Characterizing Older Adults' Driving Cessation and its Relationship with Life Satisfaction: Findings from the Canadian Longitudinal Study on Aging (CLSA)

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Activities of Daily Living (ADLs) Canadian Active Living Environments (Can-ALE) Canadian Longitudinal Study on Aging (CLSA) Étude longitudinale canadienne sur le vieillissement (ÉLCV) Place of residence, Race/ethnicity/culture/language, Occupation, Gender/sex, Religion, Education, Socioeconomic status, Social capital (PROGRESS) Quality of Life (QoL)

## Abstract (English)

**Background**: Transportation is a crucial facilitator of quality of life. Most older adults drive and prefer to; however, many live long enough to experience driving cessation. Driving cessation can help improve safety for people on the road, but it can also lead to negative consequences such as depression, decreased activity participation, unfulfilled needs, and social isolation. These consequences impact quality of life.

**Methods**: This thesis employs data from the Canadian Longitudinal Study on Aging (CLSA) to examine the reasons for driving cessation and the associated socio-demographic characteristics. Logistic regression models are used to understand the relationships between sociodemographic characteristics, driving status, life satisfaction, and a desire to participate in more activities.

**Results**: The results confirm that the odds of not having a driver's license significantly increase in older age. Compared to those aged 65-74, those aged 75-84 are 2.77 times (p-value = <0.001) more likely to no longer drive. People over 85 are 7.59 times (p-value = <0.001) more likely to drive no longer. Females are almost two times (OR 1.97, p-value <0.001) more likely to stop driving than males. Those partnered were less likely (OR 0.66, <0.001) to stop driving than those not. Those with lower incomes are also more likely to stop driving at an older age. Compared to those in the \$50,000-\$99,999 bracket, individuals with incomes between \$20,000-\$49,000 are almost two times (OR 1.94, p-value (<0.001) more likely to stop driving. For each unit increase in the Can-ALE scale, the odds of ceasing driving rose by 36% (OR 1.36, p-value <0.001). As expected, those with Fair/Poor health were almost 3 times (OR 2.87, <0.001) as likely to stop driving compared to those in Excellent/Very good/Good health. The most common reasons for driving cessation include no longer needing to drive, safety concerns, and physical limitations. This research did not find a significant relationship between driving cessation and life satisfaction.

**Conclusion**: Older adults who have stopped driving are more likely to be women, have lower household incomes, and have poor health. There was not a significant relationship between driving cessation and life satisfaction. This research also did not find a significant relationship between sociodemographic characteristics and the desire to participate in more activities or life satisfaction among those who have stopped driving. Reasons for driving cessation also prove to vary and be multifaceted. In this study, 'no longer needing to' was most commonly reported by women and those with favourable Can-ALE scores. Safety-related reasons were most commonly reported by men. Understanding the reasons for driving cessation can better inform policy, infrastructure, and planning. If we know that older adults living in areas with favourable Can-ALE scores can meet their needs and live well without driving, we can prioritize building ALE-friendly communities that are safe and accessible. These findings are crucial to maintaining and supporting older adults' quality of life in the transition to driving cessation.

## Abstract (French)

**Contexte**: Le transport est un facteur essentiel de la qualité de vie. La plupart des personnes âgées conduisent et préfèrent le faire ; cependant, nombre d'entre elles vivent assez longtemps pour cesser de conduire. L'arrêt de la conduite peut contribuer à améliorer la sécurité des personnes sur la route, mais il peut aussi avoir des conséquences négatives telles que la dépression, la diminution de la participation à des activités, des besoins insatisfaits et l'isolement social. Ces conséquences ont un impact sur la qualité de vie.

**Méthodes**: Cette thèse utilise les données de l'Étude longitudinale canadienne sur le vieillissement (ELCV) pour examiner les raisons de l'arrêt de la conduite et les caractéristiques sociodémographiques associées. Des modèles de régression logistique sont utilisés pour comprendre les relations entre les caractéristiques sociodémographiques, l'état de la conduite, la satisfaction de la vie et le désir de participer à davantage d'activités.

Résultats: Les résultats confirment que la probabilité de ne pas avoir de permis de conduire augmente de manière significative avec l'âge. Par rapport aux personnes âgées de 65 à 74 ans, les personnes âgées de 75 à 84 ans sont 2,77 fois (valeur  $p = \langle 0,001 \rangle$  plus susceptibles de ne plus conduire. Les personnes âgées de plus de 85 ans sont 7,59 fois (valeur p = <0,001) plus susceptibles de ne plus conduire. Les femmes sont presque deux fois plus susceptibles (OR 1,97, p-value <0,001) d'arrêter de conduire que les hommes. Les personnes en couple sont moins susceptibles (OR 0,66, <0,001) d'arrêter de conduire que celles qui ne le sont pas. Les personnes à faible revenu sont également plus susceptibles d'arrêter de conduire à un âge plus avancé. Par rapport aux personnes dont les revenus se situent entre 50 000 et 99 999 dollars, les personnes dont les revenus se situent entre 20 000 et 49 000 dollars sont presque deux fois plus susceptibles (OR 1,94, valeur p (<0,001)) d'arrêter de conduire. Pour chaque unité d'augmentation de l'échelle Can-ALE, la probabilité de cesser de conduire augmente de 36 % (OR 1,36, valeur p <0,001). Comme prévu, les personnes en bonne/mauvaise santé étaient presque trois fois plus susceptibles (OR 2,87, <0,001) d'arrêter de conduire que celles en excellente/très bonne/bonne santé. Les raisons les plus courantes de l'arrêt de la conduite sont le fait de ne plus avoir besoin de conduire, les problèmes de sécurité et les limitations physiques. Cette étude n'a pas mis en évidence de relation significative entre l'arrêt de la conduite et la satisfaction de la vie.

Conclusion: Les résultats concernant l'arrêt de la conduite s'alignent sur ce qui a été trouvé précédemment dans la littérature. Les personnes âgées qui ont arrêté de conduire sont plus susceptibles d'être des femmes, d'avoir un revenu familial plus faible et d'être en mauvaise santé. Il n'y a pas de relation significative entre l'arrêt de la conduite et la satisfaction de la vie. Cette recherche n'a pas non plus trouvé de relation significative entre les caractéristiques sociodémographiques et le désir de participer à davantage d'activités ou la satisfaction de la vie chez les personnes qui ont arrêté de conduire. Les résultats concernant les raisons de l'arrêt de la conduite confirment que les raisons varient et sont multiples. Dans cette étude, le fait de ne plus avoir besoin de conduire a été le plus souvent mentionné par les femmes et les personnes ayant un score Can-ALE favorable. En revanche, les raisons liées à la sécurité ont été le plus souvent évoquées par les hommes. Comprendre les raisons de l'arrêt de la conduite peut permettre de mieux informer les politiques, les infrastructures et la planification. Par exemple, si nous savons que les personnes âgées vivant dans des régions où les scores Can-ALE sont favorables peuvent répondre à leurs besoins et bien vivre sans conduire, nous pouvons donner la priorité à la construction de communautés favorables à l'ALE qui sont sûres et accessibles. Ces résultats sont essentiels pour maintenir et soutenir la qualité de vie des personnes âgées lors de la transition vers l'arrêt de la conduite.

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*Please refer to the Active Living Environments Indices dataset documentation available under the Data section of the CANUE website (<u>www.canue.ca</u>) for additional information.* 

# Contribution of Authors

Victoria Ramirez took the lead in writing the code, performing the statistical analyses, and serving as the primary author of every chapter. Prof. Kevin Manaugh supervised the thesis and made valuable intellectual contributions. He directed my analysis and R code and offered insightful comments that assisted in editing the thesis. Prof. Mylene Riva offered thoughtful comments and suggestions on the thesis.

## Chapter 1: Introduction

Populations across the world are aging. Population aging, or the increasing median age due to declining fertility rates and rising life expectancy, has societal implications, including impacts on labour and financial markets, demand for goods and services, family structures and intergenerational ties (United Nations, 2022). Most countries are experiencing remarkable growth in their older population. It is estimated that by 2030, 1 in 6 people in the world will be 60 years of age or older and that by 2050, this population is expected to grow to 2.1 billion (United Nations, 2022; WHO, 2024). Older adults are diverse and have varying needs as they experience many unique biological changes with age, such as physical and cognitive decline. Along with biological changes, aging is often associated with life transitions and events such as retirement, relocation, and driving cessation (United Nations, 2022). As a result, countries must adapt to ensure their social and health systems can support the aging population.

Following global trends, Canada's 65 and older population is one of the fastest-growing age groups (Statistics Canada, 2022a). As of 2023, almost 20% of the Canadian population is 65 and older (Statistics Canada). By 2036, this demographic is expected to grow to over 25% of Canada's population (Statistics Canada, 2017). Moreover, the population aged 85 and older is growing at unprecedented rates. As of 2022, 2.3% of the population is 85+, and this age group saw a 12% increase from 2016 to 2021 (Statistics Canada, 2022b). Likewise, the centenarian population increased by 16% between 2016 and 2021 (Statistics Canada, 2022b). By 2046, the population aged 85 and older is estimated to triple to almost 2.5 million (Statistics Canada, 2022a).

Estimated increases in older Canadians will have many implications for health care, housing, transportation, and consumption habits. Older adults have increasingly unique needs and become more vulnerable as they age and their health and mobility decline. As more people

are living to 85 and beyond in Canada, there will be increasing pressure on all levels of government to ensure adequate resources and support for healthy aging and quality of life. Challenges will also persist if shortages in the healthcare workforce continue (Statistics Canada, 2022b). Adequate social measures must be implemented to protect this group physically, emotionally, and financially. Ultimately, housing, healthcare, and transportation must be prioritized for older Canadians' healthy aging and favourable quality of life.

