 times (95% CI 1.21, 3.76) and 4.56 times (95% CI 2.85, 7.27) higher odds of being located in a visible minority neighbourhood relative to an NVM neighbourhood, and significantly for South Asian and MVM neighbourhoods (Table 5.4).

Table 5.4: Odds of retailers being located in racial/ethnic neighbourhoods

	***n* of DAs (%)**	***n* of retailers (%)**	**Total OR unadjusted (95% CI)**	**Sig.**
Total	3683			
Conventional Race/Ethnicity		91		
NVM (ref)	2634 (71.5)	85 (93.4)	-	-
Black	124 (3.4)	0 (0.0)	0.00 (0.00, 0.00)	0.996
Chinese	342 (9.3)	3 (3.3)	0.28 (.08, .90)	0.032
South Asian	296 (8.0)	0 (0.0)	0.00 (.00, .)	0.994
MVM	287 (7.8)	3 (3.3)	0.10 (0.10, 1.07)	0.066
Discount Race/Ethnicity		77		
NVM (ref)	2634 (71.5)	43 (55.8)	-	-
Black	124 (3.4)	8 (10.4)	3.69 (1.62, 8.39)	0.002
Chinese	342 (9.3)	8 (10.4)	1.29 (.57, 2.89)	0.537
South Asian	296 (8.0)	7 (9.1)	1.49 (.66, 3.35)	0.330
MVM	287 (7.8)	11 (14.3)	2.22 (1.10, 4.49)	0.025
Ethnic Race/Ethnicity		155		
NVM (ref)	2634 (71.5)	68 (43.8)	-	-
Black	124 (3.4)	8 (5.1)	2.61 (1.16, 5.84)	0.019
Chinese	342 (9.3)	20 (13.0)	2.14 (1.21, 3.76)	0.008
South Asian	296 (8.0)	34 (22.0)	4.56 (2.85, 7.27)	<.001
MVM	287 (7.8)	25 (16.1)	3.80 (2.3, 6.25)	<.001

Among neighbourhoods organized by SEI, conventional retailers are largely dispersed in higher equity areas (i.e., SEI neighbourhoods 3 and 4). Relative to high-equity neighbourhoods, lower equity neighbourhoods (i.e., SEI neighbourhoods 1 and 2) have between 2.88 times higher odds (95% CI 1.43, 5.78) and 4.32 times higher odds (95% CI 1.85, 10.11) to have discount retailers located within them and 4.80 (95% CI 2.48, 9.31) and 8.67 times higher odds (95% CI 4.11, 18.26) to have ethnic retailers located within them (Table 5.5).

Table 5.5: Odds of retailers being located in SEI class neighbourhoods

	***n* of DAs (%)**	***n* of retailers (%)**	**Total OR unadjusted (95% CI)**	**Sig.**
Total	3683			
Conventional SEI		91		
1	224 (6.1)	1 (1.0)	0.18 (.02, 1.38)	0.101
2	903 (24.5)	24 (26.4)	1.08 (.59, 1.95)	0.793
3	1623 (44.1)	41 (45.1)	1.04 (.61, 1.77)	0.866
4 (ref)	933 (25.3)	25 (27.5)	-	-
Discount SEI		77		
1	224 (6.1)	12 (15.5)	4.32 (1.85, 10.11)	<0.001
2	903 (24.5)	32 (41.6)	2.88 (1.43, 5.78)	0.003
3	1623 (44.1)	22 (28.6)	1.09 (.52, 2.28)	0.801
4 (ref)	933 (25.3)	11 (14.3)	-	-
Ethnic SEI		155		
1	224 (6.1)	24 (15.5)	8.67 (4.11, 18.26)	<0.001
2	903 (24.5)	57 (36.8)	4.80 (2.48, 9.31)	<0.001
3	1623 (44.1)	62 (40.0)	2.77 (1.44, 5.34)	0.002
4 (ref)	933 (25.3)	12 (7.7)	-	-

5.4.3 Food Retailer Distances Among Racial/Ethnic and Social Equity Neighbourhoods and Intersectional Profile Neighbourhoods

The mean distance from neighbourhood centroids to conventional, discount, and ethnic grocers were 1966.5m, 1782.2m, and 1945.8m, respectively (Table 5.6)[6]. Table 6 shows that as SEI score increased exclusive of race/ethnicity, mean distance to the nearest conventional grocer decreased (from 2366.4m in SEI class 1 DAs to 1580.0m in SEI class 4 DAs). On the other hand, as SEI score increased exclusive of race/ethnicity, mean distance to the nearest discount and ethnic store increased (from 1549.9m in SEI class 1 to 1973.8m in SEI class 4 for discount grocers, and from 1378.6m in SEI class 1 to 2499.5m in SEI class 4 for ethnic grocers). Table 5.6 also shows that NVM neighbourhoods exclusive of SEI have the shortest mean distance to conventional (1561.0m) and discount (1758.7m) retailers, but the longest mean distance to ethnic retailers (2219.5m). Comparatively, South Asian neighbourhoods exclusive of SEI have the longest mean distance to

[6] Note that two intersectional profile neighbourhoods did not calculate distances to conventional, discount, and ethnic retailers due to computing errors where the road network could not be reached from the population-weighted centroids of those DAs. Both invalid DAs were from the NVM SEI class 3 group, and specifically, were located on Toronto Island and in Mount Pleasant Cemetery.

conventional retailers (3839.2m), Chinese neighbourhoods exclusive of SEI have the longest mean distance to discount retailers (1890.9m), and MVM neighbourhoods exclusive of SEI have the shortest mean distance to ethnic retailers (1094.6m). Mean distance to all retailer types is also shorter in gentrifying areas compared to non-gentrifying areas (Table 5.6).

Table 5.6: Mean distance in metres (SD) for different variables to conventional, discount, and ethnic food retailers

	***n* of DAs (%)**	**Conventional store mean distance (m) (SD)**	**Discount store mean distance (m) (SD)**	**Ethnic store mean distance (m) (SD)**
Total	3683	1966.52 (1437.90)	1782.16 (1015.26)	1945.84 (1983.55)
SEI				
1	224 (6.1)	2366.40 (1498.90)	1549.89 (862.62)	1378.59 (1491.25)
2	903 (24.5)	2251.92 (1621.99)	1730.33 (993.98)	1615.321(1729.93)
3	1623 (44.1)	1974.77 (1448.72)	1732.87 (971.54)	1889.76 (1953.59)
4	933 (25.3)	1579.95 (1079.23)	1973.84 (1112.94)	2499.46 (2231.09)
Predominant Race/Ethnicity				
NVM	2634 (71.5)	1560.97 (1008.91)	1758.77 (1018.81)	2219.53 (2208.19)
Black	124 (3.4)	3101.59 (1691.95)	1762.64 (895.88)	1566.54 (1576.52)
Chinese	342 (9.3)	2520.83 (1508.15)	1890.89 (958.98)	1330.77 (703.23)
South Asian	296 (8.0)	3839.22 (2006.08)	1874.33 (975.48)	1205.23 (922.92)
MVM	287 (7.8)	2606.20 (1634.52)	1780.63 (1123.81)	1094.63 (852.91)
Gentrification				
Gentrifying	465 (12.6)	1861.02 (1196.50)	1545.68 (869.03)	1614.71 (1372.09)
Non-gentrifying	3218 (87.4)	1981.77 (1469.04)	1816.33 (1030.32)	1993.68 (2052.69)
RFE				
Food Desert	346 (9.4)	2783.99 (1488.97)	2160.49 (887.63)	2296.31 (1899.41)
Food Mirage	155 (4.2)	1365.59 (1367.29)	2339.63 (878.10)	2586.45 (2141.88)

