



HOUSING – TRANSPORTATION - FOOD AFFORDABILITY NEXUS

A Literature Review

Faculty of Environment Design, University of Calgary
September, 2017

Hemontika Das
Hemontika.das2@ucalgary.ca

ABSTRACT

The overarching proposal for this three-year research project is to identify urban planning policies that best support more affordable living at the Housing – Transportation – Food (HTF) nexus in Calgary. The purpose of this paper is to compile the literature review that was conducted over three months to understand the intersections of two or more the domains. This paper was compiled with two objectives:

1. The first objective was to explore research that might intersect the three HTF domains with one another.
2. The second objective was to identify any general principles, trends and correlations that have been previously studied on affordability and accessibility within the HTF realm.

INTRODUCTION

Affordability of households expenses is a growing concern in Canadian cities. Affordability and affordable living is one that impacts all individuals at various degrees and has the power to control all aspects of an individuals' life, particularly those with low socio-economic status (SES). Often when planning for an affordable city, planners only consider the cost of housing and rent. However, there are two other cost expenses that households incur: transportation and food. The nexus of affordable Housing, Transportation and Food (HTF) would create an integrated approach to this triple threat.

THE THREE PRIORITIES

The premise of affordability and access for the purpose of this project lies behind three priorities – housing, transportation and food. These are three highest (and/or required) expenses of any household, which is why it is important to study the affordability of each. For housing, the aim is to provide affordable housing that is close to basic services and amenities that a household requires. For transportation, the aim is to optimize transit and active transportation infrastructure and reduce automobile dependencies. For food, the aim is to ensure that everyone has access to affordable and healthy food of their choice.

AFFORDABILITY

Considering the topic of 'affordable living' - 'Affordability' can be defined as something "that can be believed to be within one's financial means". 'Living' can be defined as "having life; being alive; not dead". Maslow's hierarchy of needs theory states that food and shelter are physiological needs that are physical requirements for human survival - without which the human body is unable to function properly. These are considered to be the most important need and required to be met above all else (McLeod, 2016). Based on this, affordable living would be to be able to affordable the basic necessities to live, that is food and shelter.

In the field of urban planning, the subject of 'affordable living', often refers to issues surround housing. Land use and zoning policies influence the cost of housing in neighbourhoods that can be controlled by urban planning policies. Transportation and public transit undoubtedly shapes infrastructure, determines the movement of people and the functionality of a city. There is extensive research, policy and considerations on

affordable housing and some also in conjunction with transportation design guidelines. Food is also a major cost for humans, but more importantly an essential cost to stay healthy. Affordable living should therefore consider not only housing, but also the transportation and food nexus.

In the Calgary context the current state of research considers topics surrounding each one of these issues individually. However, there is a significant gap in research that intersects all three topics simultaneously. This literature review identifies the current state of research throughout Canada that considers the support for affordable living at the housing – transportation – food domain(s) from an urban planning and built environment perspective. These findings will lead to better understanding of the assumptions, controversies and gaps in Calgary to increase affordability. Public policy solutions may then be identified and recommended to contribute to the affordable living issue.

HOW? FOR WHOM? WHY?

Throughout the research process, an urban design and built environment lens was used to focus the perspective of the study. The reason for approaching our research efforts from an urban design perspective is because it can influence and support affordable and accessible living for all populations through planning practises. The goal of this research is to ultimately improve the lives of marginalized and vulnerable populations in order to reduce household expenditures and promote self-sufficiency and sustainability. If we successfully build an accessible and affordable city, its impacts do not only end there; it improves the overall health of the city and its citizens. This research is important because it aspires to obtain Imagine Calgary's dream, which is for Calgary "to become a great place to make a living and a great place to make a life" for everyone (The City of Calgary, 2006).

OBJECTIVE 1:

THE SCOPING REVIEW

The first objective of this research was to do a literature review using a scoping review methodology. It is important to note here that this scoping review was not intended to be rigorous and systematically thorough. Significant discretion was used when doing searches and throughout the methodology. The reason for this was due to the lack of time as the review was conducted and summarized within three months, where typically scoping literature reviews can take up to a year to complete.

GOAL

The goal of the review was to identify articles that related to HTF and the built environment within urban geographies and understanding studies that explored the intersections between the HTF domains.

METHOD

The search strategy for the scoping review following the below-mentioned steps:

1. Identification of databases
2. Identification of key terms

3. Decision of inclusion and exclusion criteria
4. Records identified through database searching
5. Additional records identified through other sources
6. Records duplicates removed
7. Records screened, included and excluded based on title and abstract
8. Full text articles assessed for eligibility
9. Irrelevant full text articles excluded
10. Review of articles included in synthesis

IDENTIFICATION OF DATABASES

To begin with, several interfaces accessible primarily through the University of Calgary (U of C), and online were selected to conduct the database searches. These interfaces included CINAHL, EBSCO, JSTOR, OVIC, ProQuest (accessed from U of C) and TRID (accessed online). These specific interfaces were selected because they were easily accessible, and offered research from a wide variety of journals related to urban design, built environment and public health. Due to the limited time of three months to conduct a literature review, it was decided at this time that no additional interfaces would be searched. Each of these interfaces have access to several databases that house hundreds of journals through which articles would be selected for review.

IDENTIFICATION OF KEY TERMS

Several key terms in each of the three HTF domains were decided upon through a brainstorming session with three research assistants at the University of Calgary, Faculty of Environment design working on this project. It is important to note here that each of the key terms searched are relatively general. In conducting this research, at this point in time, searching for a wide range of contextual and specific key terms were limited to avoid biased practices.

These could have potentially created a biased scoping review search because often times, as planners that conduct research, may assume solutions to the problem from inception. Such key terms include words such as: car sharing, quality of local transportation, household size, density, healthy lifestyles, food preferences etc.