While older adults are generally living healthier and higher quality lives, they are mostly excluded from processes and decision-making regarding services and infrastructure that directly affect their lives, such as healthcare and transportation services (D'cruz & Banerjee, 2020; Sin et al., 2021; Watson, 2018). Systematic social, political, and economic exclusion from decision-making arguably prevents people from improving their circumstances (Tauke & Smith, 2020). Age-based discrimination exists across the world and interacts with other forms of discrimination, such as those based on gender, social and economic status, race, ethnicity, and disability (D'cruz & Banerjee, 2020). For example, older adults' healthcare expenses increase as their health declines, yet their financial resources and opportunities to earn income also decline (Luong & Hébert, 2009). Another example is older adults no longer being able to drive and having limited access to alternative transportation options despite their need for mobility to fulfill basic needs such as accessing goods and services. This puts many older adults in a vulnerable position. This study will examine the occurrence of driving cessation, especially the associations with various sociodemographic characteristics.

Transportation is a basic need as it intersects with many critical issues related to healthy aging, including healthcare visits, shopping, social activities, family visits, and feelings of independence. However, transportation infrastructure often fails to be designed to include older

people's needs. There are high rates of automobile dependency in North America, especially among older adults, yet, with age, the ability to drive declines (Cui et al., 2017; Newbold et al., 2005; Schouten et al., 2022). As a result, older people often need more access to the basic need of adequate transportation infrastructure. Given the high rates of automobile dependency due to system design lacking available, affordable, and usable alternatives and the declining ability to drive among older adults, this study focuses on the occurrence of driving cessation and its association with life satisfaction. Transportation is a crucial element related to quality of life and healthy aging among other systems and infrastructures, therefore, it must be inclusive for all user groups.

A key motivation of this study is to understand what policy and built environment features can be prioritized to help older adults live well throughout older age, especially through the transition of driving cessation. Transportation solutions are not one size fits all. It is important to understand what built environment features, especially as they relate to transportation, may impact driving cessation. Examples of these features may include density, accessibility, and walkability. Understanding the built environment features associated with driving cessation can help urban and transportation planners prioritize features in communities to support older adults' quality of life and meet their needs even when they stop driving.

## 1.1 Research Objectives

This thesis analyzes driving cessation among older adults in Canada. It highlights the differences between current and former drivers and key associations between driving cessation and various sociodemographic characteristics. It explores the relationships between driving cessation, built environment features, activity participation, and life satisfaction. Given the limited research on the connection between driving cessation and life satisfaction among older Canadians, this thesis aims to fill a critical gap in the literature. The findings will enhance our

understanding of transportation-related challenges faced by older Canadians and how they impact their life satisfaction. It will also provide valuable insights to inform policies and improvements in transportation infrastructure and the built environment to support the aging Canadian population.

## 1.2 Research Questions

This thesis will explore how driving status and reasons for driving cessation vary among older Canadians. It will also explore how the built environment impacts driving cessation. Lastly, it will explore how driving cessation impacts older Canadians' satisfaction with life and desire for more activity participation. I will answer the following questions:

- 1. What are the reasons for driving cessation among older Canadians?
- 2. Among the older Canadian population, how do current and former drivers vary by sociodemographic characteristics? And, how does driving cessation impact older Canadians' life satisfaction and desire for more activity participation?
- 3. What is the association between the built environment (especially as it relates to density, accessibility, and walkability) and driving cessation among older Canadians?

## 1.3 Hypotheses

Based on previous findings in the literature, my hypotheses for this study are as follows:

- Common reasons for driving cessation include physical and medical conditions, vision problems, and financial concerns.
- 2. Driving cessation is more likely among women, individuals with lower incomes, those reporting poorer health, and retired individuals.
- 3. Driving cessation is less likely among those with religious affiliation.
- Driving cessation negatively affects life satisfaction and positively impacts the desire for more activity participation.

5. Those living in environments that support active living will be likelier to cease driving.

In the following chapters, I review the literature related to my research questions, focusing on key concepts within the broad topics of transportation and quality of life, particularly in the context of driving cessation and life satisfaction among older adults in Canada. I explore the sociodemographic characteristics, consequences, and decision-making processes associated with driving cessation. Following the literature review, I describe the data and methods used in this study, including a discussion of their limitations. Finally, I conclude by presenting the research results and discussing their implications, and potential directions for future research.

## Chapter 2: Literature Review

This section presents key findings from the literature on transportation and quality of life among the aging population. The findings contextualize what is known about driving cessation and life satisfaction among older adults.

## 2.1 Transportation

As individuals age, they are more likely to experience limited mobility and transportation options due to health-related and psychosocial functional limitations (Turcotte, 2012). Transportation and mobility are a predominant component of achieving instrumental activities of daily living (IADLs), which directly influence quality of life (Fricke & Unsworth, 2001; Oxley & Whelan, 2008; Patterson et al., 2019; Tomioka & Hosoi, 2017). Moreover, transportation plays integral roles in accessing goods and services, employment, and social activities that are often spatially dispersed but are critical components of health and well-being (Dickerson et al., 2007; Oxley & Whelan, 2008; Patterson et al., 2019). Oxley and Whelan (2008) found that mobility is crucial to quality of life as it is a means to help maintain independence, a positive psychological outlook, and overall well-being. Adequate transportation contributes to these outcomes by facilitating independence and enabling social and familial visits, which have significant psychological and physiological benefits.

Transportation and travel behaviour refer to the decisions related to how, when, where, and with whom one travels and the motivations of those choices (Mao, 2023). Transportation behaviour can be predicted by sociodemographic characteristics and often changes throughout one's life. For example, a study by Newbold et al. (2005) reported that older Canadians generally make fewer daily trips, and their trips are shorter in duration than their younger counterparts. Moreover, the proportion of trips for work-related reasons declines significantly with age, while trips associated with goods and services, entertainment, and religious and volunteer

organizations increase. Research also shows that cognitive, psychosocial, environmental, and financial factors influence transportation behaviour, which are critical issues in older age (Webber et al., 2010). For example, many neighbourhoods throughout Canada are designed for driving as the primary form of transportation, compelling older adults to rely on personal vehicles for activities (Hansen et al., 2020 & Turcotte, 2012). At the same time, older adults have fewer opportunities to work or are retired, often living on lower and fixed incomes (Statistics Canada, 2023). As a result, they may struggle to afford to maintain a car and the other costs associated with driving may be unable to meet their needs.

It is estimated that three-quarters of adults aged 65 and older hold a driver's license and that driving a car is a primary mode of transportation (Raina et al., 2018). The CLSA reported that driving a motor vehicle is the most common form of transportation for older Canadians, regardless of age, sex, geographic location, health, or functional status (Raina et al., 2018). Few older Canadians use public transit, and accessible transit use is rare before the age of 85 (Turcotte, 2012). Newbold et al. (2005) confirmed that older adults take fewer trips overall and travel for different reasons than their younger counterparts in the workforce. Yet, the study demonstrated that older adults' reliance on driving their private automobiles was no less significant than that of those in the workforce as the number of trips older drivers take by car increased over the study as they aged compared to alternative modes.

According to Kim (2011), being a car passenger was the most common mode of transportation for adults even after they stopped driving. For many, driving a car symbolizes personal freedom and independence and contributes to overall quality of life (Edwards et al., 2009; Newbold et al., 2005). In a study with 1,000 Canadian participants, Hassan et al. (2022) highlighted that older adults' ability to drive and drive alone directly affected their satisfaction

with everyday mobility. Based on older adults' dependence on driving and preference to fulfill needs and carry out daily living activities, we see an association between driving and quality of life.

Whether driving should continue throughout old age is a topic of debate in the literature. While driving offers significant mobility and health benefits, it also raises safety concerns. Older adults may prefer to drive and are generally safe drivers, but as they age, they can pose greater risk to themselves and others on the road. For example, death rates and severity of their injuries are disproportionately higher compared to younger drivers because of increased frailty in older age (Dobbs, 2008).Many older drivers begin to self-regulate their driving to avoid unsafe situations and pose less risk, but this can worsen matters as their skills and confidence behind the wheel decline (Charlton et al., 2003; Connell et al., 2013; Feng et al., 2020 & Stinchcombe et al., 2024). Essentially, there are benefits and risks associated with adults driving throughout old age.

Oxley and Whelan (2008) conducted a systematic literature review to address the issues associated with older adults' transportation and mobility needs, advocating the importance of keeping older adults on the road. Their review provides clear evidence that, for older adults who cease driving, quality of life is reduced, among other adverse consequences of poor mobility. They reported that mobility and driving status are crucial to quality of life in terms of maintaining physical and psychological health and social networks. They also established that poor mobility burdens the individual, family, and societal level with consequences that may outweigh the risk of harm from traffic crashes. Understanding older adults' transportation needs and supporting their mobility is essential. Their study also presented evidence that subgroups of older adults, such as women and those who struggle financially, are more likely to suffer more pronounced consequences. Ultimately, it is well established in the literature that adequate

transportation is crucial to health and well-being (Banister & Bowling, 2004; Owsley, 2002; Oxley & Whelan, 2008).

### 2.6 Driving Cessation

For many older adults, driving cessation is inevitable. Driving cessation is generally when drivers start self-regulating their driving, eventually changing their driving status completely. Studies find that, on average, older drivers will live 6 to 10 years after they cease driving (Babulal et al., 2019 & Foley et al., 2002). According to Babulal et al. (2019), many older drivers expect to stop driving before the end of their life. Typically, driving cessation leads to older adults relying on transportation alternatives such as receiving rides from others and public, active, and accessible transit or motorized mobility aids.

## 2.6.1 The Driving Cessation Debate

While much of the existing literature highlights the hazards and safety concerns associated with older adults continuing to drive, recent studies explore the benefits of allowing older adults to maintain their driving license, especially in auto-dependent environments (Curl et al., 2014; Edwards et al., 2009; Janushewski, 2014; Oxley & Whelan, 2008). In these contexts, the detrimental consequences of relinquishing driving may outweigh the perceived benefits.