When intersectional profile neighbourhoods are considered mutually, more pronounced differences in distance to conventional, discount, and ethnic retailers can be observed (Table 5.7). As SEI increased in equity for all racial/ethnic neighbourhoods, mean distance to conventional retailers decreased for NVM neighbourhoods but increased for South Asian neighbourhoods and fluctuated for Black, Chinese, and South Asian neighbourhoods; mean distance to discount retailers decreased for none but increased for South Asian neighbourhoods and fluctuated for NVM, Black, Chinese, and MVM neighbourhoods; and mean distance to ethnic retailers decreased for none but increased for NVM, Chinese, and South Asian neighbourhoods and fluctuated for Black and MVM neighbourhoods. Across all racial/ethnic neighbourhoods, mean distance is also shortest to ethnic retailers compared to mean distance to conventional or discount retailers for low equity areas (SEI 1) (Table 5.7).

Table 5.7: Mean distance in metres (SD) for intersectional profile neighbourhoods to conventional, discount, and ethnic food retailers

	n of DAs (%)	Conventional mean distance (m) (SD)	Discount mean distance (m) (SD)	Ethnic mean distance (m) (SD)
Total	3683			
NVM				
SEI 1	66 (0.01)	1846.67 (1115.22)	1494.44 (841.92)	1850.40 (2111.49)
SEI 2	487 (0.13)	1657.23 (1117.74)	1719.76 (1025.45)	1999.89 (2132.03)
SEI 3	1227 (0.33)	1584.60 (1035.21)	1671.69 (953.00)	2079.94 (2149.09)
SEI 4	854 (0.23)	1450.04 (877.74)	1926.56 (1095.49)	2573.85 (2300.38)
Black				
SEI 1	64 (0.01)	2814.61 (1509.02)	1716.10 (875.67)	1508.92 (1505.81)
SEI 2	48 (0.01)	3526.16 (1956.13)	1710.62 (850.01)	1422.93 (1637.14)
SEI 3	10 (0.002)	2894.50 (1087.06)	2191.07 (1042.77)	2175.54 (1423.33)
SEI 4	2 (0.0005)	3131.01 (1954.41)	2358.69 (1962.91)	3812.23 (1911.84)
Chinese				
SEI 1	14 (0.003)	2569.74 (2044.75)	1459.69 (581.56)	1028.06 (551.55)
SEI 2	125 (0.03)	2426.10 (1561.43)	1712.51 (794.79)	1196.65 (608.59)
SEI 3	162 (0.04)	2639.10 (1450.70)	1830.28 (913.88)	1361.45 (704.49)
SEI 4	41 (0.01)	2325.63 (1370.41)	2821.46 (1158.97)	1721.82 (849.96)
South Asian				
SEI 1	40 (0.01)	2214.07 (1403.19)	1203.47 (722.96)	762.23 (476.11)
SEI 2	114 (0.03)	3787.32 (1900.25)	1783.74 (920.61)	1128.78 (844.58)
SEI 3	123 (0.03)	4318.47 (1984.92)	2092.58 (980.82)	1318.25 (1030.55)
SEI 4	19 (0.005)	4469.39 (2107.47)	2417.37 (965.96)	1864.85 (879.06)
MVM				
SEI 1	40 (0.01)	2587.96 (1690.20)	1753.43 (990.13)	1130.60 (626.75)
SEI 2	129 (0.03)	2497.19 (1642.17)	1747.61 (1157.79)	1070.70 (774.49)
SEI 3	101 (0.02)	2703.93 (1625.31)	1836.39 (1143.20)	1094.42 (1028.86)
SEI 4	17 (0.004)	2895.74 (1569.15)	1763.95 (1123.78)	1192.82 (763.35)

Table 5.8 shows that even after adjusting for SEI score, living in a Black, Chinese, South Asian or MVM neighbourhood is associated with an additional 1545.99m (95% CI 1307.36, 1784.61), 961.35m (95% CI 818.64, 1104.06), 2280.69m (95% CI 2126.11, 2435.26), and 1047.96m (95 % CI 890.35, 1205.56), respectively, to the nearest conventional retailer relative to NVM neighbourhoods. All visible minority neighbourhoods also travel further distances to access discount supermarkets compared to NVM neighbourhoods; however, they experience shorter mean distances to ethnic stores, anywhere between 261.33m (95% CI -628.29, 105.63) and 925.92m (95% CI -1168.29, -683.55) less on average (Table 5.8).

5.4.4 Differences in Food Access Across Gentrifying and Non-Gentrifying Areas

Table 5.8 shows that distance to all retailers is shortest in gentrifying census tracts on average. Overall, R^2 suggests that 17.2% to 25.4% of the variation in distance to a conventional retailer can be

explained by racial/ethnic SEI composition. On the other hand, R^2 is much lower for discount (1.5% to 2.3%) and ethnic retailers (2.9% to 6.5%) (Table 5.8). In non-gentrifying areas, R^2 is also higher (6.5% to 25.4%) than in gentrifying areas (1.5% to 17.2%). Controlling for SEI, mean distance to retailers in gentrifying areas is only significant for Chinese and South Asian neighbourhoods to conventional supermarkets using NVM neighbourhoods as a reference category. In non-gentrifying areas, mean distance to retailers is significant in all visible minority neighbourhoods to conventional supermarkets, only Black neighbourhoods to discount supermarkets, and only Chinese, South Asian, and MVM neighbourhoods to ethnic retailers (Table 5.8).

5.4.5 Racial/Ethnic Composition of Food Deserts and Food Mirages

NVM neighbourhoods make up the greatest *absolute* share of both food deserts (46.8%) and food mirages (72.3%) (Table 5.9). However, *relative* to the overall percentage of NVM neighbourhoods, only 6.2% exist in food deserts and 4.3% exist in food mirages. Comparatively, a third (30.6%) of all Black neighbourhoods and approximately a sixth of all Chinese (14.9%), South Asian (16.2%), and MVM (16.4%) neighbourhoods exist in food deserts. About a tenth (9.7%) of all Black neighbourhoods also exist in food mirages, and when taken together, almost half (40.3%) of all Black neighbourhoods live in unfavourable, unaffordable RFEs (Table 5.9).

Findings from regression models in Table 5.9 also indicate that Black neighbourhoods have 6.74 times higher odds (95% CI 4.45, 10.19), Chinese neighbourhoods have 2.67 times higher odds (95% CI 1.90, 3.74), South Asian neighbourhoods have 2.95 times higher odds (95% CI 2.08, 4.18), and MVM neighbourhoods have 2.98 times higher odds (95% CI 2.10, 4.24) of existing in food deserts relative to NVM neighbourhoods. Black neighbourhoods are also the only ones that are significantly more likely than NVM neighbourhoods to exist in food mirages (OR 2.41 95% CI 1.29, 4.50) (Table 5.9).