HOUSING	TRANSPORTATION	FOOD
Affordable Housing	Active Travel	Urban Food
Housing Affordability	Active Transportation	Urban Agriculture
Below Market Housing	Active Mode of Transportation	Urban Food Systems
Non-Market Housing	Transit	Food Availability
Residential	Public Transit	Food Non-Availability
Housing	Public Transportation	Food In-Availability
Houses	Transit Network	Food Accessibility
House	Transit Orientated Development	Food In-Accessibility
Home	Transit Orientated Design	Food Security
	Transportation Planning	Food Insecurity
	Walkability	Hunger
	Walking	Food Insufficiency

	Pedestrian Friendly	
--	---------------------	--

Figure 1: Key Search Terms

Although many specific contextual terms were avoided, there were some that were searched within documents once they were imported from the original search.

CONTEXTUAL TERMS
Built Environment
Community
Development
Connectivity
Land Use
Public Realm
Urban Design
Urbanization
Urban Planning
Urban Form

Figure 2: Contextual terms searched within all imported articles

INCLUSION CRITERIA

An inclusion criteria was developed in order to focus the scoping review. This included the following:

- Canadian context
- Article and study is related to the built environment and urban design
- Some correlation between housing, transportation and food
- Considerations of policy and best practices
- English Language
- Consider problems and solutions to affordability of housing, transportation or food in the urban context only
- Focus primarily on marginalized urban communities/population with a specific reach in lower socio-economic status.
- Studies published between 1993 and 2017

Due to the large scope of research on housing, transportation and food, at time when searching specific terms over 15,000 – 20,000 articles would be generated. For these searches, if the interface provided options to focus the search further based on databases or topics, appropriate data bases and topics were excluded to further refine the search and focus it to the research theme. For example, when searching for the key term “transit”, the search would generate articles related to cells and biology. Therefore, such topics would be avoided.

Additionally, when certain interfaces did not offer the option for choosing topics, they often included the option to include or exclude certain journals. In this scenario, journals related to biology would be excluded. As a result, within the interface the search was refined to only include transit related to transportation and urban design by excluding irrelevant topics. Through this method a large number of articles were eliminated that would typically be irrelevant to this research topic.

It is recognized here that this may not be a consistent approach to a scoping review throughout all interfaces, but this approach was taken in the interest of saving time.

EXCLUSION CRITERIA

The exclusion criteria therefore included the following:

- Studies that focused on rural design
- Studies related to topics other than the built environment and urban design
- Studies published prior to 1993
- Articles not written in the English language

RESULTS

The Mendeley software was utilized to import and store all citations. The table below illustrates the total number of citations imported from each database, excluding duplicates. In importing the articles, duplicates are automatically removed in the Mendeley. It appears that 325 articles of the articles that appeared in the original searched were duplicates and automatically removed from the imports through Mendeley. However, it is possible that there were occasional fails in removing duplicates due to a difference in title formats for some articles.

CINAHL	EBSCO	JSTOR	OVID	Pro Quest	TRID	Total
261	337	534	299	528	325	2284

Two hundred and four full citations were reviewed, and of these, 50 were found to meet the inclusion criteria of this review. Eighteen selected articles were most relevant and informed the research and have been referred to throughout this literature review. Some grey literature was also found throughout the research process. These citations were primarily government reports and refer to data regarding housing, transportation or food. Five such reports were referred to in this article.

ANALYSIS OF RESULTS

THE INTERSECTIONS

In general, most of the research focused on one of the three domain – housing, transportation or food – with some mention of one other domain. Rarely do they consider all three domains within a study, and if they did, it would be a brief mention or acknowledgement. Particularly, no study focuses on the affordability and access realm of housing, transportation and food in detail.

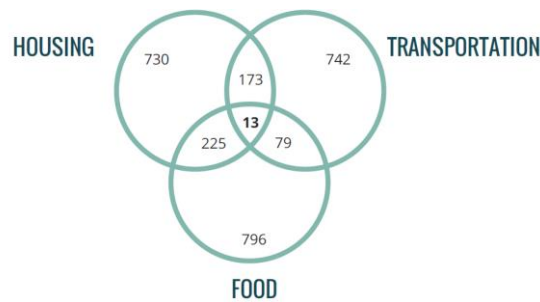


Figure 3: The number of articles that intersected between domains after searching key terms (these do not necessarily have to be related to the research topic)

From all the articles that were imported into Mendeley, only 13 articles had key terms that intersected all three topics. Unfortunately, none of them were related to the research topic.

PLANNING AND THE FOOD REALM

The most interesting finding through this scoping review was the exploration on the food domain and its link to housing and transportation. Interestingly enough, majority of the articles that appeared through the searches that were most relevant to the research topic was about food and food insecurity. Researchers that have done studies on food insecurity have discovered that housing and transportation significantly impact household food security. Furthermore, the built environment has an impact on the physical access to food.

On the contrary, within the realm of planning, the housing and transportation sectors do not often consider food within their studies. This indicates that although the food sector has realized that housing and transportation impacts its affordability and access, the housing and transportation sectors have not considered their impacts on food affordability and access.

Food is often not recognized as a part of the planning field within its production, processing, distribution, consumption and waste management capacities despite each of these stages being connected to the urban design.

In a literature review by Pothukuchi and Kaufman (2000) as well as this scoping review, it was found that the discussion of food is rarely in planning journals. More recently feminist planners have started to study food as a part of a woman's traditional role in the home, and as a result neighbourhoods have been analyzed from such social perspectives over urban design. For instance, many articles from this literature review suggested that food consumed and diet habits are handed down from parents to children and therefore urban food interventions should be geared towards parents, particularly the mothers (Sylvestre, O'Loughlin, Gray-Donald, Hanley, & Paradis, 2007),

Pothukuchi and Kaufman (2000) explain that food is limited in planners' attention because of the belief that it is not in their turf - it is not an urban issue, but rather a rural issue. The system is driven primarily by the private market and planning agencies are rarely funded to do food systems planning.

Although there are many reasons that food is not prevalent in the planning realm, there are ways in which it can be enhanced. One of which is compiling more data about the access and availability of food, which is one of the primary goals of the HTF project. Secondly, planners can analyze connections between food and other planning concerns such as community land use patterns, the impact of food system activities, trends and relationships in neighbourhoods with food entities and transit availability. The food component can be integrated into the community goals through tools used by planners such as zoning and land use bylaws.