Driving safety among older adults has been a public health concern (Wang et al., 2003). While most older adults are generally safe drivers, they suffer a disproportionately high rate of motor vehicle fatalities compared to other adult drivers, as they have an increased crash rate and an increased risk of fatality (Transport Canada, 2021; Wang et al., 2003). These factors are commonly influenced by medical conditions, medications, and functional impairments in this age group (Hill et al., 2020; Statistics Canada, 2022a; Wang et al., 2003). For example, vision changes, the ability to reason and remember, and some diseases and medications can affect driving ability. Older adults, particularly those 65 and older, often use more medication than

younger populations (National Institute on Aging, 2022). Hill et al. (2020) found that medication use among older adults was linked to increased unsafe driving behaviours, such as speeding, rapid deceleration, and other unsafe mechanisms, maneuvering, and techniques, for example, avoiding left-hand turns across oncoming traffic. Older adults also tend to experience vision impairment, one of the most common age-related conditions (Horowitz, 2004). Wood and Black (2016) demonstrate that driving ability and safety are negatively affected by ocular diseases such as cataracts, glaucoma, age-related macular degeneration, hemianopia, and diabetic retinopathy. Luckily, seeking treatment can positively impact a range of these vision issues.

Managing the balance between safety concerns and the autonomy associated with driving is a growing challenge. While driving in older age poses risks, the literature also investigates the dangers of driving cessation and unmet needs due to transportation limitations among older adults. Driving cessation and other circumstances can lead to unmet transportation needs or an inability to fulfill the needs associated with various trips and activities (Luiu et al., 2017). Many older adults view driving as a mark of independence, which is recognized as vital to health and quality of life (Edwards et al., 2009; Newbold et al., 2005). For many older individuals, access to a private automobile and a driver's license has been linked to health benefits associated with higher rates of social participation and community engagement (Turcotte, 2018). For these reasons, research suggests that doctors and medical advisors take extra caution when making recommendations related to driving (Betz et al., 2013; Carr, 2004).

#### 2.6.5 The predictors of driving cessation

Driving cessation is a complex process not explained by one factor alone (Dellinger et al., 2001; Dugan et al., 2013). Influences on older adults' travel behaviour and driving cessation include age, gender, income, health issues, transport availability, and other sociodemographic characteristics and built environment factors (Anstey et al., 2001; Asse et al., 2014; 2005;

Edwards et al., 2009; Hassan et al., 2022; Wasfia et al., 2011; Wood et al., 2023). In this study, I review the factors that impact older adults' travel behaviour, such as sociodemographic characteristics, health, transport availability, and the built environment.

Driving cessation is associated with various sociodemographic characteristics. Compared with current drivers, the consensus in the literature is that former drivers are generally older, have lower incomes, have higher levels of education, live with others, and are more likely to be women (Anstey et al., 2001; Asse et al., 2014; Edwards et al., 2008; Liddle et al., 2014). Ragland et al. (2005) found that former drivers are also more likely to be widowed. According to Qin et al. (2020), living in an urban area also strongly predicted driving cessation in older age. Literature also notes that there are various health factors associated with driving cessation, such as disease, vision problems, neurological disorders, pain, multiple medical conditions, or taking multiple medications related to driving status in older adults (Anstey et al., 2001; Anstey et al., 2006; Al-Hassani & Alotaibi, 2014; Asse et al., 2014; Kline & Wenchen, 2005; Shimada et al., 2016; Qin et al., 2020; Wood & Black, 2016). Edwards et al. (2008) examined older drivers' physical, visual, health, and cognitive abilities as potential predictors of driving cessation. Edwards et al. (2009) used longitudinal data to examine the risk of cessation as a function of demographic, physical, and cognitive predictors. Their study contributed to existing research that cognition is a more salient predictor of driving cessation than physical performance. Ultimately, their model indicated three significant predictors of driving cessation: older age at baseline, number of days driven per week, and slower cognitive processing speed. In another study, Anstey et al. (2005) highlighted that subjective feelings of health and well-being may be more influential than the objective experience of chronic medical conditions and sensory impairment

in predicting positive outcomes for maintaining driving in old age. Ultimately, there are many characteristics associated with driving cessation.

#### 2.6.2 The reasons for driving cessation

There are numerous reasons for older adults to stop driving. Health-related reasons are dominant as physical mobility, vision, and cognition decline with age (Dellinger et al., 2001; Maliheh et al., 2023; Pellichero et al., 2021; Ragland et al., 2004). A recent review by Maliheh et al. (2023) investigating noncognitive reasons for driving cessation found that reasons fell into six main categories: physical health, psychological health, interpersonal influence, transportation support, policies, and sociodemographic characteristics. Ragland et al. (2004) found that among 2,046 Californians, problems with eyesight were by far the most cited among medical reasons for limiting and avoiding driving. Driving cessation is also often influenced by safety concerns for the driver and others on the road. Ragland et al.'s (2004) study also noted that among nonmedical reasons, being concerned about crashes while driving was often reported by participants. Studies have also concluded that finances play a role in the decision-making process of driving cessation (Choi et al., 2012; Vivoda et al., 2020). According to a study by Choi et al. (2012), nearly 15% of participants reported financial difficulty as their main reason for driving cessation, especially the costs associated with owning and maintaining a car and insurance. These findings suggest that older adults with limited income or financial resources may stop driving regardless of their mobility needs or physical functioning. Driving cessation is a personal experience and can be involuntary or voluntary. Interestingly, Malileh et al. (2023) discovered that those who voluntarily stop driving are not necessarily in poorer health conditions than current drivers. Ultimately, while health is a common predictor for driving cessation, there are various reasons older adults stop driving.

In a Canadian study with around 100 participants, Patterson et al. (2019) reported that reasons for driving cessation included advice from their doctor, a driving-related crash, age, moving to an urban area, and the cost of gas and insurance. Hassan et al. (2022) studied the perceived reasons for driving cessation compared to the actual ones among 1,000 older adults across Ontario. Participants were asked to rate the importance of various factors influencing one's decision to stop driving. Current drivers responded that the most common factors that might affect older adults' decision to stop driving were a doctor's recommendation, inability to complete license renewal requirements, and physical condition or limitations. Participants who indicated that they already ceased driving reported that the most critical factors that affected their decision to stop driving were safety and the cost of gas and upkeep of the car being too expensive. One of the lowest factors of driving cessation reported by former drivers was someone else advising them to stop. These findings show that anticipated reasons for driving cessation, such as health status, may not align with actual reasons for driving cessation among older adults. In their study, Hassan et al. (2022) highlight the importance of safety and financialrelated implementations, arguing that addressing these concerns could allow older adults to continue driving safely if they are still physically able.

Ultimately, driving cessation can happen voluntarily or involuntarily, over time or abruptly. Therefore, older adults should plan for such an event (Betz et al., 2014 & Hassan et al., 2022; Hansen et al., 2020). Some studies explore the influences on older adults' driving cessation decision-making process. Studies show that friends and peers heavily influence decision-making, but family intervention is more common among those with medical conditions (Betz et al., 2013 & Seiler et al., 2012).

#### 2.6.3 Outcomes

While the reasons for driving cessation can be diverse, research shows that driving cessation is associated with increased feelings of dependence, depression, social isolation, and unmet needs (Kerschner & Silverstein, 2016).

When older people cannot drive, fulfilling their needs is difficult. Basic survival needs are difficult to meet without adequate transportation and being unable to drive in car-centric environments. In Musselwhite and Haddad's study (2010), older participants note the significance of fulfilling such needs using their car as it can minimize walking and carrying heavy shopping items. This study also points out that feelings of independence and control over one's life are difficult to achieve once a person stops driving. Without the ability to pick up the keys and go, there are feelings of dependence and depression (Chihuri et al., 2016 & Hwang & Hong, 2018). It is also worth noting that driving a car can represent some people's social and financial status. Once older adults stop driving, they often lose identity and social acceptance (Musselwhite & Haddad, 2010). Musselwhite and Haddad's study (2010) also focused on aesthetic needs or the search and appreciation for beauty via driving. Participants' needs were largely unmet among those who had given up driving, except when their family or friends took them to the countryside or sea. Beyond that, participants were generally reluctant to request leisure trips, such as scenic drives. Furthermore, bus routes and underground railways are not oriented toward viewing natural scenery, leaving aesthetic needs to remain unmet even when these modes are used. Ultimately, findings in the literature highlight that transportation is vital for fulfilling basic needs through goods and services, social interaction, a sense of independence and control, exercising cognitive skills, and exploring natural and scenic environments. While basic needs can be fulfilled without driving, fulfilling emotional and aesthetic needs without driving is increasingly complex, and these unmet needs have consequences.

The consequences of driving cessation are largely negative. The consequences of driving cessation are physical and psychosocial encompassing themes of decreased QoL (Stinchcombe et al., 2021), such as elevated rates of depression (Liddle et al., 2014), diminished engagement in out-of-home activities (Liddle et al., 2011), heightened social isolation and loneliness, perceived loss of independence and quality of life, compromised health status, reduced self-care capabilities, cognitive decline (Chihuri et al., 2016), limited access to healthcare, and diminished emotional well-being (Choi et al., 2012 Edwards et al., 2009; 2012; Kostyniuk & Shope, 2003; Mezuk & Rebok, 2008; Qin et al., 2020; Schouten et al., 2022). Driving cessation is also associated with fewer social roles and more time spent in solitary leisure activities (Liddle et al., 2011). Furthermore, driving cessation can increase stress and worry about relying on others for rides (Mullen et al., 2017). It can also result in a lack of freedom (Sanford et al., 2019). In a Canadian study looking at perceptions of driving cessation, participants perceived driving cessation as a loss of control and independence and an event that would lead to isolation and dependency on others (Stinchcombe et al. 2019).