Among gentrifying census tracts, Chinese neighbourhoods have significantly higher odds (OR 3.55, 95% CI 1.73, 7.25) of existing in food deserts within these areas and MVM neighbourhoods have significantly higher odds (OR 3.61, 95% CI 1.22, 10.68) of existing in food mirages within these areas (Table 5.9). Among non-gentrifying census tracts, all visible minorities are significantly higher odds of existing in food deserts within these areas, but only Black neighbourhoods have significantly higher odds (OR 2.39, 95% CI 1.24, 4.60) of existing in food mirages within these areas (Table 5.9).

Table 5.8: Linear regression of intersectional profile neighbourhoods related to distance to conventional, discount, and ethnic food retailers, overall and stratified by gentrifying and non-gentrifying neighbourhoods

	n (%)	**Conventional distance (m) OR adjusted (95% CI)**		**Discount distance (m) OR adjusted (95% CI)**		**Ethnic distance (m) OR adjusted (95% CI)**	
		R^2 = .243	**Sig.**	**R^2 = .018**	**Sig.**	**R^2 = .060**	**Sig.**
Total	3683						
SEI (1 – 4)		3.59 (-48.73, 55.93)	0.893	163.68 (121.57, 205,78)	<0.001	262.42 (181.94, 342.90)	<0.001
Race/Ethnicity							
NVM (ref)	2634 (71.5)	-	-	-	-	-	-
Black	124 (3.4)	1545.99 (1307.36, 1784.61)	<0.001	248.15 (56.16, 440.14)	0.11	-261.33 (-628.29, 105.63)	0.163
Chinese	342 (9.3)	961.35 (818.64, 1104.06)	<0.001	200.32 (85.50, 315.14)	<0.001	-779.40 (-998.86, -559.93)	<0.001
South Asian	296 (8.0)	2280.69 (2126.11, 2435.26)	<0.001	226.93 (102.56, 351.30)	<0.001	-835.73 (-1073.45, -598.01)	<0.001
MVM	287 (7.8)	1047.96 (890.35, 1205.56)	<0.001	145.96 (19.15, 272.76)	0.024	-925.92 (-1168.29, -683.55)	<0.001
		R^2 = .172	**Sig.**	**R^2 = .015**	**Sig.**	**R^2 = .029**	**Sig.**
Gentrifying	465 (12.6)						
SEI (1 – 4)		19.45 (-111.24, 150.15)	0.770	-99.80 (-203.36, 3.75)	<0.001	119.15 (-43.17, 281.49)	0.150
Race/Ethnicity							
NVM (ref)	338 (72.7)	-	-	-	-	-	-
Black	10 (2.1)	847.01 (129.17, 1564.84)	0.021	126.17 (-442.56, 694.91)	0.059	415.52 (-476.03, 1307.08)	0.360
Chinese	56 (12.0)	1018.62 (704.82, 1332.43)	<0.001	-31.98 (-280.61, 216.64)	0.663	-163.32 (-553.08, 226.42)	0.411
South Asian	24 (5.2)	1809.77 (1347.28, 2272.26)	<0.001	198.66 (-167.76, 565.10)	0.801	-805.10 (-1379.52, -230.68)	0.006
MVM	37 (8.0)	316.62 (-62.27, 695.51)	0.101	69.14 (-231.04, 369.34)	0.651	-251.99 (-722.58, 218.59)	0.293
		R^2 = .254	**Sig.**	**R^2 = .023**	**Sig.**	**R^2 = .065**	**Sig.**
Non-Gentrifying	3218 (87.4)						
SEI (1 – 4)		2.46 (-54.54, 59.28)	0.935	191.88 (146.19, 237.56)	<.001	266.10 (177.06, 355.13)	<0.001
Race/Ethnicity							
NVM (ref)	2296 (71.3)	-	-	-	-	-	-
Black	114 (3.5)	1610.18 (1356.50, 1863.87)	<0.001	254.54 (49.91, 456.17)	0.015	-361.99 (-758.86, 34.87)	0.074
Chinese	286 (8.9)	948.59 (790.68, 1106.50)	<0.001	249.57 (122.82, 376.32)	<0.001	-885.79 (-1132.83, -638.76)	<0.001
South Asian	272 (8.5)	2324.92 (2160.50, 2489.34)	<0.001	220.97 (89.00, 352.95)	0.001	-871.83 (-1129.05, -614.61)	<0.001
MVM	250 (7.8)	1156.44 (984.64, 1328.23)	<0.001	159.03 (21.13, 296.93)	0.024	-1033.68 (-1302.44, -764.92)	<0.001

Table 5.9: Binary linear regression of racial/ethnic variables related to food deserts and food mirages, overall and analyses stratified by gentrifying vs. non-gentrifying neighbourhoods

	***n* (% of RFE DAs) (% of racial/ethnic DAs)**	**Total OR unadjusted (95% CI)**	**Sig.**	***n* (% of RFE)**	**Gentrifying OR unadjusted (95% CI)**	**Sig.**	***n* (% of RFE)**	**Non-gentrifying OR unadjusted (95% CI)**	**Sig.**
Food Desert Race/Ethnicity	346 (N/A) (9.4)			55 (15.9)			291 (84.1)		
NVM (ref)	162 (46.8) (6.2)	-	-	26 (7.6)	-	-	136 (39.3)	-	-
Black	38 (11.0) (30.6)	6.74 (4.45, 10.19)	<0.001	4 (1.2)	7.10 (1.89, 26.62)	0.004	34 (9.8)	6.91 (4.46, 10.70)	<0.001
Chinese	51 (14.7) (14.9)	2.67 (1.90, 3.74)	<0.001	13 (3.8)	3.55 (1.73, 7.25)	<0.001	38 (11.0)	2.41 (1.64, 3.55)	<0.001
South Asian	48 (13.9) (16.2)	2.95 (2.08, 4.18)	<0.001	3 (0.9)	.96 (.21, 4.32)	0.967	45 (13.0)	3.31 (2.30, 4.75)	<0.001
MVM	47 (13.6) (16.4)	2.98 (2.10, 4.24)	<0.001	7 (2.0)	2.48 (1.00, 6.15)	0.049	40 (11.6)	3.09 (2.11, 4.53)	<0.001
Food Mirage Race/Ethnicity	155 (N/A) (4.2)			22 (14.2)			133 (85.8)		
NVM (ref)	112 (72.3) (4.3)	-	-	14 (9.0)	-	-	98 (63.2)	-	-
Black	12 (7.7) (9.7)	2.41 (1.29, 4.50)	0.006	1 (0.6)	2.57 (.30, 21.72)	0.386	11 (7.1)	2.39 (1.24, 4.60)	0.009
Chinese	8 (5.2) (2.3)	.53 (.26,1.11)	0.096	2 (1.3)	.85 (.18, 3.87)	0.841	6 (3.9)	.48 (.20, 1.10)	0.085
South Asian	5 (3.2) (1.7)	.38 (.15, .95)	0.040	0 (0.0)	.00 (.00, .)	0.998	5 (3.2)	.42 (.16, 1.04)	0.061
MVM	18 (11.6) (6.3)	1.5 (.90, 2.5)	0.118	6 (3.9)	3.61 (1.22, 10.68)	0.020	12 (7.7)	1.23 (.67, 2.22)	0.494

5.5 Discussion

5.5.1 Summary of Key Findings

This study used an intersectional lens to explore food access at the neighbourhood level to various types of food retailers in Toronto, Canada by racial/ethnic and socio-economic-related characteristics. We also explored the extent to which gentrification modified these associations and extend our understanding of food deserts and food mirages in Toronto from Menko and Minaker (2021) by identifying the racial/ethnic compositions of these unfavourable and inequitable RFEs.