URBAN PLANNING WITHIN PUBLIC HEALTH

Within the realm of urban design and planning when considering the topic of food as well as transportation that does not utilize cars, the research tends to focus on public health. This includes the impact of active transportation on the mental and physical health of an individual or household, to tie this into food, the access to healthy food is also related to health and therefore this plays key role in such articles as well. Consequently, majority of the articles that were selected for review were from the *Canadian Journal of Public Health*. This may suggest that the benefits of access to healthy foods may be a greater concern for the public health sector than it is for urban planners, however, active transportation is highly regarded in the planning realm.

LITERATURE

KEY ASSUMPTIONS AND HYPOTHESIS

The following sections focuses on the basic trends and principles that were revealed through the literature review. The information gathered has been summarized based on one primary domain –housing, transportation or food - within which the study was conducted.

KEY FINDINGS

HOUSING

MAXIMUM HOUSEHOLD SPENDING ON SHELTER

Research shows that housing cost, out of all household expenses, is one of the most expensive, let alone a basic need that one must incur. The Canadian Mortgage and Housing Corporation (CMHC) guideline for the maximum amounts that households should spend on their shelter states that ‘no more that 30% of gross household income should be spent on rent’. Additionally, ‘no more than 32% of gross household income should be spent on home ownership’ where ownership costs include water, fuel, electricity, condominium fees, principle and interest, and property taxes (City of Calgary, 2011). Such guidelines address the basis of housing affordability, which is widely utilized by researchers, strategies and plans in Calgary (City of Calgary, 2011).

AFFORDABLE HOUSING AND TRANSPORTATION INDEX

To enhance this guideline, a Housing + Transportation Index was created in The Penny Wise Pound Fuelish Report published by the Centre for Neighbourhood Technology based on data from 337 U.S. metropolitan regions recommending that an attainable standard for transportation affordability is 15% of gross income (Centre for Neighbourhood Technology, 2010). With a 30% housing affordability standard, the total combined housing and transportation cost should be 45% of household income.

$$\text{Affordability Index} = \frac{\text{Housing costs} + \text{Transportation costs}}{\text{Income}}$$

To calculate affordability, the index adds housing costs and transportation cost, divided by the median income. Housing costs include rent, utility, mortgage payments, condo and other fees, property taxes and insurance premiums. Transportation costs factor in nine variables that include six neighbourhood variables (residential density, gross density, average block size, transit connectivity index, job density, average time to work) and three household variables (household income, household size, commuters per household). These factors are used to predict costs for car ownership, car usage and public transit usage, which in turn equates to the total transportation costs. By factoring in transportation costs into the affordability index, new home buyers or renters are able to consider the cost of travel based on the home location. This adds a level of transparency to the home buying process that is often ignored.

MINIMUM WAGE IS NOT ENOUGH

The City of Calgary's Affordable Housing Fact Facts provides information on the need for affordable housing in Calgary based on the household's gross annual income indicating that 19% of all Calgary households earn less than \$44,000 and spend 30% or more on shelter costs. The report analyses rental housing costs in Calgary and compared them against minimum wage. Concluding that earning a minimum wage will not be enough for one person to rent an apartment in Calgary (City of Calgary, 2011). This limits the amount of disposable income for the household to spend on transportation and food.

A SPRAWLING CITY

After decades of urban sprawl, planners are now thoroughly able to view and understand its opportunity costs. These include issues such as increased household costs, loss of liveability, distance from amenities, work and school, and a compromise in sustainability. Often, the cost of purchasing a house in the distant suburbs may be significantly lower than those in the inner city due to a lack of amenities. For those in the lower income bracket, this would mean that live, work and play in the same area with access to jobs and transit is a distant reality. As a result, it requires households to own at least one car (Dawkins & Moeckel, 2016). The "drive till you qualify" approach results in higher transportation costs placing a strain on residents' budgets and higher sensitivity to gas prices. A sprawling city contributes to more traffic congestion, less leisure time with families, and higher production of greenhouse gasses. Additionally, housing affordability drops when including transportation costs to household cost (Centre for Neighbourhood Technology, 2010).

TRANSPORTATION

TRANSPORTATION AFFORDABILITY: EVALUATION AND IMPROVEMENT STRATEGIES

Litman defines the concept of transportation affordability as “the financial burden that households bear in purchasing transportation services, particularly those required to access basic goods and activities (healthcare, shopping, school, work, social activities).” Similar to research carried out throughout Canada and the U.S. this article again states that less than 45% of household income should be spent on housing and transportation combines, and that lower income people spend a larger portion of their income on transportation.

In urban planning currently, the transportation system performance is primarily based on travel speeds and favours faster, more expensive modes such as automobiles, or slower but affordable modes such as walking, cycling and transit. Litman suggests some strategies to reduce overall transportation costs such as improving the non-automobile transportation infrastructure; accessible development and housing; car sharing initiatives and vehicle rental options; efficient car pricing options (Litman, 2016).

BUILT ENVIRONMENT AND HEALTH IMPACTS

Built environments with greater levels of active transportation and recreational physical activity, with a lower amount of fast food chains have an impact on physical activity and in turn lower obesity and chronic disease rates. The modes of transportation that people chose to take can have a significant impact on health, and in turn economic situation (medical costs). As planner, it is therefore important to link the walkability and bikability of neighbourhoods and cities in order to address public health issues related to active transportation, physical health and mobility. Although not all variable in the built environment might have a significant impact on the behaviours of individuals, certain variables in the urban setting encourage the use of active transportation. These include the length of roads, bicycle and sidewalk facilities, distance to the nearest major destinations (schools, transit hubs, food outlets). Higher mixed land use, intersection density, retail floor-to-area ratio, residential density, transit stop density and retail food store density is associated with more physical activity, lower body weight, better health and reduced vehicular usage. Research shows that better access to parks and trails are typically associated with walking for exercise and leisure, while greater sidewalk coverage and bike facility access is associated with more walking and biking for transportation. (Ulmer, Chapman, Kershaw, Campbell, & Frank, 2015)

TRANSIT ORIENTATED DEVELOPMENT

Transit orientated development (TOD) has been recognized as a solution to the sprawl problem along with many others such as traffic congestion, pollution, urban poverty, etc. In such areas, an efficient transit system is surrounded by dense and variety of housing options with opportunities for commercial land use that can potential satisfy food requirements. Despite its benefits, one must be cautious of the impacts of TOD on housing prices. TODs have the potential to increase housing costs, and therefore displace low income families – a concept termed as ‘transit induced gentrification’ (Dawkins & Moeckel, 2016). This phenomenon would occur as

the improved access to transit options is capitalized into the surrounding land and housing prices. Without any market intervention to ensure some affordable housing is built, Dawkins and Moeckel (2016) argue that lower income people may be forced out of the neighbourhood. On the contrary, some argue that regardless of an increase in housing prices, the accessibility to transit and amenities nearby will offset the need for an automobile, thus factoring in housing and transportation costs may still be lower than other transit-poor locations.