## 2.6.4 Health outcomes

While health issues can lead to driving cessation, there is growing evidence that giving up driving can itself contribute to various health problems and a general decline in well-being in older adults (Chihuri et al., 2016; O'Connor et al., 2013; Edwards et al., 2009). In a review of 16 various cohort, cross-sectional, and case-control studies examining the effects of driving cessation on subsequent health and well-being in older adults, Chihuri et al. (2016) reported that driving cessation was generally associated with physical, social, and cognitive function and general health declines. In their meta-analysis, Chihuri et al. (2016) also established that the association between driving cessation and poor physical functioning was strong in longitudinal studies, even after adjusting for sociodemographic factors and baseline health. In a study by

Edwards et al. (2009), there was a rapid decline in general health trajectory among adults aged 65 and older after driving cessation. Similarly, Choi et al. (2012) found that former drivers had faster cognitive decline over ten years than active drivers, even after controlling for baseline cognitive function and general health. Chihuri et al. (2016) also established that significant risks of depressive symptoms, admission to long-term care facilities, and mortality are associated with driving cessation.

#### 2.6.4.1 Depression

There is mounting evidence that driving cessation is associated with increased depressive symptoms (Al-Hassani & Alotaibi, 2014; Edwards et al., 2009; Fonda et al., 2001; Marottoli et al., 1997; Liddle et al., 2014; Missell-Gray & Simning, 2024; Ragland et al., 2005; Windsor et al., 2007). In a longitudinal study using the Center for Epidemiological Studies Depression Scale by Fonda et al. (2001), respondents who stopped driving had a more significant risk of worsening depressive symptoms over time compared to those who reduced or continued driving. In another longitudinal analysis using the same scale, Ragland et al. (2005) compared the depression scores of 42 participants who stopped driving to the 1,419 participants who continued to drive. Depression scores were higher in former drivers, while current drivers had virtually no change after controlling for changes in health status and cognitive function. Interestingly, Windsor et al. (2007) found a corresponding decrease in the sense of control, partly explaining the association between depressive symptoms and driving cessation. Using the Center for Epidemiologic Studies Scale, Chihuri et al. (2016) found that driving cessation nearly doubled the risk of more significant depressive symptoms in older adults across one Australian and four American studies.

#### 2.6.4.2 Activity

The importance of maintaining an active and engaged lifestyle for physical and mental health has been well studied. Historically, research has focused on the impacts of physical activity on quality of life (Marsillas et al., 2017). However, examining many types of activities is essential when investigating the relationship between older adults' activity engagement and quality of life. Activity participation and social engagement have been associated with quality of life, especially later in life (Baeriswyl & Oris, 2023; Bertelli-Costa & Neri, 2021; Bevil et al., 1994; Herzog et al., 2002; Jang et al., 2004; Li & Loo, 2017; Marsillas et al., 2017; Steinkamp & Kelly, 1987). A study by Marsillas et al. (2017) observed that active aging, or aging physically, socially, economically, and culturally active and productive, positively impacted older adults' life satisfaction. Maier and Klumb (2005) also identified that time spent with friends increases the odds of survival in individuals aged 70 and older. Moreover, a study by Ponce et al. (2014) with 31,428 older adult participants showed that subjective well-being is dependent on active participation in social life.

Baeriswyl and Oris (2021) used 12 variables to capture various activities when examining the associations between social participation and individual life satisfaction among older adults. Consistent with the literature, they observed that social participation is essential for life satisfaction. Additionally, multi-activity participation is positively associated with life satisfaction. They conclude that having rich and varied social participation is associated with higher life satisfaction, consistent with previous findings (Bevil et al., 1994). Ultimately, they established that social participation is a more critical for life satisfaction than the area of residence, age, having a partner, and working.

## 2.6.4.3 Impact of driving cessation on activity

Driving can be a crucial facilitator of social engagement and activity participation. Conversely, driving cessation can drastically reduce older adults' out-of-home activity and social engagement (Curl et al., 2014; Edwards et al., 2009; Mezuk & Rebok, 2008; Pellichero et al., 2021). Marottoli et al. (2000) identified a strong association between driving cessation and decreased older adults' out-of-home activity levels in older adults, even after adjusting for health-related and sociodemographic factors. As a result, driving cessation can put older adults at risk for social isolation. In a longitudinal study over six years, Qin et al. (2020) reported that those who had stopped driving within the last year had a persistent two-fold higher risk of social isolation compared with those driving. Curl et al. (2014) also used longitudinal data to examine the impact of driving cessation on older adults' productive and social engagement. In this study, the likelihood of formal and informal volunteering dropped by 68% and 70%, respectively, after individuals reported no longer driving. Ultimately, their results revealed that social engagement and formal volunteering declined more sharply over time for former drivers than current drivers while controlling for health and related factors. A study by Pachana et al. (2016) investigating the relationship between driving cessation and social engagement among older Australian women confirmed driving cessation to harm women's mental health, which was consistent with previous research. According to their study, women who remained socially active after driving cessation had better mental health. Their findings confirm the importance of social engagement and activity participation for mental health, especially after adults stop driving at an older age.

Older adults face challenges and barriers after driving cessation, especially while maintaining leisurely activity participation and social engagement. A longitudinal study by Pellichero et al. (2021) examined the barriers and facilitators to social engagement and activity participation among older adults after driving cessation. Their study showed that planning and

anticipating driving cessation is crucial in maintaining social participation. They also observed that planning for driving cessation and a history of diverse mobility habits, such as public transit use, facilitated the maintenance of social participation among older adults who no longer drive.

#### 2.6.6 Planning for driving cessation

Driving cessation is common in old age, yet studies show that few plan for or prepare for the event (Betz et al., 2013; Feng & Meuleners, 2020; Mullen et al., 2017). Driving is a crucial activity of daily living (ADL). If one cannot fulfill this critical activity, it will significantly impact one's daily living. Therefore, one should proactively plan for the day they can no longer fulfill this critical activity. There is limited research regarding the planning of driving cessation. Dickerson et al.'s (2019) analysis regarding the research on planning for driving cessation confirmed that although there has been progress in work supporting the transition process of nondriving, there are still many knowledge gaps. Existing research points to the benefits of planning for driving cessation, yet many older adults do not (Hansen et al., 2020). Evidence also suggests that education-based interventions can support older adults in the driving cessation process (Liddle et al., 2014; Mullen et al., 2017). Oxley and Fildes (2000) created a handbook to assist a smooth transition from driving, which focused on providing information about driving, particularly the issues of when and how to retire, and aimed to provide current information on alternative transport and mobility options for older drivers. Anecdotal evidence shows that older drivers find the information helpful in alleviating some mobility consequences of driving cessation (Oxley & Whelan, 2008).

While research regarding planning for driving cessation is limited, it is generally agreed upon that anticipation and planning for stopping driving are important parts of the driving cessation process (Betz et al., 2014; Dickerson et al., 2007; Hansen et al., 2020; Liddle et al., 2014; Mullen et al., 2017; Oxley et al., 2008). According to Hansen et al. (2020), very few older

adults who are still driving make plans for when they may no longer drive. Meanwhile, some former drivers did not consider the reality of being unable to drive in later life. Many studies have established that older adults are reluctant to engage in planning for driving cessation because they are aware of potentially harmful outcomes and lack readiness for the change (Liddle et al., 2014). Mullen et al. (2017) also established that many older adults negatively perceive driving cessation. Their study also showed few discrepancies between older adults' anticipations of driving cessation and the actual experience of driving cessation. According to their study, highlighting some of the positive impacts experienced by former drivers, such as spending more time with friends and family or those who are giving them rides, can increase peace of mind related to safety and improve the transition experience.

## 2.1 Quality of Life

Quality of life (QoL) conceptually captures the subjective well-being of individuals or population groups, including both positive and negative elements (Teoli & Bhardwaj, 2024). According to Teoli and Bhardwaj (2024), critical indicators of QoL include health, relationships, education, work, environment, social engagement, wealth, a sense of security and safety, freedom, autonomy, decision-making, and belonging. Typically, in older age, there is a strong influence from health, family, and finances (Martinez-Martin et al., 2012). Some studies show that depression, functional dependence, mobility, and social support have the most significant influence on QoL for older generations (Bechtold et al., 2021; Prieto-Flores et al., 2011; Seymour et al., 2008; Richard et al., 2005; Sováiová Soósová, 2016). In the Canadian context, Richard et al. (2005) uncovered that the most salient factors related to the quality of life for older adults included health, services, independence, accessibility, decision-making power, and social integration. They also identified loneliness, isolation, and the loss of loved ones as having a

determinantal effect on older Canadian's QoL. On the flip side, they reported that feelings of social integration and participation in social activities improved QoL.

Transportation provides the predominant means for predicting QoL, including health, independence, accessibility, activity participation, social integration, and connectedness. For older adults in Canada, driving is the most common form of transportation (Raina et al., 2018). Evidence shows that driving cessation among older adults impacts QoL (Patterson et al., 2019). In this thesis, I focus on the life satisfaction domain of QoL and its relationship with driving cessation.

#### 2.2 Life Satisfaction

Diener, Emmons, Larsen, and Griffin (1984) defined life satisfaction as people's subjective evaluation of their lives in favourable terms. More specifically, life satisfaction is the judgmental or cognitive component of subjective well-being and QoL, determining whether one is satisfied with life (Diener et al., 1984). Life satisfaction typically relies on the respondents' standards of a good life. There can be many influences on life satisfaction.

Empirical evidence indicates that satisfaction with life has beneficial social, physical, and mental health outcomes (Kim et al., 2021; Pavot & Diener, 2008). Kim et al. (2021) evaluated whether positive change in life satisfaction was associated with better outcomes on 35 physical, behavioural, and psychosocial health and well-being indicators. Among a nationally representative study of 12,998 US participants aged 50 and older, they found that participants who reported the highest life satisfaction had better subsequent outcomes on physical health indicators, including lower risk of pain, physical functioning limitations, and mortality; lower number of chronic conditions; and higher self-rated health. They also reported better outcomes across psychosocial factors, including optimism, purpose in life, financial mastery, and lower loneliness and depression.