Findings of this study are consistent with most, but not all, extant literature suggesting that exclusive of SEI status, visible minority neighbourhoods have poorer geographic access (both in terms of density and proximity) to conventional retailers (Tables 5.4 and 5.6). However, visible minority neighbourhoods appear to be better served in terms of density to discount and ethnic retailers and in terms of mean distance to ethnic retailers (Table 5.4). Exclusive of racial/ethnic composition, low SEI neighbourhoods face longer distances to conventional retailers but shorter distances to discount and ethnic retailers (Table 5.6). Low SEI neighbourhoods are also significantly more likely to have discount and ethnic retailers located within them (Table 5.5). When SEI and race/ethnicity are considered together (i.e., intersectional profile neighbourhoods), descriptive statistics show that mean distances to conventional retailers are longer for visible minority neighbourhoods in low and high equity areas compared with NVM neighbourhood counterparts; mean distances vary to discount retailers among visible minority neighbourhoods and NVM neighbourhoods and SEI areas; but mean distance to ethnic retailers are overwhelmingly shorter for visible minority neighbourhoods in low and high equity areas compared with NVM neighbourhoods counterparts (Table 5.7). Linear regression results reveal that controlling for SEI, visible minority neighbourhoods face significantly longer distances to conventional retailers relative to NVM neighbourhoods, particularly for South Asian neighbourhoods; longer distances to discount retailers, significant for Chinese and South Asian areas; but shorter distances and more favourable outcomes to ethnic retailers, significantly for Chinese, South Asian, and MVM neighbourhoods (Table 5.8).

Generally speaking, mean distance to all retailers is shorter on average within gentrifying census tracts (Table 5.7). However, controlling for SEI, Chinese and South Asian neighbourhoods face significantly longer distances to conventional grocers in gentrifying areas. Comparatively,

controlling for SEI in non-gentrifying areas, mean distance to conventional retailers is significantly longer for all visible minority neighbourhoods, significantly longer to discount retailers for Chinese neighbourhoods, and shorter to ethnic retailers for all visible neighbourhoods, significantly for Chinese, South Asian, and MVM neighbourhoods (Table 5.8). Finally, visible minority neighbourhoods make up just a little over half of all food deserts (53.2%) and are all significantly more likely to exist in these RFEs relative to NVM neighbourhoods (Table 5.9). Among food mirages, Black and MVM neighbourhoods have higher odds of being located in these areas relative to NVM neighbourhoods. Of note, relative to all Black neighbourhoods across Toronto, almost half (40.3%) exist among food deserts and food mirages (Table 5.9).

Findings of this study point to complexities in food environment and gentrification research and add to the growing body of literature specific to Canadian contexts. Three key implications may be drawn from this research, applicable to outcomes in Toronto and to wider contexts: 1) conventional supermarket redlining may be happening (or has historically happened) in visible minority and low socio-economic status neighbourhoods in Toronto based on proximity and density findings of conventional retailers in these neighbourhoods; 2) affordable and ethnic food options are geographically available for visible minority and low-socio-economic status neighbourhoods outside of food deserts and food mirages; and 3) there are likely other substantial processes beyond race/ethnicity and socio-economic outcomes happening in gentrifying census tracts that influence food access in these neighbourhoods based on the limited amount of significant outcomes among visible minority neighbourhoods after controlling for SEI, and future research might consider exploring longitudinal changes in visible minority neighbourhoods.

5.5.2 Implications for Toronto

Although not explicitly assessed, conventional supermarket redlining may be possible based on mean distance and food desert findings across visible minority and NVM neighbourhoods in Toronto. Even among the most equitable SEI areas, visible minority neighbourhoods experience drastically longer distances to conventional retailers. In fact, mean distance to conventional supermarkets is *shortest* in NVM SEI class 4 neighbourhoods (1450.0m), which is a stark difference from the longest mean distance to conventional retailers found in South Asian SEI class 4 neighbourhoods (4469.4m) (Table 5.7). Race/ethnicity also appears to have a huge importance for where food deserts are situated across Toronto. Collectively, visible minority neighbourhoods make up 53.2% of all food deserts and are all

significantly more likely to exist in these unfavourable RFEs than NVM neighbourhoods, especially Black neighbourhoods (OR 6.74 95% CI 4.45, 10.19) (Table 5.9). About 40% of all Black neighbourhoods are food deserts, even though they make up only 11.0% of food desert DAs. Additionally, 14.9% of all Chinese neighbourhoods, 16.2% of all South Asian neighbourhoods, and 16.4% of all MVM neighbourhoods exist in food deserts. Taken together, these findings illuminate the possibility that conventional supermarket redlining is happening (or has happened) across Toronto given the widespread absence of and long travel distances to conventional retailers in visible minority and low socio-economic status neighbourhoods. More research is warranted of longitudinal food retail development and closures across Toronto to better understand this theory.

Alternatively, there does appear to evidence of discount and ethnic supermarket being highly accessible for low-income and racialized communities in Toronto given the high odds of these retailers locating within visible minority neighbourhoods. Access to discount and ethnic retailers for visible minority groups, regardless of SEI score, is, on average, within or just above the set measure of reasonable walking distance (1000m or less) to a retailer, and typically shortest among low SEI groups (Table 5.7). This indicates that affordable, healthy food is geographically accessible for these population groups in Toronto, and particularly for lower income families who may be more price-sensitive shoppers and generally have less spending power on non-shelter expenses. Regression analyses results also suggest that while not all neighbourhoods offer equal access to a diversity of retailers, ethnic shops are significantly more likely to be located within visible minority neighbourhoods (Table 5.4), and therefore, are servicing racialized communities that may use these types of stores as third places and to meet their cultural food needs, preferences, and practices. Again, more longitudinal research is warranted to explore when discount and ethnic retailers opened in these neighbourhoods and whether access to these retailers have remained consistent, improved, or worsened relatively over time.