TRANSIT-ORIENTED DEVELOPMENT AND GENTRIFICATION

Studies show that the value of public transit is often capitalized into the housing and land costs. Transit induced gentrification assumes that those who value the proximity to transit will fact that into the housing prices and will be willing to outbid lower income households for housing within a TOD. Typically, areas with efficient transit options, with mixed land uses, retail amenities have higher housing prices and therefore higher income people. In contrast, it could also be suggested that lower income people that prefer to live in the inner city due to better transit options would be willing to bid more for housing.

Dawkins and Moeckel (2016) suggest that cities can implement regulatory policies to encourage more affordable housing near TOD. One such tool is inclusionary zoning programs that award density bonuses in exchange for the provision of affordable housing. Although an obvious solution to the housing transportation and food nexus may be TODs, one must be mindful of the potential unintended consequence such as transit induced gentrification and plan appropriate measures to limit this phenomenon.

WALKABILITY AND HOUSING VALUES

A solution to affordable living in the housing transportation food nexus is to not own a car. Households with consequently rely on transportation modes such as transit, biking and walking. If planners built the city of Calgary as one that was pedestrian and bike friendly, then it would be important to consider the impact of these urban design changes on the housing market. Walking the Walk explores the connection between housing prices and walkability in the U.S.

Walkability is measured through a neighbourhood's walk score, and the higher the walk score, the more walkable the neighbourhood is. The walk score considered accessibilities to amenities and the range of choices. In the U.S., neighbourhoods that are walkable have much higher premiums for their housing process. This is a result of consumer demand of housing in these areas. The research used an economic tool called hedonic regression to calculate the market value that home buyers attach to houses with housing walk scores. Although there were many controlled variables, the study concluded that people attach a positive value to walkable neighbourhood with retail services, schools and parks. People are most willing to pay a premium on housing when they have the option to live without an auto-mobile, especially when transit in the region is efficient. The study concludes that walkability is strongly associated with higher housing prices.

The study by Dawking & Moeckel (2016) stated that transit orientated development increase housing prices, whereas Cortright (2009) concludes that walkability and access in general increases housing value. As a result, to improve the housing transportation and food nexus, should transit and walkability be a solution to improve access to food for lower income vulnerable populations then there must be regulations to ensure some affordable housing options.

BUILT ENVIRONMENT, LOW SES AND ACTIVE TRANSPORTATION

When exploring the socio-economic status (SES) as a moderator to the relationship between the built environment and active transportation, a study by Steinmetz-Wood & Kestens (2015) revealed that neighbourhood connectivity and density of services and amenities had a weak relationship with the use of active modes of transportation compared to those with a high SES. This may be due to other cultural and behavioural factors such as psychological stress, lack of time, living in stressful situations, characteristics of the surrounding environment such as crime rates and high traffic. Additionally, other physical feature of the built environment may be lacking in neighbourhoods of low SES such as adequate lighting to ensure a safer commute, biking infrastructure (lanes, parking, paths). A lack of such factors in the built environment may contribute to the lower rates of active transportation usage in such populations compared to those living in higher SES neighbourhoods. Therefore improving and enhancing the built environment might potentially increase the odds of lower SES populations to engage in active transportation (Steinmetz-Wood & Kestens, 2015).

THE BARRIERS TO WALKING

In exploring the perceived barriers to walking of those between the ages of 19 – 92, it appears that younger people dislike walking as they perceive distances to be long and believe that minimal walking is sufficient. For seniors, factors such as poor lighting, too much auto-mobile traffic, dangerous crossings, lack of companions to walk with and the mere dislike of walking are barriers to walking. Those living in poorer and middle-income households feel that they are not in good health, have a physical disability and no safe place to walk due to crime. This suggests that those in a lower SES brackets may be lacking access to healthy foods and do less physical activity hence face health problems. Barrier to walking is not only a safety, or a built environment issue, but also a social one where those that don't have a partner(s) to walk with will less often chose such a mode (Clark & Scott, 2016).

HOW PEOPLE SHOP

Modes of transportation, the time it takes, distance and cost, all have a role in shopping patterns. Once such study focused on understanding how time for transportation might impact affordability and access to shopping. According to a study by Farber, Paex, Mercado, Roorda, & Morency (2011), the poorest and the wealthiest households travel longer for food. However, the reasons for this pattern is different. The wealthy travel longer due to cheaper relative travel costs. Poorer households travel longer because they often tend to travel using public transit, and live in unserved parts of the city, forcing them to travel farther. Additionally, they do not value time as much as higher income people as cheaper goods and services frequently is more attractive than

saving time. Interestingly, the poorest households have high participation and frequency rates for grocery shopping but lower grocery shopping durations. This may be indicative of a more precarious live-one-day-at-a-time situation, in which more frequent trips to the stores for shorter shopping episodes are associated with limitations to afford, carry, or store larger quantities of purchased items (Farber, Paex, Mercado, Roorda, & Morency, 2011).

FOOD

DEFINING FOOD INSECURITY

Food security is an increasing problem globally, particularly in lower-income populations, and those living in social housing face it more than those that do not. Food security as defined at the World Food Summit in 1996, which can be utilized throughout the HTF project as - “Food security exists when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy lifestyle” (Food and Agriculture Organization, 1996). There are several concepts of food security that can be utilized. The first is by McKeown (2006):

- Universality → Who should get the food?
- Stability → When should one get food?
- Dignity → How is one obtaining the food?
- Quantity → How much food is being obtained?