At the same time, lower levels of life satisfaction increase the risk of poor mental health, especially depression (Headey et al., 1993; Koivumaa-Honkanen et al., 2001; Lee et al., 2020; Melo et al., 2022). According to Michalski et al. (2022), poorer life satisfaction is associated with future mental health-related healthcare visits in hospitals, emergency departments, and outpatient settings among a provincially representative sample of 131,809 Ontarian adults. Ultimately, research indicates that prioritizing higher life satisfaction yields positive life outcomes, whereas neglecting this can lead to adverse consequences.

Evidence consistently shows that Canadians generally report high life satisfaction (Branch-Allen & Jayachandran, 2016; Raina et al., 2018). Studies also show that when compared to other age groups, older Canadians have higher average life satisfaction than their younger counterparts (St. John et al., 2021; Uppal & Barayandema, 2018). While older adults in Canada are generally satisfied with life, many unique life events and transitions happen in older age, such as retirement and driving cessation, that can impact life satisfaction. Understanding the impacts of these unique life events and transitions is important, especially their impact on life satisfaction.

Several measures and scales of life satisfaction exist. A renowned measure of life satisfaction is the Satisfaction with Life Scale (SWLS), introduced by Diener, Emmons, Larsen, and Griffin in 1985. The SWLS was developed to measure respondent's holistic, subjective life satisfaction (Diener et al., 1985). This scale allows subjects to assess their satisfaction individually through personal life domains according to their values rather than through specific life domains such as health or finances. The SWLS has been tested as a valid and reliable measure of life satisfaction and is suited for various applications and age groups, including subgroups and small geographies (Diener, 1985; Magyar-Moe, 2009). One part of the scale

critiqued is the fifth statement, "If I could live my life over, I would change almost nothing." It has been suggested that the fifth statement has a weaker association with life satisfaction and causes participants to reflect on the desire to change rather than their current satisfaction with life (Pavot & Diener, 1993).

#### 2.2.2 Predictors of Life Satisfaction

There are many predictors of life satisfaction. A Canadian study by Branch-Allen and Jayachandran (2016) with a sample of 19,597 participants across all ages found that respondents reported higher life satisfaction if they were female, younger, married, from high socioeconomic status backgrounds, born in Canada, religious, and demonstrated high levels of neighbourhood interaction. Similarly, the respondents of this study had more satisfaction with life if they had better health, social contact, a greater sense of belonging to their community, more leisure and volunteer activities, and more time with family and friends. The study concluded that being healthy, Canadian-born, participating in spiritual and leisure activities, volunteering, and living in an urban city with a good job contributes to greater life satisfaction. In the Canadian Longitudinal Study on Aging, Raina et al. (2018) reported that most participants from the baseline felt satisfied with life, while only 4.9% of participants reported dissatisfaction.

Results from Raina et al. (2018) concluded that loneliness is linked to lower life satisfaction. Those who reported being lonely at least some of the time reported lower life satisfaction than those who reported being rarely or never lonely. They also shoeed an association between a desire to engage in more activities and lower levels of life satisfaction, regardless of age or sex. In another cross-sectional analysis of the CLSA baseline data, St. John et al. (2021) established that urban-rural differences, income, age, sex, and chronic conditions influenced life satisfaction. They also suggest that other related factors to older adults' life

satisfaction include social engagement, relationships, economic stability, population density, and an established sense of community.

## 2.6.4.4 Driving Cessation and Life Satisfaction

Given the associations related to driving cessation, those who stop driving may be less satisfied with life. A study based in South Korea found that after adjusting for demographic and health-related variables, older adults who ceased driving had lower life satisfaction compared to their counterparts who were still driving (coef. = -1.39, p-value = 0.018) (Kim et al., 2021). According to Liddle et al. (2011), driving cessation is associated with lower life satisfaction in the Australian context. Furthermore, former drivers were less likely to participate in volunteer work and family member roles and spent less time away from home and more time in solitary leisure (Liddle et al., 2011). Research should expand the literature on driving cessation and its impacts on quality of life in the Canadian context.

More research is needed in the Canadian context regarding the relationship between older adults driving status and life satisfaction. Liddle et al. (2011) conducted a cross-sectional study of 234 older people residing in Australia to understand the impact of driving status on older adults' life satisfaction. When comparing current to former drivers, former drivers reported significantly lower life satisfaction, even while controlling for sociodemographic factors such as health status, activities of daily living, gender, age, and living situation. Moreover, former drivers spent less time on social activities, away from home, and more time in solitary leisure.

## 2.4 Inclusion of Sociodemographic Characteristics

Transportation behaviour and life satisfaction are complex and not explained by one factor. Factors such as age, gender, and income affect both transportation behaviour and life satisfaction. Given that many factors can influence driving cessation and life satisfaction and that research regarding such social issues should prioritize equity, the inclusion of sociodemographic

variables analyzed in this thesis is inspired by Evan and Brown's PROGRESS framework (2023). This section details the association of variables from the PROGRESS framework.

## 2.4.1 Place of Residence

Place of residence is an essential determinant of driving cessation and life satisfaction (Hansen et al., 2020; Hwang & Hong, 2018; Jamal & Newbold, 2020; Johnson, 2002; Patterson et al., 2019; St. John et al., 2021; Yang et al., 2018). Place of residence can refer to country, province, or region; dwelling type and living situation; and rural or urban settings (O'Neill et al., 2014). These factors impact the availability and accessibility of services, social relations and economic status, which can impact travel behaviour and life satisfaction (Statistics Canada, 2022a; Biagi & Meleddu, 2023; Burger et al., 2020).

Living alone is common among older adults. In Canada, one-person private household dwellers represented 42% of all people aged 85 and older compared with 7% of people aged 20 to 24. The rise of one-person households despite the economic downturn and housing affordability issues is thought to be due to population aging. Anstey et al. (2006) examined coresident status, whether an individual lives alone versus with another person in their household, as a predictor of driving cessation within the Australian Longitudinal Study of Aging, finding that co-resident status became significantly associated with driving cessation after three years. D'Ambrosio et al. (2008) found that women who lived alone were less likely to self-regulate their driving in older age. Those living alone may have to rely on themselves for transportation compared to those who live with others. Additionally, those living alone may not have less social contact than those living with others. As a result, living alone may increase the perceived value of driving as it can provide social interaction, and solo dwellers may be less willing to selfregulate or cease driving.

Older adults' travel behaviour is also significantly influenced by their setting. For example, some settings are denser and more walkable than others. Most older Canadians live in metropolitan areas (Channer et al., 2021; Turcotte, 2012), but those living in less walkable and lower-density neighborhoods often face greater challenges in maintaining mobility as they age. In such areas, public transit options may be limited, requiring older adults to rely more heavily on personal vehicles to meet their daily needs (Stinchcombe, 2021 & Breen, 2012). As a result, older adults in rural areas commonly must travel greater distances to reach services and are less likely to have alternatives for driving, making them more car-dependent (Giménez-Nadal et al., 2024; Hildebrand et al., 2004; Raina et al., 2018). Levels of accessibility and services differ in urban and rural contexts. For example, rural areas need help building and maintaining public transit services (Stinchcombe, 2021 & Breen, 2012). Services in rural areas also tend to be less accessible via walking and research shows that older adults in rural settings are at a higher risk of low activity participation and transport-related social exclusion (Preston & Rajé, 2007; Shergold and Parkhurst, 2012). In a study by Strogatz et al. (2020), older adults in rural areas reported that driving is more critical due to the lack of available transportation alternatives and less accessible services than their urban counterparts. Ultimately, older adults in rural Canada are more dependent on meeting their needs by car than their urban dwellers (Hanson & Hildebrand, 2011; Hildebrand et al., 2004; Raina et al., 2018).

Conversely, urban living typically offers higher density and accessibility via public transit, walking, and cycling, which influences travel behaviour. In studying the mobility patterns of older adults in 10 developed countries, Giménez-Nadal et al. (2022) found that compared to their rural counterparts, older non-working adults in Canadian urban areas spend more leisure time and less time on housework-related trips. While these urban dwellers generally have more

access to alternative and public forms of transportation, they still reported that medical-related trips were difficult to make without driving. In addition to medical trips, they reported difficulty finding alternative transportation options for personal errands and shopping. On the other hand, they noted that work-related, entertainment and social trips would not be a problem if they did not have access to a vehicle; however, this could reflect the lack of necessity of these trips within this demographic. Overall, older adults in rural Canadian areas are more dependent on cars and driving than people living in urban areas, which may influence their satisfaction with life once they cease driving.

In Canada, many aged 85 and older move to downtown centers (Statistics Canada, 2022a). This is likely because more amenities and services, such as public transportation, hospitals, long-term care, and other dwelling options, are available (Statistics Canada, 2022a). A study by Cheng et al. (2019) found that moving to urban areas increased the use of active travel (walking and cycling) and public transit among older adults. It is also suggested that urban living can improve attitudes towards active transportation modes, creating a positive reinforcement effect, especially for leisure trips (Cheng et al., 2019). Life satisfaction also varies by the density and accessibility of living environments. While urban areas offer advantages like higher income, better education rates, and accessible services, urban residents often report lower life satisfaction compared to rural areas (Helliwell et al., 2015; Helliwell et al., 2019; Lu et al., 2015; St. John, 2021). Overall, we see significant differences in transportation behaviours, driving cessation, and life satisfaction among older adults between urban and rural residents in Canada. For these reasons, when investigating the impacts of driving cessation, it is important to consider urban and rural settings, specifically the features that differentiate these environments, such as density, accessibility, and walkability.