Differences in distance between gentrifying and non-gentrifying census tracts for intersectional profile neighbourhoods are potentially evidence of other substantial processes happening in changing areas of Toronto that would influence food access and food retailer location beyond race/ethnicity and socio-economic outcomes. For instance, non-gentrifying areas are more established and are likely experiencing less substantial urban form changes, including increased street networks and greater food retail development; this may explain why after controlling for SEI,

racial/ethnic composition was only significant in non-gentrifying in terms of distance to all retailers and across food deserts where there is no retail development. In gentrifying areas, it is possible that the food landscape is also changing, and food access is more variegated within these city corridors. However, longitudinal research is again warranted on food retailer development in Toronto, alongside other scholarship on gentrification processes and mechanisms and the stability of RFEs, to assess the significance of food access opportunities within and between gentrifying areas and to better interpret associations between food environments and purchasing patterns (Filomena et al., 2013; Ohri-Vachaspati et al., 2019).

5.5.3 Broader Implications to Planning Policy, Theory, and Research

Findings from this study have several practical and theoretical implications for the planning profession. Intersectionality in place-based food access research can be particularly powerful for encouraging structural interventions in the built environment to improve population and individual health behaviours (Caiola et al., 2015). Failing to examine food access relationships through an intersectional lens could stymie our understanding of influential processes and relationships that affect healthy food access and being able to identify effective planning interventions that would ameliorate health disparities relevant to dietary intake.

By illuminating intersectional differences in geographic food access to different types of food retailers, and potentially where differences range within and across racialized and marginalized areas, planners can assess where efforts and interventions may be necessary to ameliorate disparities based on spatial analysis based on inequitable and unsustainable planning decisions of the past. For example, in neighbourhoods where retailers are several kilometres away by street-network distance, and particularly in visible minority socially inequitable areas, planners could review zoning land use plans to increase food retail zoning and assess minimum separation requirements between retailers in addition to promoting a diversity of retail food development. However, given that focusing exclusively on increasing the presence of food retailers in underserved neighbourhoods does necessarily promote healthy food consumption (Freedman et al., 2021; Ma et al., 2018), another solution might be planners lead and conduct comprehensive community food assessments that consider multiple aspects of the built environment, including public and private transportation routes to retailers, grocery store operating hours and marketing strategies, community resources, and residents' perspectives on and challenges to healthy food access in their neighbourhoods. A richer

understanding of the availability and spatial patterning of healthy food retailers across an entire city helps target interventions at the most precise geographic scale and can highlight differences in access between gentrifying and non-gentrifying areas. Doing so would add to commercial gentrification literature and answer broad questions of how these processes play into other dynamics of social inequality (Zukin, 2009). Where necessary, interventions could also mitigate risks of retailer displacement, such as through upgrades in small stores in gentrifiable neighbourhoods to keep them within communities while still prioritizing the needs of local, existing customers (Ohri-Vachaspati et al., 2019). That said, efforts should be controlled and gradual so as not to upgrade their merchandise and ambience to a degree the only attracts new clientele and risks losing existing, local customers (Zukin, 2009) or to not be misconstrued as a "saviour" solution for a neighbourhood but rather employed in a way where benefits trickle down to lower-income residents (Doucet, 2020).

These types of wide-ranging policy and advocacy options to improve poor food access fall under "food haven" planning and public health approaches. A "food haven" is an equitable, prosperous, and sustainable retail food environment where healthy food and beverage options are accessible, convenient, affordable, and desirable (Tonumaipe'a et al., 2021) and where planning policies and advocacy specifically lead to favourable opportunities for healthy food access for racialized and marginalized populations at risk of food insecurity and displacement (Menko & Minaker, 2021). Food havens were recently posited in the literature by Tonumaipe'a et al. (2021) as places of food sanctuary for low socio-economic and vulnerable people, but the term could be elaborated to also consider the adverse effects of gentrification on food access. In fact, there is also opportunity to also incorporate an intersectional lens into food haven planning policies to tailor effective and culturally sensitive solutions to poor food access that break down persistent and dominant social group power relations and hierarchies. Both Menko & Minaker (2021) and Tonumaipe'a et al. (2021) contend that food haven outcomes are more effective when formulated in combination with efforts that promote food sovereignty and in allyship with the public health sector and grassroots and community organizations.

Furthermore, while these findings are significant now for the City of Toronto, and while this study has applications for other Canadian or North American cities, social phenomena are fluid; therefore, planners and researchers are advised to continuously revaluate and reformulate their assumptions about food equity. Specifically, planners should revisit how visible minorities experience

food environments as new urban, suburban, and social patterns emerge and as redevelopment projects transform built environments, if only to avoid grounding further power differentials in geographic locations and determine appropriate solutions. One opportunity to do so would be through qualitative research that assesses whether the equitable spatial distributions of retailers are in fact "spatial injustices". For instance, one approach could be asking residents of visible minority neighbourhoods whether the omission of conventional retailers their communities "matters" given the amount of discount and ethnic retailers within their proximity that presumably help meet dietary intake and the cultural appropriateness of foods. Another might be to review the development and existence of RFEs and the spatial patterning of retailers relative to pre-war and post-war eras phenomena. For example, researchers could consider both cross-sectional and longitudinal differences in food access between urban and suburban neighbourhoods, or even population density at the DA level, to more accurately describe differences in proximity and density based on market demands and to explore whether differences in access are the result of equity and racial issues or other impeding urban forces.

5.6 Conclusion

5.6.1 Study Limitations

This study has several limitations. Although a significantly large number of retailers were considered towards this study (n=323), a total of 134 retailers from the DineSafe 'Supermarket' category were excluded, thus, not all grocery retailers were analyzed in Toronto and healthy food access is not limited to retailers considered in this study. Misclassification of some stores is also possible, and future categorizations of food retailers might benefit from a more systematic and rigid classification protocol or more recent primary data collection of food prices. However, in the event of any concerns when reclassifying retailers, retailers were contacted by phone to gain more information about their services and food offerings. Retailers beyond the border of the City of Toronto were also not considered and residents in fringe neighbourhoods also cross municipal boundaries to purchase food; this means that neighbourhoods food access on the periphery might be underestimated in our study. We also imposed 1km boundaries to capture food access from the population-weighted centroid of DAs, however, households do not only shop at retailers closest to their place of residence nor do these boundaries do not necessarily restrict food purchasing or indicate how households define their local food environment. Given that the Not Visible Minority category includes those with Aboriginal identity, we missed an opportunity to assess food access for this population group, yet Aboriginal

peoples experience among the highest rates of food insecurity in Canada (Tarasuk and Mitchell, 2020). We also did not consider public transit in our measures of food access; however, this would be an excellent avenue for future research.

Finally, this study is cross-sectional and would have benefited from a longitudinal assessment of neighbourhood food access to retailers over the same 10-year period from 2006 to 2016 to better assess differences between gentrifying and non-gentrifying areas and to illustrate access in changing retail food environments. A longitudinal assessment would also identify when retailers located within certain neighbourhoods to better understand if supermarket redlining and greenlining are processes happening in Toronto. Similarly, our measure of gentrification does not capture all processes and dynamics of gentrification that could have been employed, and future research should look to broader our operationalization of gentrifying areas to more focally define and interpret outcomes. We also did not consider differences in access between urban and suburban neighbourhoods; however, suburban areas are less dense and would characteristically have retailers more widespread. That said, a strength of this study is that all DAs in Toronto were considered, and different types of statistical analyses were used to evaluate the significance of differences in distance and density of retailers in racial/ethnic social equity neighbourhoods. Measures used to derive racial/ethnic compositions of neighbourhoods and the SEI are also standardized and use Canadian census data, thus, this study has applications to major cities across Canada and presents new opportunities for retail food protection and development in ethnic enclaves. Finally, this study is the first of its kind to incorporate an intersectional lens in food access planning research in Toronto, especially as food access relates to gentrification, and can serve as a guiding example for future quantitative, qualitative, and mixed methods studies.