The second concept of food security is by Koel (1999):

- Availability → sufficient food for all people at all times
- Accessibility → Accessible to all equally
- Acceptability → Culturally acceptable food is produced and obtained in ways that do not compromise people’s dignity, self-respect or human rights
- Adequacy → Nutritious, safe and produced in environmentally sustainable ways

It is important to note that there are many approaches and facets to food intake and security. For the purpose of this research, affordability and access is the primary perspective through which the research has been conducted. That is not to minimize the importance of other determinants of eating behaviours (Friendly, 2008).

PRIORITIZING HOUSING AND TRANSPORTATION OVER FOOD

The rent-food dichotomy is stated in Pothukuchi and Kaufman’s work (1999), then repeated in Friendly’s work (1999) appearing repeatedly throughout the research. This dichotomy stresses that people will always prioritize housing costs over food. As the cost of housing increases, the resources that would otherwise be supporting a households’ social determinants of health start to deplete.

Also, food may be the first commodity to be sacrificed because it is an easy product that is purchased often. On the contrary, a car is purchased once in several years at least and is not a flexible commodity in terms of buying and selling. Therefore, one could assume that between the three domains of housing, transportation and food, the latter would always be the first one to go, a car would be second, and housing least of all.

FOOD IN THE URBAN PLANNING REALM

Typically, in the urban field, planners often tend to focus on issues such as housing, infrastructure, employment, transportation and the environment. The food domain, although crucial to public life is seldom considered.

Pothukuchi & Kaufman (1999) in their paper suggest ways in which a city could play a more active role in the food system. They propose that cities could create a food policy council, that is either an independent entity, part of the planning department or its own department within the municipal government.

In comparison, the City of Calgary although does not appear to have a specific food council, the food strategy known as *CalgaryEATS! Food System Assessment and Action Plan* (City of Calgary, 2012) is a council endorsed strategy. It seems as though it is the Office of Sustainability and Planning & Development that share the responsibility of the Land Use Amendment Project that came out of the food strategy.

Pothukuchi and Kaufman first discuss the reasons for which food has a low visibility in the realm of urban planning. First, there is a small known portion of the city that experiences issues surrounding the availability or affordability of food (Pothukuchi & Kaufman, 2000). Second, urban space was termed as a place that was 'not' agricultural. Food is often perceived as an agricultural issue, and rural regions are the ones that predominantly have agricultural land uses. Therefore food is dichotomy between the urban and rural uses. Third, technological advances significantly improved food processing and preservation after the industrial revolution. With mass commercialization of food and readily available food everywhere, it is often taken for granted.

HUNGER AND LOW INCOME POPULATIONS

Hunger is less visible. Hunger is often a hidden struggle inside homes and therefore it is difficult to be certain of what percentage of the city may be facing such challenges without assuming that this is a low-income population problem. Additionally planners do not try to understand the affordability and availability of food to marginalized and vulnerable populations at all times and through the right channels. For instance, are low-income people constantly having to visit emergency food channels, or do they have access to healthy food without an emergency.

THE LINK BETWEEN FOOD AND TRANSPORTATION AND HOUSING

Pothukuchi and Kaufman re-enforce that lower income people pay higher proportions of their income on food and have fewer choices due to the lack of supermarkets in the inner-city (assuming that they live in the inner city). Additionally, with the absence of a car, they have less access to healthy food. Walter P. Hedderley in his book *How Cities are Fed* use the term 'foodshed'. It points to the issues related to the food distribution system. In the Housing Transportation and Food nexus project, the concept of food shed can be utilized to understand the regions where food is available vs. unavailable. This can be analyzed through many different categories such as type of retailers, cost and type of food.

The paper then goes on to explain the importance of food in the urban space and why it should be a major issue, particularly for planners. These include several factors including: food establishments are a major business contributes to significant employment; a significant portion of income is spent on food; household trips to grocery stores can be a large portion of distance driven and transportation costs; food contributes to many relate health problems including chronic diseases and obesity; a significant portion of the household wastebasket including packaging is waste that ends up in landfills; chemicals and pesticides from farms can find their way into the city water therefore contributing to water and soil pollution; the quality of transit can impact the access to affordable food for many low income populations; when there is a short supply of affordable housing, and people are forced to live in houses that are over their budget, food is often the first expense that is sacrificed; many people rely on emergency food supplies such as food banks, soup kitchens and shelters Pothukuchi and Kaufman (1999).

Pothukuchi and Kaufman (1999) recommend that by setting up a food policy council or a department of food, an entity is able to focus solely on all food related urban issues. This includes understanding the food system in the city, advocate, educate, frame policy, implement strategies and gather feedback from community members. This not only would improve the state of the food system in the city, but it would also ensure that the municipality is accountable for the issues.

This article is significantly relevant to the housing transportation and food nexus project because it validates the importance of food in the urban planning field. Each of the above mentioned challenges are directly related to food, but are also linked to other urban planning issues such as land use, housing, transportation, transit, environment, waste and recycling and public health. It is therefore inviteable that food become central to the urban agenda. Even throughout the scoping review, it was evident that housing and transportation is within the food agenda, however issues surrounding food are not considered within the housing and transportation realm.

In addition to the role of the city in improving the food system, Pothukuchi & Kaufman (1999) adresses the fact that food is an issue that needs to be tackled through all domains of urban planning planning in order to serve the population well. Therefore it should also be private planning firms that think about the linkages that food may create among physical, economic and social dimensions through different sectors. Commercial land use is often where the food realm sits, however there sould be some consideration in ensuring that food is accessible to a diverse range of people from an economic and demographic perspetive. A political will, creativity and innovation is required inorder to improve a vital urban system and thus the housing transportation food nexus project may contribute to such changes by considering the linkages between the three domains.