### 2.4.2 Race, Ethnicity, Culture and Language

As Canada's population grows, it is becoming increasingly diverse. Statistics Canada (2022b) projects that by 2041, half of Canadians will be immigrants or their Canadian-born children. The proportion of racialized individuals among those aged 65 and older is expected to increase the most. With these demographic shifts, understanding how race and ethnicity impact older adults' experiences, health, and quality of life becomes crucial. Despite Canada's diversity, racial discrimination remains prevalent, with recent data showing higher discrimination rates among Black and Indigenous people compared to previous years (Statistics Canada, 2022b; Cotter, 2019; Godley, 2018). Discrimination affects various aspects of life, including psychological health and social functioning (Broman, 1997; Cénat et al., 2021; Utsey et al., 2002). For example, Black individuals in predominantly white schools report higher life satisfaction compared to those in predominantly Black or mixed-race schools (Broman, 1997).

Studies show that women and ethnic minorities are more likely to be non-drivers or former drivers than their White counterparts, even with similar functioning levels (Babulal et al., 2018; Choi et al., 2012; Mezuk & Rebok, 2008). Older Black people, in particular, are less likely to drive than older White people (Choi & Mezuk, 2013; Mann et al., 2005), and racial disparities in driving cessation increase with age (Choi et al., 2012). Schouten et al. (2022) found that Black and Hispanic individuals are more likely to limit or stop driving compared to non-Hispanic Whites. Rosenbloom (2001) noted that race and ethnicity affect travel patterns, with Black, Asian, and Hispanic older adults making fewer and shorter trips than their White counterparts, even after controlling for income and location. Understanding these variations in transportation behavior among older adults is essential for addressing their needs and improving accessibility (Rosenbloom, 2001).

## 2.4.3 Occupation

Retirement significantly impacts driving behavior and life satisfaction among older adults. As the Canadian population ages, retirement rates are rising, with over 90% of Canadians aged 70 and older reporting they are retired (Statistics Canada, 2023). Today, the transportation system predominantly serves the needs of work commuters and efforts to design and create a more sustainable transportation system are targeted at the commuting population (Siren & Haustein, 2015). This can result in less accessible transit options for those who are retired. Retirement often leads to reduced driving and more leisurely trips, with retirees relying heavily on cars for transportation (Chihuri, 2016; Siren & Haustein, 2015). In older adult's transition to retirement, we see a shift in mobility patterns (Berg et al., 2014; Carp, 1972; Chihuri et al., 2016; Cœugnet et al., 2013; Siren & Haustein, 2015)... A systematic literature review by Chihuri (2016) found that going to work was the most common reason for older adults to continue driving, and retirement significantly impacted their driving behaviour.

Retirement also affects life satisfaction, though its impact varies. Some retirees maintain high life satisfaction, while others experience a decline or improvement, depending on their preand post-retirement experiences (Heybroek et al., 2015; Pinquart & Schindler, 2007). These variations highlight the importance of considering retirement when examining transportation behavior and life satisfaction in older adults.

#### 2.4.4 Gender/Sex

Biological and gender-based differences between men and women significantly influence behavior and perceptions. However, research does not always clearly distinguish between sex and gender identity. If studies and data collection methods do not differentiate between sex assigned at birth and gender identity, it becomes difficult to ascertain which aspect respondents
refer to (Hammond & Stinchcombe, 2019). In such cases, terms like "sex/gender" and "men/women" can be used. Given the lack of specificity in the data used in this thesis, along with similar trends in the literature, I use the terms sex/gender and men/women interchangeably.

Sex/gender plays a crucial role in shaping the roles individuals assume, the expectations placed upon them, and their relationships with others. These factors influence the distribution of power and resources in society, affecting people's social, health, and economic outcomes (Government of Canada, 2022). Research highlights that gender/sex considerations are vital when designing interventions to improve the health and well-being of older Canadians (Prus & Gee, 2003). It is essential to account for sex/gender in research, as these factors can shape an individual's experience of infrastructure, programs, and policies in both similar and distinct ways.

#### 2.4.5 Gender/Sex and Transportation

There are notable gender/sex differences in transportation behaviors and experiences (Briscoe et al., 2019; Garrard et al., 2012). Men and women often differ in their interactions with transport systems in terms of safety, frequency, attitudes, and affordability (Namgung & Andar, 2014; Ouali et al., 2020). Societal gender roles heavily influences these behaviors. For instance, women are 42% more likely than men to assume caregiving responsibilities for family members (Statistics Canada, 2022d). These caregiving roles often shape women's transportation habits, such as making more trips for grocery shopping or chauffeuring children, which impacts their mode choice and frequency of trips. Additionally, women's lower average earnings may affect their transportation choices and mobility (Cui et al., 2020; Drolet & Amini, 2023; Young & Lachapelle, 2017).

Research has explored gender/sex differences in transportation among older adults, specifically focusing on mobility constraints (D'Ambrosio et al., 2008; Dupuis et al., 2007; Li et

al., 2012; Mitra et al., 2021). D'Ambrosio et al. (2008) found that women are more likely to selfregulate their driving compared to men and often report lower confidence in their driving abilities. Furthermore, older women, who tend to live longer, experience more prolonged illnesses and disabilities, leading to heightened physical and social mobility barriers (Dupuis et al., 2007; Statistics Canada, 2012). Women are also more likely to be widowed and live alone, increasing their dependence on transportation assistance (Statistics Canada, 2012). Dupuis et al. (2007) noted that women face three times as many transportation difficulties as men.

Understanding these gender/sex differences in transportation experiences, especially as individuals age, is critical. Since older women are more likely to encounter travel barriers, it's important to anticipate their needs to prevent unmet mobility challenges (Luiu et al., 2017). Moreover, as women's societal roles have evolved, older women are now more independent than previous generations, suggesting a growing demand for mobility solutions that cater to their needs (D'Ambrosio et al., 2008; Luiu et al., 2017).

#### 2.4.6 Gender/Sex and Life Satisfaction

The relationship between gender/sex and life satisfaction has yielded mixed results in global studies. For instance, a meta-analysis by Batz and Tay (2018) summarized several nationally representative studies, showing varied findings. Their global analysis found that women report higher life satisfaction than men. However, smaller-scale data suggested that men have slightly higher life satisfaction, though the difference is negligible. Their research identified structural, socio-cultural, and biological factors as key influences on life satisfaction differences between genders.

In a study across 60 countries, Inglehart et al. (2002) found that gender differences in life satisfaction shift with age. Older women reported lower life satisfaction than older men, while younger women had higher satisfaction than their male counterparts. Joshanloo and Jovanovíc

(2020) analyzed data from 1,801,417 participants across 166 countries and found that women reported higher life satisfaction than men across all income, education, and employment groups, despite less favorable objective conditions for women globally. A previous study by Joshanloo (2018) revealed significant similarities in the predictors of life satisfaction across genders, but also found that socio-political and employment-related factors play a more significant role in men's life satisfaction, while interpersonal relationships and social support are more crucial for women.

At a national level, Branch-Allen and Jayachandran (2016) found that younger, married women with higher socioeconomic status reported greater life satisfaction in Canada. Using baseline CLSA data, St John et al. (2021) found a positive association between life satisfaction and being female, though this data collected information on sex, not gender. Despite limited research examining life satisfaction differences in relation to transportation, it is clear that gender/sex plays a pivotal role in shaping experiences across various domains.

# 2.4.7 Religion

Religion significantly shapes societal norms, attitudes, and behaviours, influencing values and decision-making. Each religion has doctrines that affect consumption habits, including food and technology use (Daas, 2018; Minton & Cabano, 2024; Mortimer et al., 2020). This influence extends to car ownership and transportation behaviour, though transportation research often overlooks cultural and religious factors, focusing mainly on tourism and pilgrimages. Newmark and Rearick (2021) found that religious affiliation, such as that of Cowboy Churches, affects car ownership in rural areas, linking religious culture with transportation choices (Dallam, 2018). Additionally, access to religious services often requires a car, which may influence driving cessation among older adults (Harrison & Ragland, 2003). This thesis hypothesizes that religious affiliation will affect driving cessation decisions, with affiliated individuals less likely to stop driving. Religion also impacts life satisfaction, with studies showing strong positive associations between religious service attendance and life satisfaction (Kortt et al., 2014; Yaden et al., 2022).

## 2.4.8 Education

In Canada, older adults are more educated than previous generations. From 1990 to 2006, the percentage of men aged 65 and older with less than a high school education fell from 63% to 46%, while the proportion of postsecondary graduates increased. A similar trend is seen among women, supported by initiatives aimed at improving education for older adults (Kops, 2020; Macleod, 1985).

Higher education is generally linked to better health, higher income, and reduced social isolation, contributing to positive life outcomes such as increased life satisfaction (Cowell, 2005; Cutler & Lleras-Muney, 2012; Groot & Maassen van den Brink, 2007; Ross & Wu, 1995; Zimmerman & Woolf, 2014). Educated individuals typically have better health and more social support, along with healthier behaviors like reduced smoking and increased exercise (Ross & Wu, 1995). Studies also show that education enhances life satisfaction, with Fernández-Ballesteros et al. (2001) finding that for older Spaniards, education and income are more significant for life satisfaction than age or gender.

Education also affects transportation behavior. Shinar et al. (2001) found that in the US, higher education levels correlate with increased safety belt use, though more educated individuals are also more likely to report speeding. Older adults with higher incomes prefer driving or carpooling over public transit (Su & Bell, 2009). Conversely, those who cease driving often have lower educational attainment, reflecting fewer resources and limited access to alternative transportation (Baum et al., 2013; Choi et al., 2012; Dellinger et al., 2001; Edwards et al., 2009; Jette & Branch, 1992; Ma et al., 2016; Marottoli et al., 1993; Pellichero et al., 2021).

Thus, education plays a crucial role in shaping both transportation behavior and overall life satisfaction, highlighting its importance in any analysis.