5.6.2 Concluding Remarks

This study assessed food access in terms of distance and density to conventional and discount supermarkets and to ethnic retailers for different racial/ethnic SEI neighbourhoods and determined which areas and which population groups experience favourable and poor outcomes. We presented findings through an intersectional planning-lens and observed how differences in distance are portrayed across gentrifying and non-gentrifying areas. We also built on Menko and Minaker's (2021) study of retail food environments in Toronto and identified the racial/ethnic composition of food deserts and food mirages and the odds of visible minority neighbourhoods to exist in

unfavourable food environments. Through revealing and understanding intersectional differences in geographic food access, planners can act more effectively on improving healthy food access opportunities at the neighbourhood level through food haven policies. Future studies can use these findings to build on food access research in Toronto, and planners and researchers can apply this methodology to other Canadian and North American cities to improve comparisons across different local contexts and to collaboratively develop practical and attainable food security and public health plans.

5.6.3 Acknowledgements

This study was funded in part by the Emily Ruston Mann Memorial Graduate Scholarship and the Canadian Institute of Planners President's Scholarship awarded to Patrycia Menko.

Chapter 6
Conclusion

6.1 Introduction

This concluding chapter reflects on the research presented in Chapters 4 and 5 and synthesizes key findings from the manuscripts across four focus areas relative to the study objectives. They are: the state of retail food environments (RFEs) in Toronto (i.e., food deserts and food mirages) at the dissemination area level; the significance of including economic dimensions, a diversity of food retailers, and measures of gentrification in RFE studies; incorporating intersectionality into planning and food access research; and advancing planning practice and equity work through a food haven framework. The discussions throughout this section have real and practical implications for planning practice, theory, and policy and are applicable to the City of Toronto, other major cities in Canada, and wider scholarly contexts including retail food environment and food gentrification literature. This thesis was largely a strong diagnostic exercise and exploratory project undertaken to determine whether the dynamics of food access could be captured quantitatively and to raise awareness of food access issues, particularly advancing understandings about how place-based geographic and economic constraints can influence population dietary intake. It appears that this approach was able to address some research gaps, but more research on this topic is necessary in Canada, particularly employing a mixed methods approach or a qualitative component. Recommendations for research and practice based on this studies' findings are embedded throughout the discussions below.

6.2 Healthy Food Access Metaphors in Toronto, Canada: Food Deserts and Food Mirages

As cited throughout this thesis, unfavourable and inequitable RFEs are of both planning and public health concern because they can impede people's capacity to make healthy eating choices. Findings from Chapter 4 and 5 illustrate that both food deserts (9% of DAs, or n=346 of 3,702 total DAs) and food mirages (4% of DAs, or n=155 of 3,702 total DAs) seem appropriate to describe certain dissemination areas (DAs) in Toronto, though neither predominates Toronto neighbourhoods. These RFEs were found by measuring the density of differently priced food retailers within a 1000m service area from the population-weighted centroids of DAs facing significant inequity as defined through the Social Equity Index (SEI). Strengths of my approach are described first, followed by a reflection of some of my major findings.

By including a greater diversity of food retailers in my analysis (i.e., butcher shops and fish shops that are often omitted from food access studies), I not only defined food deserts more stringently than previous research but also provided a more comprehensive picture of healthy food density in the Toronto. Further, nearly 30% of butcher shops and fish shops (57 out of 195 total butcher shops and fish shops) sold a variety of healthy food items and are possibly not being accurately captured in DineSafe's categorization of 'Supermarkets'. While I did not separately look at DAs that were only being serviced by butcher shops and fish shops, it would have been an interesting research opportunity to see the communities where these non-traditional food outlets may be solely servicing dietary intake. Additionally, I did not consider the actual population density of DAs to aid in my analysis either, but the population-weighted centroid method allowed me to measure food access with increased certainty of where the majority of populations live and cluster and the types of food retailers within their walking distance reach. By examining my results at the local DA level, I also revealed substantial disparities across widespread Neighbourhood Improvement Areas, thus, it may be worthwhile for the City of Toronto to revisit how they delineate services and investment within larger areas.

The racial/ethnic composition of food deserts and food mirages leads me to speculate that neighbourhood racial composition is significantly associated with the development of these RFEs. It is particularly concerning that 40.3% of all predominantly Black neighbourhoods are found in food deserts and food mirages compared to 10.5% of NVM neighbourhoods. Considering that Toronto has a considerable immigration population and is forecasted to experience the largest population gain in the Greater Toronto Area reaching 3.95 million people by 2046 at a projected growth rate of 32.6% (Ontario Ministry of Finance, 2021), it is important that city decision-makers are prepared to facilitate healthy, sustainable, and equitable food environments among vulnerable and racialized communities and cater to their unique socio-cultural needs. One approach may be to protect existing small ethnic retail grocery stores in gentrifying RFE areas, as suggested by Komakech and Jackson (2016). Another may be to broaden existing zoning bylaws to better promote discount and ethnic retailers. Additionally, in areas where food deserts and food mirage intersect with gentrifying areas, including Business Improvement Areas (BIAs), it is advisable that the appropriate municipal divisions evaluate potentially impacts of displacement on nearby businesses and residents living in those neighbourhoods and the effects of BIA projects, among other interventions, on affordable and culturally accessible food retail to make more informed and strategic planning decisions. This is not

to argue that BIAs do not provide important economic growth and community capacity across neighbourhoods, but rather that their outcomes should be review comprehensively to ensure they lead to positive social urban experiences, particularly in terms of food access, and any unintended outcomes are mitigated appropriately. Future longitudinal research on the spatial distribution of food retailers and that builds on this study is also warranted to explore whether supermarket redlining and supermarket greenlining are phenomena operating in Toronto in racialized and low-equity neighbourhoods.

6.3 Considerations of Economic Access, Inclusion of Non-Traditional Food Retailers, and Paying Attention to Gentrification

Food affordability is arguably an empirically difficult concept to capture. As Breyer and Voss-Andreae (2013) describe, "no single price level captures the term's meaning for all demographics since affordability must be tied to incomes, budget constraints, and, to some extent, preferences" (p. 137). That said, including an economic lens to this thesis broadened assumptions about affordable food access in Toronto and elevated my study of geographic access and barriers to food retailers. In particular, incorporating Camden et al.'s (2017) study on food prices across supermarkets allowed me to include an element of the consumer nutrition environment in our analysis of the community nutrition environment, and categorize food retailers into further classifications of different types of food retailers. This not only led me to identify and more accurately describe food mirages in Toronto, but also measure density of and proximity to discount and ethnic retailers for racialized and low-income communities. My findings suggest that exclusive of food deserts and food mirages, visible minorities and low-equity households (who may be more price-sensitive shoppers) are generally well serviced by retailers they might use to procure affordable and cultural food staples that may also moonlight as third spaces for socialization. However, these same communities do not equitably experience access to conventional and chain supermarkets, relative to their Not Visible Minority (NVM) counterparts.