HOMEOWNERSHIP AND FOOD INSECURITY

It is well established that housing is recognized as a basic right and a key determinant of health. A study in Canada suggests that food insecurity tends to be higher for non-homeowners (17.9%) and lower for homeowners (3.3%). The typical demographics of those who are not homeowners include lower income families with low level of education, higher number of children, lone parent and aboriginal status. This article, like many

other also suggest that lower income families sacrifice on food expenses in order to be able to make housing payments and bills. When household costs increase, people spend less on food. But According to Kirkpatrick and Tarasuk (2007) there is a positive correlation with household subsidy and improvement in the adequacy of food. Therefore, in order to tackle food affordability, we must first and foremost tackle household affordability. Additionally, it is proven that lower income households tend to purchase poor quality and nutritional food because they are the cheapest (Kirkpatrick & Tarasuk, 2007). It is therefore evident that in addition to ensuring access to food in general, it is important that lower income households have access to affordable nutritious and healthy food.

Non-home owners are typically more at risk of food insecurity than those that owned homes. This is true across all demographics. A study by (McIntyre, Wu, Fleisch, and Emery (2015) found that in terms of income, 62% of the homeowners had an income of over \$60,000, where in comparison, only 24% of the non-homeowners did. The reasoning for home ownership being less prone to food insecurity was that they felt as though owning a home was protective. Owners' household wealth and assets were above and beyond their income. Due to this, owners are able to access credit and borrowing, which provides them a safety net to food insecurity. On the contrary, renters are often only dependant on their incomes and thus may feel as though they are not protected beyond that. Additionally, with home ownership, one's mortgage is typically steady, whereas rental rates change based on the housing market. The renter may be able to afford housing one month, and if the market improves and rent increases, the house suddenly becomes less affordable. This causes instability in their household budgets and thus renters may sacrifice on food items, leading to food insecurity (McIntyre, Wu, Fleisch, & Emery, 2015).

Since the 1970s in Canada, there has been a lot of support for home ownership over renting by the government through many initiatives for home owners. Additionally, changes in land use and zoning bylaws have reduced rental only zoning. This has led to a higher number of condo buildouts and a decrease in the number of rental properties (Hulchanski, September 2007; McIntyre, Wu, Fleisch, & Emery, 2015). It may be important to understand the housing market in Calgary from an ownership versus rental units perspective to shed some light on potential food insecurity.

PHYSICAL DISTANCE TO STORES

Often planners assume that households will go to the closest store to where they live however, that is not always the case. There are many factors that impact the food outlet choice above and beyond proximity. These include price, food quality, availability of specific foods, store and neighbourhoods safety and cleanliness. A cross-sectional analysis of a community based grocery store in Saskatoon found that although people were aware of the existence of a new grocery store in the neighbourhood, only Aboriginal households shopped there. All other cultural households including Chinese, South Asian, and South East Asian and Caucasian cultures preferred to stick to their traditional diets and preferred their respective cultural speciality stores that were in other neighbourhoods (Lotoski, Engler-Stringer, & Muhajarine, 2015). Therefore, when planning for food outlets

in a neighbourhood it is important to consider the cultural makeup and demographics of the area and situate culturally appropriate stores closer to homes and cater to the diversity of the population.

ALTERNATIVE SOLUTIONS TO FOOD ACCESS

There is no one firm solutions to the problem of food insecurity from the access perspective. The CalgaryEATS! document identifies several different forms of food outlets that can be categorized into market food sector, institutional food sector, community food sector and the charitable food sector. Subcategories within these include wholesalers, major retailers (large supermarkets), convenient stores, institutional food producers (schools, hospitals, restaurants, universities, roof-top gardening), community gardens, small scale commercial grocers and entrepreneurs, farmers' markets, community kitchens, food banks, meal program, food recovery programs. In order for a food system to be complete, there needs to be each of these avenues to food access that caters to the different populations (The Calgary Food Committee and Serecon Management Consulting Inc, 2012).

One such study based in Edmonton, Alberta explored whether community gardens can improve the access to fresh fruits and vegetables in food desert areas (supermarkets). The study showed that community gardens tend to cluster in areas that are close to supermarkets therefore households or neighbourhoods that have poor access to supermarkets, also tend to have limited access to community gardens. In Edmonton, fresh fruits and vegetables are readily available in lower income neighbourhoods, and therefore such neighbourhoods also have access to supermarkets. Interestingly enough, although typically studies in the US show that lower income neighbourhoods lack healthy food outlets, this was not the case in Edmonton (Wang, Qui, & Swallow, 2014). Case studies in several other Canadian cities have also found that lower income neighbourhoods have ample access to fruits and vegetables. This is because they are more often located near the inner city in mature neighbourhoods. In Calgary's case, the CalgaryEATS! document identifies several lower income neighbourhoods that are currently food deserts from a supermarket perspective (The Calgary Food Committee and Serecon Management Consulting Inc, 2012). This is therefore an area of further research to identify whether other food outlet options are available in such neighbourhoods and how they might influence the food security of the households.

Friendly recognizes Community Food Security (CFS) as a strategy to address food security that utilizes a more community and participatory approach where households are not required to fall back into emergency or charity methods of obtaining food. CFS initiatives would include community gardens, food markets, farmers' markets, school food programs, cultural food programs, community kitchens, cooperatives, community supported kitchens etc. In understanding other options and alternatives to market food retailers, communities may be able to improve the state of food security for vulnerable populations (Friendly, 2008).

THE STATE OF FOOD IN CALGARY

The Calgary Food System and Assessment Plan (The Calgary Food Committee and Serecon Management Consulting Inc, 2012) is a council-endorsed food strategy that assesses the food system in Calgary to understand

it's food profile including production, processing, distribution, access, consumption and food waste recovery. The report concludes that there is a gap between the current state and the targets for ImagineCalgary Plan for Long Range Sustainability. Particularly, the action portion of the report focuses on the accessibility and affordability of food at a household scale. There are nine different types of food retailers in Calgary that can be categorized into market and community retailers. Each type of retail establishment contributes to the access of food. Market retailers are grocery stores or convenient stores, and community retailers are those that are a part of the community food sector often focusing on local products.

Food security, or lack thereof exists in Calgary where accessibility can be defined as physical, or financial. Physical access to food is heavily reliant upon the urban form. The assessment concluded that there are some residential areas within Calgary that have a high percentage of low-income householders with no available of grocery stores within 1km. Grocery stores are clusters along major roads with several food deserts. Therefore, individuals would require vehicles to access food, or inconvenient transit options that take a significant time to reach destinations. In assessing the financial access to food the report addresses the cost of food, situations that may present food insecurities, and options for those suffering greater risks.