# 2.4.9 Socioeconomic Status (Income)

Income influences transportation behaviour as it can largely determine lifestyle, residential location, and access to resources and opportunities. A few key themes in the literature regarding how income interacts with transportation behaviour. Nordbakke and Schwanen (2015) show that older retired people with low income have fewer and shorter travel journeys than others. In a study of 421 individuals from the Puget Sound Transportation Panel in Washington State, Sungyop and Ulfarsson (200, retired older people with higher incomes were more likely to drive or carpool. Moreover, those with higher incomes were more likely to consider public transit their least favourable mode, while low-income households have a higher propensity toward using public transit and walking (Sungyop & Ulfarsson, 2004). In a study examining the transportation alternatives of older adults who can no longer drive, Kim (2011) shows that higher income has a significantly positive impact on older adults' use of alternative transportation, such as walking, riding a bike, and taking public transit. Overall, the literature confirms that income should be included when assessing the travel behaviour of older adults.

Many older Canadians live on low and fixed incomes (Statistics Canada, 2024; Luong & Hébert, 2009). Socioeconomic status plays a vital role in the driving status of older adults. Research shows that older adults with lower income are likelier to limit or stop driving than those with higher income (Dickerson et al., 2007; Ragland et al., 2004; Rosenbloom, 2001). A study by Choi et al. (2012) highlights that finances play a role in the decision-making process of driving cessation, especially costs relating to owning and maintaining a car and insurance. Nearly 15% of participants reported financial difficulty as their main reason for driving

cessation. These findings suggest that older adults with limited income or financial resources may stop driving regardless of their mobility needs or physical functioning. As many older retired adults may not have a source of income from active employment, some studies also look at the relationship between wealth and driving cessation (Vivoda et al., 2021; Drentea & Reyonds, 2012). Interestingly, Vivoda et al. (2021) reported that those with lower wealth also have higher odds of driving cessation.

Income is also a well-being domain and a predictor of life satisfaction (Nakamura et al., 2021; Riddick, 2009). Generally, research shows that individuals with high incomes tend to be happier than individuals with lower incomes (Cheung, 2015 & Stevenson & Wolfers, 2008). According to a study by Branch-Allen and Jayachandra (2016), among 19,597 older adults residing in Canada, those with higher incomes were more likely to be satisfied with life. Using the Canadian Longitudinal Study on Aging, St John et al. (2021) also reported a strong association between income and life satisfaction while accounting for many potential confounding factors, such as health. Given that income impacts transportation behaviour and life satisfaction and older people are likelier to have low income, I include total household income in my analysis.

## 2.4.10 Social Capital on Transportation Behaviour and Life Satisfaction

In the PROGRESS framework, social capital refers to social relationships and networks (O'Neill et al., 2014). There is a social influence on transportation behaviour and life satisfaction. For example, research shows that decisions related to driving cessation often occur within a social context, with input from family, friends, and doctors (Ang et al., 2019; Hassan et al., 2022). Moreover, having a spouse or partner can also influence driving decisions, as there may be spousal expectations or dependencies related to transportation needs. Similarly, living

with others or having a support network may also influence driving decisions. Those who live with others or have a support system of friends and family may be able to depend on their network to fulfill their transport needs. At the same time, research shows that those who depend on rides may be more likely to continue driving at an older age (Horowitz et al., 2015). Some drivers may also anticipate their social network to suffer if they stop driving, which can prolong the decision (Mullen et al., 2017). Ultimately, older adults often consider their social networks and support systems when stopping driving.

Social capital is also known to impact life satisfaction. Kehn (1993) examined the influence of social variables on the happiness of older adults, specifically looking at their living arrangements (living alone, living with a spouse, or living with a child or relative) and reported that marital status and living with a spouse or partner is a good predictor of happiness. According to a longitudinal study by Chipperfield and Havens (2001), losing a partner or marriage later in life negatively impacts life satisfaction, especially among men. Moreover, men's life satisfaction increased when they gained a spouse, but the same was not true for women. Hong and Duff (1997) examined the impacts of marital status, frequency of seeing children and friends, and frequency of community engagement on older adults' life satisfaction. They found that having a spouse was the strongest predictor of life satisfaction. The following strongest predictors were community engagement and interacting with friends. In a study examining the relationship between partnership status and physical functioning later in life, which can contribute to a higher quality of life and life satisfaction, Clouston et al. (2014) reported a robust relationship between partnership status and physical function. More specifically, individuals in marital partnerships had higher physical function than those who remained single or were divorced.

In recent studies, social capital and support significantly impact life satisfaction. According to Papi and Cheraghi (2021), social support and daily activities significantly predict

levels of life satisfaction. Other studies continue to show that those married or partnered are likelier to have higher life satisfaction (Evans et al., 2023; Gattig & Minkus, 2021). A systematic review by Stahnke and Cooley (2021) showed a positive relationship between partnership and life satisfaction. Su et al. (2022) used the Canadian Community Health Survey, representing 97% of the Canadian population, to longitudinally explore changes in the associations between social support and life satisfaction over time. Their study showed a consistently positive correlation between social support and life satisfaction. In a similar study, Su et al. (2022) examined the relationship between life satisfaction and self-perceived health, reporting that even when controlling for sociodemographic characteristics, the relationship between life satisfaction and self-perceived health varied across different levels of social support. Generally, social capital and support of friends and family have positive impacts and predict relatively high levels of happiness, satisfaction with life, and functional mobility. Based on these findings, I examine the influence of social capital, specifically in terms of partnership status and living with others.

# 2.5 Other determinants

In addition to sociodemographic characteristics, health issues, transport accessibility, and the built environment influence transportation behaviour (Ang et al., 2019; Mann et al., 2005).

# 2.5.1 Health

Health is an important factor to consider when evaluating driving status and life satisfaction. Physical and cognitive health decline are a natural part of the aging process. Meanwhile, mobility has physical and cognitive requirements. For example, driving is a complex task requiring various physical and cognitive abilities and behavioural and perceptual skills. Due to declining health, older adults often limit and eventually stop driving (Babulal et al., 2019;

Mann et al., 2005). Health-related conditions are some of the most common reasons for driving cessation (Ackerman et al., 2008; Edwards et al., 2008; Hassan et al., 2022; Maliheh et al., 2023; Ragland et al., 2004). Health and medical-related indicators of driving cessation include vision, chronic conditions, and disease (Ragland et al., 2004).

It is generally agreed that a simple global self-rated health question provides a useful summary of how patients perceive their overall health status. General self-rated health items can capture elements of physical and psychological health. Self-reported health is also a common predictor of morbidity and mortality (Whitmore et al., 2021). For example, the 36-Item Short Form Health Survey (SF-36) asks, "In general, would you say your health is:" with five response categories: excellent, very good, good, fair, and poor. While examining the Australian Longitudinal Study on Aging (ALSA), Anstey et al. (2005) established that this self-rated health question was the most reliable health-related predictor of driving cessation.

Health also impacts life satisfaction. Studies show that good physical health is significantly associated with higher reporting of life satisfaction (Alsubaie, 2021; Bramhankar et al., 2023; Su et al., 2022). Using data from the Indian Longitudinal Study on Aging, Bramhankar et al. (2023), established that self-rated health is a significant factor determining life satisfaction, with those reporting good self-rated health being five times more likely to have satisfaction with life (5.27, p < 0.001) when compared to older adults with poor self-rated health.

## 2.5.2 Built Environment

The built environment can influence transportation behaviour and life satisfaction. For older adults, the built environment can support transport needs or be a detriment to mobility. Compared to studies involving their younger counterparts, relatively few studies have been conducted to examine the built environment specific to older adults' needs. Generally, variables used to study the association between neighbourhood characteristics and older adults'

transportation behaviours include street connectivity, the density of intersections, neighbourhood poverty, proximity to green spaces, points of interest, and walk score (Rosso et al., 2011; Yang et al., 2018). Examining the relationship between the built environment and older adults' needs is especially important as they prefer to age in place, remaining in their homes or local communities for as long as they are physically able to throughout old age (Wiles et al., 2012; Rowles, 1983). As a result, older adults tend to spend more time in their neighbourhoods and may perceive the built environment differently than the general population (Glass & Balfour, 2003; Haselwandter et al., 2015). Many older adults experience benefits from aging in place, such as having a sense of identity through independence and connections with their local social networks (Wiles et al., 2012; Rowles, 1983). There are also practical benefits of familiarity and security. At the same time, older adults age and experience cognitive and physical limitations that can impact their mobility, primarily related to their ability to drive or use alternative modes of transportation. From this, older adults can become more vulnerable to the accessibility and infrastructure within their local community. Older adults may also be more sensitive to environmental factors such as poor weather conditions, poorly maintained sidewalks, and lack of crosswalks and transit stops. Yang et al. (2018) argue that focusing on built environment factors rather than individual-centred mobility barriers may yield greater benefits for older adults.

After conducting a comprehensive review that examined associations of the built environment with mobility and disability in adults aged 60 years or older, Rosso et al. (2011) confirmed associations between mobility and the built environment. According to Rosso et al. (2011), three specific built environment domains (transportation systems, land use patterns, and urban design) can impact both functional limitations and disability in positive and negative directions. More specifically, street connectivity, road and traffic conditions, safety measures,

and proximity to destinations such as retail establishments, parks and green spaces have the greatest impact on older adults' mobility and disability in positive and negative directions. The most promising evidence was the relationship between mobility and high-density intersections, street and traffic conditions, and proximity to points of interest. Density and accessibility can support mobility and activity participation especially via walking, cycling, and the use of public transportation.

A way to measure built environment features that support mobility and activity participation in the Canadian context is using Can-ALE scores from the Canadian Active Living Environments Database (Ross et al., 2018). Can-ALE scores measure how conducive built environments are to physical activity resulting from walking, cycling, and the use of public transportation (Ross et al., 2018). Research that leverages these scores can more clearly illustrate the relationships between built environment features conducive to mobility, activity participation, and active living than using standard urban and rural variables (Ross et al., 2018).