Future research directions would benefit from robust qualitative work to capture whether these findings solicit "spatial injustice" or whether planners, decision-makers, and allied activist and advocacy groups should focus their efforts on other areas of the city. For example, future research is advised to integrate qualitative components or adopt mixed methods research approaches, such as policy analyses or in-depth interviews with planners or affected communities, to better understand the

governments and planner's role in food system policy creation and promotion and perspectives at the ground-level from both communities and from practitioners. While not noted in either manuscript, a future study might also consider incorporating the Nutritious Food Basket tool to monitor the cost of healthy eating across different food retailers, particularly among high-cost grocers in food mirage RFEs. The Nutritious Food Basket is a survey tool that collects food cost data "to inform health and social policy and educate others about the relationship between poverty and food insecurity" and has recently been updated to reflect Canada's new food guide (Government of Canada, NFB, 2021).

Further, to address socio-political challenges in food access, I considered two measures of gentrification to observe where substantial urban changes area associated with poorer quality RFEs in Toronto. Specifically, in Chapter 4, I looked at socio-economic changes in the status of residents and housing costs from 2006 to 2016 across census tracts and gentrifying policy areas through BIAs. These perspectives offered a fuller understanding of gentrification mechanisms and outcomes in Toronto, and I was able to contribute to the scant food gentrification literature in Canada by testing Breyer and Voss-Andreae's (2013) theory that gentrification processes can lead to food mirages where poverty remains high. In Chapter 5, I looked at differences between gentrifying and non-gentrifying census tracts in terms of 1) distance to differently priced food retailers among intersectional profile neighbourhoods and 2) the odds of visible minority neighbourhoods being located in food deserts and food mirages relative to NVM neighbourhoods. A key understanding about the fluidity of RFEs emerged through both manuscript endeavours, in that socio-political forces may contribute to different built environments, but the planning goal is that they rather transform and remedy them into equitable areas rather than reconcentrated pockets of poverty. However, it was beyond the scope of this study to undertake a longitudinal assessment of DineSafe grocers, but future studies in Toronto and beyond can look to evaluate substantive changes in food retailer development and displacement across cities to more fully understand potential implications of gentrification; and may even consider turning to Jeong and Lui (2020)'s study for methodological guidance when measuring neighbourhood diversity and food access across changing metropolitan areas.

6.4 Incorporating Intersectionality into Planning Food Access Studies

The insights associated with incorporating intersectionality into the second manuscript of this thesis can be expressed through three overarching themes. First, an intersectional lens helped explore and capture how social identities and conditions are rooted in structures of power and geographic location

in Toronto. By applying a racial/ethnic composition of a DA and SEI score, I was able to disentangle overlapping categories of neighbourhood-level identity and socio-economic indicators relative to food purchasing power among racialized and non-racialized communities and under various conditions (i.e., considering retail distributions and differences between gentrifying and non-gentrifying areas). I also compared food access experiences between intersectional profile neighbourhoods relative to the socially dominant group, which I considered to be NVM neighbourhoods, to better understand how power hierarchies exist in terms of food access in Toronto, and additionally explored whether there are pronounced differences in access and exclusion between gentrifying and non-gentrifying areas.

Second, I set an example for conceptualizing and incorporating intersectionality as a methodology in quantitative planning food access and food gentrification studies in Canada. Although some previous research examined how race/ethnicity and socio-economic position are associated with neighbourhood food access, many fail to capture them as mutually constituted social positions, leading to over- and under-estimates of true disparities plus mixed findings among the literature. As mentioned in Chapter 5, intersectional research can thus reduce measurement bias (Bauer, 2014; Caiola et al., 2015) and result in appropriate and feasible plans and policies that establish food procurement standards that provide and promote healthy food choices in public sector settings (Vanderlee et al., 2017), as evidently needed in Ontario.

Finally, I made the argument that intersectionality should establish itself as the next progression in planning worldviews. Traditionally, advocacy, equity, and humanist planning models were concerned about challenging previous planning assumptions, promoting systems change, and advocating for the interests and well-being of marginalized groups and areas (Whittemore, 2015). Intersectionality builds on these notions and powerfully adds more profound analyses and heightened awareness of contemporary social determinants of health, racism, complex configurations of social constructs, and feminist philosophies grounded in history and place (Caiola et al., 2015). Given the rise in urbanization and subsequent changing urban dimensions across global cities, including Toronto, intersectionality can be used to explore “hidden linkages” (Seto, 2016) in urban food systems to achieve food security and healthful and nutritious dietary intake among different social groups in an urban era.

6.5 Planning Opportunities to Improve Food Access: Food Haven Frameworks and Policies

The term "food haven" was posited throughout this thesis to capture a much-needed planning framework and policy objective wherein the most vulnerable members of society and retailers and residents of unfavourable and inequitable RFEs are intentionally promoted and politically protected from gentrification and displacement. My conceptualization of a food haven builds on work proposed earlier this year by Tonumaipe'a et al. (2021) that defined food havens as places, settings, and sanctuaries of food refuge and optimal well-being and where people have high availability of healthy food and beverages that are accessible, convenient, affordable, and desirable. My use of the term implies that food deserts and food mirages RFEs can transition to food havens through practical, thoughtful, and culturally sensitive planning decisions and multi-level government plans. In ways, I also demonstrate an application of the postpositivist worldview embedded in this thesis, in the sense that we challenge and refine a fluid claim about community food environments based on different social contexts and urban environments in Toronto.

Of note, it is interesting to learn that Tonumaipe'a and colleagues (2021) are from New Zealand. This demonstrates that current urban typologies and healthy food RFE metaphors are not effectively capturing implications for vulnerable populations, and that this is both a local issue in Toronto and a global issue across endeavors of food scholarship. Additionally, it is possible that planning policies of the past were limited in addressing issues of food access, inequity, and injustice because an appropriate guiding reference framework did not exist before now. Considering presently demonstrated support from the Canadian Institute of Planners and provincial planning bodies in pursuit of food systems planning, Canada is uniquely and advantageously positioned to champion the food haven framework and open a forum for feedback, input, and clarity in developing this idea. A multitude of public and private stakeholders, councils and committees, field experts, allied health and economic agencies, and grassroots activists should be involved, including racialized groups and Indigenous communities.

Reflecting on the limitations of this thesis, future scholars are encouraged to operationalize food havens in collaboration with other academics and practicing planners while also continuing to contribute other transformative planning research that advances existing food-based initiatives and improves food affordability, illuminates important equity considerations and confronts issues of

spatial power and injustice, and slows gentrification phenomenon to more distinguishably appropriate and sustainable urban development and revitalization processes. Researchers are also encouraged to turn to scholars such as Wegener et al. (2012) to better understand the role and motivation behind food systems planning and barriers to food policy development at a municipal level.