The assessment suggests several planning policies to improve access to food retail outlets that supports increased non-automobile transportation options. However, it does not merge the financial and physical access to food. Such that, in lower income neighbourhood not only should there be more food retailers, but they should also be reflective of the income levels in the neighbourhood to ensure affordability.

LAND-USE BYLAWS

From the CalgaryEATS! Came the Land Use Bylaw amendment project in 2016, that proposes changes to the Land Use Bylaw within the food production realm. The primary goal for this project is to increase the resiliency, access and affordability of Calgary's food system. Proposals regarding the following issues were made: growing food; opportunities for small scale farming; community gardens; indoor commercial agriculture; food processing; extensive agriculture; intensive agriculture; urban grazing; growing on boulevard; pop up local food sales on city owned land; an agriculture land use district; breweries, wineries and distilleries; roof top gardens.

Proposals for each of these objectives would certainly improve the urban food system and it does consider different aspects. However, the bylaws could further be improved by considering access to food in relation to other land uses in the city such as residential, mixed use, industrial and commercial.

HOUSING, TRANSPORTATION & FOOD

The Housing, transportation food affordability nexus is not simply an issue of affordability of the three different components individually, but rather a combined matter. In order to make this phenomenon a reality, as research shows repeatedly, a physical nexus of not only affordable housing, transportation and food could be created. The availability of a large parcel of land has a significant role to play in making this work. Unless the city

is building a new community, or redeveloping a large portion of land, a physical nexus may be difficult to create in a short time frame.

The other option is to redevelop neighbourhoods through incremental changes to the streets, connectivity to surrounding neighbourhoods, land use, and community programs in order to foster an inclusive place where HTF is available and affordable.

ANALYSIS

Throughout the literature review there were several themes that repeatedly appeared. These can be taken into consideration when furthering this research project. Firstly, there are several scales at which research or policy could be implemented within the scope of this project. Secondly there are urban design and built environment best practices that benefit the affordability and accessibility of the HTF nexus. This section focuses on these two components of the research.

SCALES OF INTERVENTION

Within the research, each study typically selected a specific scale and chose to focus its research on that level. A total of five scales dominantly appeared: city wide, neighbourhood clusters, neighbourhood, household and individual. Within each of these, the number of people that are impacted and the types of interventions to enhance HTF affordable vary. Additionally, the level of involvement from different organizations and stakeholders will depend on the level of collaboration, relationships and roles of their input at each scale. For example, at the city scale, ensuring that an efficient transit network is well established and connected so that individuals are able to access other parts of the city within a reasonable time. At the neighbourhood cluster scale there should be access to large scale supermarkets that sells all the essentials at affordable prices so that individuals are able to one-stop stop within a reasonable distance from their homes. At the neighbourhood scale there might be smaller scale grocery shops that sell healthy foods, bike lanes and sidewalk infrastructure with ample lighting in place so that people are able to take active transportation where needed. At the household scale families may be making decisions on modes of transportation or food choices that might impact the household affordability. At the individual level what people eat, what mode they use to get around from their homes might impact their health and medical costs. At each of these scales there are potential solutions that planners, community organizations and orders of government can lead. The level and impact of scales should be considered when designing cities for affordable HTF.

AFFORDABLE HOUSING AND TRANSPORTATION INDEX

The approach to a housing and transportation affordability index in the penny Wise and Pound Fuelish report revealed a useful tool to determine the affordability, budgets and potential for many households. It addresses the affordability intersections between housing and transportation. However, one new innovation might be to include food in the index. Although significant variables and measures have to be considered prior to adding

food to the index, for the purpose of the HTF research it would be an adequate tool to measure HTF affordability. The new index might look like the following:

$$\text{Affordability Index} = \frac{\text{Housing costs} + \text{Transportation costs} + \text{Food costs}}{\text{Income}}$$

POTENTIAL OVERARCHING SOLUTION THEMES

NEW DEVELOPMENTS

One potential solution that has been reoccurring throughout all the research, particularly in new and developing neighbourhoods is physically bringing housing, transportation and food in one area, which suggests transit orientated development. Transit orientated developments can be created throughout the city with efficient transit options, frequencies and connections to other parts of the city which would satisfy the transportation needs of individuals. Consequently, and hopefully, households would not require a car should they be living in such areas. For the housing component, it would be important to have a certain percentage of all housing units to be non-market housing throughout the affordable housing spectrum. Additionally, the mixed-land use would encourage retail and food outlets to be present in the area. It would be important to ensure that retail rents are affordable for small business owners. Should rents be high, prices for goods and services sold in the space would be high and in turn may be unaffordable for lower income populations in the neighbourhood. TODs tend to be high in residential density to support the businesses in the area and ensure that they might have enough customers. Other features in the neighbourhood would be to ensure that there is infrastructure to support walkable and bikeable modes of transportation such as well-lit sidewalks, bike designated bike paths, interesting walking sights, short block lengths. Any feature that would support active modes of transportation would encourage people in the neighbourhoods to use these over a car.

EXISTING DEVELOPMENTS

For existing neighbourhoods where currently building a TOD might not be possible, there are smaller scale interventions that might be feasible. In particular, they are elements of the built environment that improves walkability and bike ability of the region. Possible zoning changes might encourage more different types of food outlets to appear. This is an area where more research is possible, to understand innovative ways in which existing neighbourhoods can improve the affordability and access to food outlets. There is a huge wealth of knowledge and experience within existing communities themselves where they create informal organizations and arrangements to be able to afford and access food or transportation (given that they have housing). Therefore, it would be important to consult with community members and understand the resources available in order to be able to enhance them. This information is typically not reflected in research studies.

In Calgary, it being a winter city, it is important to design for the weather. For example, a family of newcomers into the country are not used to the cold weather here and will prefer not to walk if they don't need to. If we

can add shelters on bus stops, that makes a big difference and prevents people from missing busses, or feeling comfortable while walking. Often, newcomer families will resort to buying a car because they prefer not to walk in the snow, and that in turn makes food unaffordable for them. Similarly, snow clearing is an issue, not only for those that feel uncomfortable walking in the snow, but also those that may be on wheelchair and have alternative modes of mobility. This is particularly an issue for seniors. They may be homebound during the winter if they are bound in a wheelchair and the snow has not been cleared. As a result, they are unable to access food and are not able to be mobile.

CONCLUSION

CALGARY TRANSPORTATION PLAN AND MUNICIPAL DEVELOPMENT PLAN

The City of Calgary's Transportation Plan (City of Calgary, 2012) and the Municipal Development Plan recognizes that Calgary, outside the downtown vicinity, has been primarily automobile centric. This is largely due to the segregated land uses with urban sprawl where residential uses are located on the outskirts of the city with a high density of jobs and services located in the downtown region. The plan therefore agrees with the CNT report (Centre for Neighbourhood Technology, 2010) that the city needs to be more compact with jobs, services and amenities closer together to make non-automobile modes of travel more convenient. This would not only offer more transportation choices to residents, but also address affordable mobility options for a diverse population. Although, the plan recognizes that transportation should be affordable for Calgarians, it does not connect transportation affordability with housing inclusive of food access.

It is therefore evident that although the issue of affordability might be considered individually from each of the three domains, they are not often viewed together. The literature review provides some direction that the food sector understands and realizes that the housing and transportation sector needs to include food in its urban planning process. However, the housing and transportation planning sectors have not really begun to plan for the access and affordability of food in conjunction with housing and transportation.

To address such issues in Calgary, there is yet much work to be done. Awareness of the issues is first and foremost, not only to those that are working towards re-moulding the planning system, but also to the citizens of the city who may be victim to the affordability crisis. Research, collaboration and connections will begin the conversation, and to further that individuals, organization and communities can develop plans and programs to improve the current conditions. It is undeniable that affordability issues need to be addressed, and although this may be a part of the larger conversations regarding poverty, urban planning and design can do its own part in the grand scheme of things to contribute to making lives easier for those that are vulnerable.

BIBLIOGRAPHY

- Centre for Neighbourhood Technology. (2010). *Penny Wise Pound Fuelish*. Chicago : Centre for Neighbourhood Technology.
- City of Calgary. (2011). Affordable Housing and Homelessness in Calgary. *Fast Facts #4*.
- City of Calgary. (2012). *Calgary Transportation Plan*. Calgary: The City of Calgary.
- Clark, A. F., & Scott, D. M. (2016). Barriers to Walking: An Investigation of Adults in Hamilton (Ontario, Canada). *International Journal of Environmental Research and Public Health*, 179-192.
- Dawkins, C., & Moeckel, R. (2016). Transit-Induced Gentrification: Who will Stay, and Who Will Go? *Housing Policy Debate*, 26(4-5), 801-818. doi:10.1080/10511482.2016.1138986
- Farber, S., Paex, A., Mercado, R. G., Roorda, M., & Morency, C. (2011). A time-use investigation of shopping participation in three Canadian cities: is there evidence of social exclusion? . *Transportation*, 17-44.
- Friendly, A. (2008). *Towards Food Security Policy for Canada's Social Housing Sector*. London: Canadian Policy Research Networks Inc. and Social Housing Services Corporation.
- Hulchanski, J. D. (September 2007). *Canada's Dual Housing Policy - Research Bulletin #38*. Toronto: Centre for Urban and Community Studies.
- Keough, D. N. (2011). *Action Research on Transportation Housing Affordability*.
- Kirkpatrick, S., & Tarasuk, V. (2007). Adequacy of food spending is related to housing expenditures among lower-income Canadian households. *Public Health Nutrition*, 10(12), 1461-1473.
- Litman, T. (2016). *Transportation Affordability: Evaluation and Improvement Strategies*. Victoria: Victoria Transportation Policy Institute.
- Lotoski, L. C., Engler-Stringer, R., & Muhajarine, N. (2015). Cross-sectional analysis of a community-based cooperative grocery store intervention in Saskatoon, Canada. *Canadian Journal of Public Health*, 103(3), 147-153.
- McIntyre, L., Wu, X., Fleisch, V. C., & Emery, J. C. (2015, July 19). Homeowner versus non-homeowner differences. *Housing and the Built Environment*, 31, 349-366. doi:10.1007/s10901-015-9461-6
- McLeod, S. (2016). *Maslow's Hierarchy of Needs*. Retrieved from www.simplypsychology.org/maslow.html
- Pothukuchi, K., & Kaufman, J. L. (1999). Placing the Food System On the Urban Agenda: The Role of Municipal Institutions in Food Systems Planning. *Agriculture and Human Values*, 16, 213-224.

- Pothukuchi, K., & Kaufman, J. L. (2000). The Food System: A Stranger to the Planning Field. *Journal of American Planning Association*, 66(2), 113-124.
- Revington, N., & Townsend, C. (2016, February 17). Market Rental Housing Affordability and Rapid Transit Catchments: Application of a New Measure in Canada. *Housing Policy Debate*, 26(4-5), 864-886.
- Steinmetz-Wood, M., & Kestens, Y. (2015). Does the effect of walkable built environments vary by neighborhood socioeconomic status? . *Preventive Medicine*, 262-267.
- Sylvestre, M.-P., O'Loughlin, J., Gray-Donald, K., Hanley, J., & Paradis, G. (2007). Association Between Fruit and Vegetable Consumption in Mothers and Children in Low-Income, Urban Neighborhoods. *Health Education & Behaviour*, 34(5), 723-734.
- The Calgary Food Committee and Serecon Management Consulting Inc. (2012). *Calgary Food System Assessment & Action Plan*. Calgary: The City of Calgary .
- The City of Calgary. (2006). *Calgary's Plan for Long Range Urban Sustainability: Imagine Calgary*. Calgary: The City of Calgary.
- Ulmer, J., Chapman, J., Kershaw, S., Campbell, M., & Frank, L. (2015). Application of an evidence-based tool to evaluate health impacts of changes to the built environment. *Canadian Journal of Public Health*, 26-32.
- Wang, H., Qui, F., & Swallow, B. (2014). Can community gardens and farmers' markets relieve food desert problems? A study of Edmonton, Canada. *Elsevier*, 55, 127-137.