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Appendix A
Technical Appendix

Developing a Social Equity Index

The Social Equity Index was modelled after the Toronto Strong Neighborhoods Strategy (TSNS) 2020 Neighborhood Equity Index (NEI). The four steps in determining equity scores for each dissemination area mimicked that of the NEI (City of Toronto, 2014).

1. Standardize indicator values

Indicator values were standardized using Equations 1 and 2 to create a common unit and range from 0 to 1, where 1 was assigned to a dissemination area with the most inequitable outcome. Standardizing indicators was important given that census indicators were of different units of measure.

Equation 1: For indicators where high values signified increased inequality (e.g., unemployment):

$$\textit{Standardized Indicator Value} = \frac{\textit{Indicator Value} - \textit{Min(Indicator Value)}}{\textit{Max(Indicator Value)} - \textit{Min(Indicator Value)}}$$

Equation 2: For indicators where low values signified increased inequity (e.g., median household income):

$$\textit{Standardized Indicator Value} = \frac{\textit{Max(Indicator Value)} - \textit{Indicator Value}}{\textit{Max(Indicator Value)} - \textit{Min(Indicator Value)}}$$

2. Determine composite indicator weights for each indicator and indicator weighted scores for each dissemination area

Composite indicator weights for each indicator were determined using principal components analysis (PCA) with varimax rotation on RStudio. PCA is a statistical reduction technique that assigns weights to indicators in proportion to their actual contribution based on the strength of variance between indicators; in other words, “factors explaining the most variance should be weighted more heavily” (City of Toronto, 2014, p.11). This method of weighting was chosen over an equal weighting scenario

to more accurately describe differences between dissemination areas based on data distributions and to avoid understating the underlying social inequity issues and factors (City of Toronto, 2014).

The PCA derived factor scores (i.e., principal components) and eigenvalues (i.e., variance explained) for each indicator. The first three factor scores were retained resulting in 91.1% of the total variance in the dataset captured. Results are summarized in Table A.1. Composite indicator weights were calculated by summing the product of each factor score multiplied by its eigenvalue (Equation 3) and then standardized so the sum of all indicator weightings is equal to 1 (Equation 4). Composite indicator weights were then multiplied by their respective standardized indicator values across each dissemination area to derive a total of five indicator weighted scores per dissemination area.

Table A.1: Standardized PCA results for the Social Equity Index

Indicators	**Factor Score 1**	**Factor Score 2**	**Factor Score 3**
Indicator 1 (Income)	-0.2886182	0.1684939	0.9356594
Indicator 2 (Unemployment rate)	-0.7935184	-0.580384	-0.1524667
Indicator 3 (Education)	0.1329772	-0.3804752	0.2122064
Indicator 4 (Lone-parent families)	-0.4533436	0.5727138	-0.181381
Indicator 5 (Recent immigrants)	-0.2526354	0.4024945	-0.1528553
Eigenvalue	0.01658318	0.00916061	0.00489113
Cumulative Proportion of Variance	0.4932	0.76563	0.91109

Equation 3:

$$Composite\ Indicator\ Weight = (Factor\ Score_1 \times Eigenvalue_1) + (Factor\ Score_2 \times Eigenvalue_2) + (Factor\ Score_3 \times Eigenvalue_3)$$

Equation 4:

$$Standardized\ Indicator\ Weight = \frac{Composite\ Indicator\ Weight}{Sum\ of\ Composite\ Indicator\ Weights}$$

3. Calculate social equity scores for each dissemination area

Social equity scores were calculated for each dissemination area by finding the sum of all five indicator weighted scores, reversing the product to support data interpretation, and then multiplying it by 100 to derive a score in range from 0 to 100, with 0 being the most inequitable score (Equation 5). Social Equity Index scores ranged from 26.20 to 82.54 and were geocoded in ArcMap 10.8.1.

Equation 5:

$$\textit{Dissemination Area Score} = \{1 - \Sigma_i [\textit{Standardized Value}_i \times \textit{Standardized Weight}_i]\} \times 100$$

Where i is one of the five indicators

4. Derive a benchmark score and identify Inequitable Dissemination Areas

A benchmark score of 63.14 was derived by first plotting the Social Equity Index scores on a line graph to approximate the number of clusters in the data set using data elbows and then determining an exact benchmark using the Jenks natural breaks classification method on ArcMap. Jenks natural breaks classification method, also called Jenks optimization method, is a data clustering method that seeks to reduce the variance within classes and maximize the variance between classes (Jenks, 1967). Approximately four distinctive data elbows were evident on the line graph, therefore, four classes were accepted as an appropriate number of score classes on ArcMap. The bottom two classes were considered to face the most significant inequities based on the breaks between scores, resulting in the benchmark score of 63.14. Dissemination areas below this benchmark score were referred to as Inequitable Dissemination Areas (IDAs) (n=1,127) and used towards identifying food deserts and food mirages. Social Equity Index score classes and counts are summarized in Table A.2. SEI scores by rank order are illustrated in Figure A.1.

Table A.2: Social Equity Index classes, ranges, and dissemination area counts

Index Class	**Score Range**	***n***
1 (More Inequitable)	26.20 – 55.37	224
2	55.43 – 63.13	903
3	63.14 – 68.48	1623
4 (More Equitable)	68.48 – 82.54	952

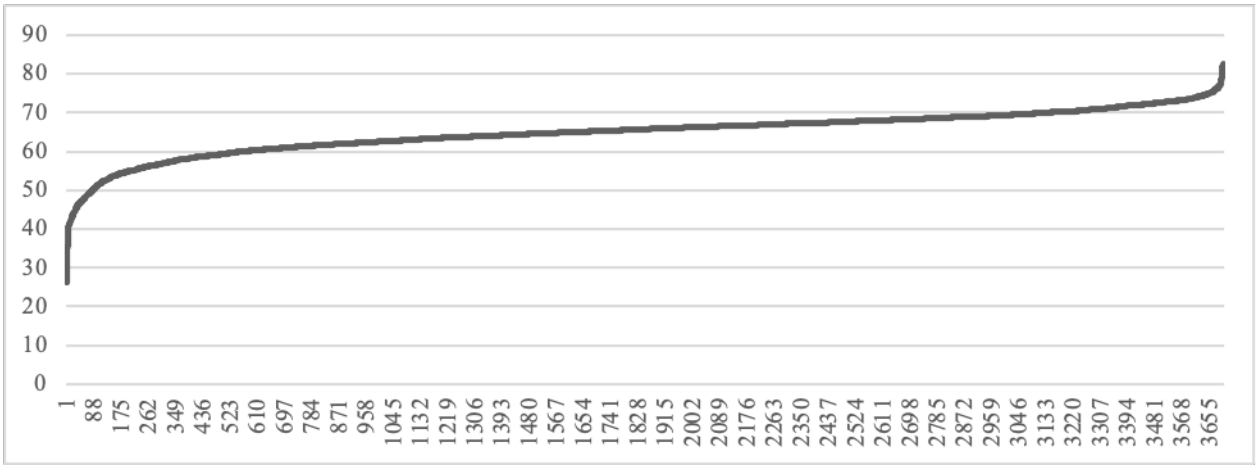

Figure A.1: SEI scores for 3,702 DAs plotted by rank order