#### 2.7 Gaps in the Literature

More literature on the relationship between life satisfaction and transportation behaviour is needed while accounting for built environment factors. For example, Branch-Allen and Jayachandran (2016) point out that previous research typically focuses on one primary determinant and various sociodemographic variables to understand determinants of life satisfaction. They propose utilizing a holistic approach instead. In their analysis, they use relevant factors of life satisfaction in Canada but fail to include any transport-related such as infrastructure or transportation behaviour, which can impact the quality of life.

Further research is needed to explore how driving cessation affects life satisfaction among older adults, as existing studies mainly highlight both positive and negative impacts but often overlook cultural factors and variables beyond socioeconomic status. Based on these

findings, I will explore the relationship between older adults driving status and life satisfaction while accounting for factors beyond socioeconomic status, such as gender/sex, race, place of residence, education, retirement status, partnership status, religion, and the built environment. Specifically, I will explore older adults driving status and the impacts of driving cessation on life satisfaction. I will also focus on the influence of geographical aspects on this relationship, such as place of residence and built environment features conducive to active living. Additionally, the literature does not include research that uses Can-ALE variables to understand the relationship between the built environment and driving cessation or life satisfaction. Therefore, this thesis seeks to fill those gaps.

# Chapter 3: Methodological Approach

To my knowledge, there is limited research reviewing the impacts of older adults' driving cessation on life satisfaction in the Canadian context. Therefore, I employ the CLSA data, a sizeable national dataset, to characterize older adults' driving cessation and examine its relationship with life satisfaction. The CLSA is the largest and longest Canadian cohort study on aging. It offers an unparalleled richness of disaggregate data, including data on older adults' transportation behaviour and various quality-of-life indicators. This chapter describes the data and methodological approach employed in this thesis.

# 3.1 Data: Canadian Longitudinal Study on Aging (CLSA)

The following section details the data source and the associated sampling methods. It also includes a table to describe the subsample used in this thesis.

My research uses secondary data from the Canadian Longitudinal Study on Aging (CLSA). The CLSA is a strategic initiative of the Canadian Institutes of Health Research (CIHR) to provide data on over 50,000 individuals between 45 and 85. It is a national, long-term study that looks at health and aging over a 20-year period. People between the ages of 45 and 85 were recruited between 2010 and 2015 to participate. The CLSA recruited participants in three ways, including the Canadian Community Health Survey, Provincial Health Registration Databases, and Random Digit Dialing. The study team of researchers collects a wide range of information about people's health as they age, including physical, emotional and social health functioning, as well as the presence of health conditions and diseases. CLSA participants fall into one of two groups: some people participate by telephone interview (Tracking Cohort), while others participate in an at-home interview and a visit to a Data Collection site in their area (Comprehensive Cohort). The main survey asks all participants common demographic, social, physical, psychological, economic, and lifestyle questions, while a subset survey for the

Comprehensive Cohort asks for more in-depth clinical and health service information (CLSA, 2022). Participants take part in a telephone interview, or in an in-home interview and visit a CLSA Data Collection Site, every three years, depending on which part of the study they are in.

In my research, I use the baseline wave of data collected between 2011 and 2015. Figure 1 details the collection timeline of the CLSA data. With this data, this thesis examines driving cessation among older Canadians, aged 65 years and older and its relationship with life satisfaction.



# **CLSA Data Collection**

Figure 1 CLSA Data Collection Timeline

Source: Canadian Longitudinal Study on Aging | Étude longitudinale canadienne sur le vieillissement. (2024). https://www.clsa-elcv.ca/data-collection

## 3.1.1 Data Inclusions and Exclusions

Some limitations of the CSLA are the excluded populations in the three territories, persons living on federal First Nations reserves and other First Nations settlements in the provinces, full-time members of the Canadian Armed Forces, and individuals living in institutions providing indefinite 24-hour nursing care. Those with cognitive impairment, as determined by CLSA interviewers, and those unable to respond in English or French are also excluded (CLSA, 2020). Individuals living independently in their communities and those living in retirement housing are included.

Another area of bias in the study is that cell phones were excluded from the telephone survey sample. The justification for the exclusion is that there are "difficulties" in calling cell phones, and census data (Statistics Canada, 2010) showed that very few households with members over the age of 45 did not have a landline (CLSA, 2020). However, since this data is from 2010, I would argue that there may now be a selection bias, especially since many participants might have removed their landlines over the years. Moreover, leaving out cell phones may exclude those who have replaced their landline with a cell phone. This may bias the sample toward older populations and technophobic groups.

In addition, much of the data in the CLSA is self-reported; therefore, we cannot assume it is completely accurate. For example, income in this data is self-reported, which may not reflect one's actual income; recall bias or error occurs when participants do not remember previous events or experiences accurately or omit details (Sedgwick, 2012).

# 3.1.2 Sampling

In the initial recruitment, there was an underrepresentation of people with lower levels of education. A lower level of education is often associated with lower income and other behaviours that may lead to lower life satisfaction and adverse health outcomes (Sungyop & Ulfarsson,

2004). To better represent the group of older adults with lower levels of education, the CLSA over-sampled people from dissemination areas with relatively high proportions of people with lower levels of education (CLSA, 2020). As a result, the CLSA exceeded their target of 50,000 people. There were 21,241 participants in the CLSA Tracking Cohort and 30,097 participants in the CLSA Comprehension Cohort. Ultimately, the working sample was 51,338 participants. In this thesis, I employ a subset sample of data that is narrowed down to the former and current drivers of the baseline wave that was collected between 2011 and 2015.

#### 3.1.3 Can-ALE Data

I also employ Canadian Active Living Environments (Can-ALE) data in my analysis which is linked to the CLSA. ALEs refer to environments conducive to physical activity and active transportation such as walking, cycling, and public transportation and are measured at the dissemination area (DA) level (Ross et al., 2018). Can-ALE scores generally comprise four main components: intersection and dwelling density, the number of destinations or points of interest, and the number of transit stops (Ross et al., 2018). The ALE and Transit class variable is a categorical value characterizing the favourability of the ALE in CMAs on a scale from 1 (very low) to 5 (very high). A higher score suggests a built environment more conducive to active transportation, including walking, cycling and public transportation (Ross et al., 2018). The transit-related Can-ALE measure helps understand the associations between the built environment and driving cessation. However, this variable only applies to those in CMAs. Using data only related to those in CMAs would exclude thousands of participants from my sample. Therefore, in this analysis, I employ the ALE class variable instead. Similar to the ALE and Transit class variable, it is a categorical value but characterizes the favourability of the ALE on a scale from 1 (very low) to 5 (very high) of the intersection density, dwelling density, and points of interest measure. The ALE class variable can be used as a proxy for what is widely referred to

as the "walkability" of an area (Ross et al., 2018). Walkability measures how friendly a region is to walking and active living, which can be associated with driving cessation.

# 3.2 Methods and Analysis

This section describes the analysis and methods employed in this thesis. It details the variables used in this analysis from the CLSA, including driving status, life satisfaction, activity participation, Can-ALE, sex/gender, race/ethnicity, religion, retirement status, total household income, partnership status, education, and self-rated health. This chapter also explains how the variables were cleaned for analysis and interpretation purposes. Overall, the selection and modification of my variables were motivated by the distribution of the data and the interpretability of the results. Through my analysis, I test five main hypotheses:

- Common reasons for driving cessation include physical and medical conditions, vision problems, and financial concerns.
- 2. Driving cessation is more likely among women, individuals with lower incomes, those reporting poorer health, and retired individuals.
- 3. Driving cessation is less likely among those with religious affiliation.
- 4. Driving cessation negatively affects life satisfaction and positively impacts the desire for more activity participation.
- 5. Those living in environments that support active living will be likelier to cease driving.

# 3.2.1 Analysis

First, I describe the distribution of the sample of CLSA participants analyzed in this thesis (Table 4.1) by driving status, sociodemographic characteristics, life satisfaction, and desire for more activity participation. Then, in Table 4.2, I display how driving cessation among CLSA participants 65 and older is distributed by age, sex/gender, race/ethnicity, province/region, religion, education, total household income, urban/rural environments, self-reported general

health, and life satisfaction. My analysis is extensive as it includes other factors pertinent to driving status in older age, such as retirement and partnership status. The selection of variables was inspired by Evan and Brown's (2003) conceptual framework, PROGRESS (O'Neill et al., 2014). Table 4.3 shows the weekly activity differences between current and former drivers. Figure 4.1 shows the reasons for driving cessation. Then, Figures 4.2, 4.3, and 4.4 show how these reasons vary by sex/gender, income, and built environment features.

Then, I use a logistic regression model to examine driving cessation's relationship with various outcomes. First, in Model 1, I explore the relationship between sociodemographic characteristics and driving cessation. Then, in Model 2, I examine the relationship between driving status and life satisfaction. In Model 3, I explore the relationship between driving cessation and the desire for more activity participation among those who are no longer driving. Finally, in Model 4, I examine the relationship between driving cessation and life satisfaction among former drivers.

All regression models adjusted for age (65-74 years, 75-84 years, 85+ years), sex/gender (female, male), province/region, race (White, other), total household income before tax (\$20,000 or less; \$20,000 or more, but less than \$50,000; \$50,000 or more, but less than \$100,000; \$100,000 or more, but less than \$150,000; \$150,000 or more), retirement status (retired, not retired), partnership status (partnered, not partnered), living situation (living alone; living with others), religion (religious; not religious), and self-reported general health (Excellent/Very good/Good and Fair/Poor) as they have been shown to influence driving status and life satisfaction. I included education (no post-secondary degree; post-secondary degree and living situation (living alone; living with others) variables in my exploratory analysis but did not find significant relationships. Since these variables are closely related to other variables in the

models, such as income and partnership status, I removed education and living situation from my models.

## 3.3 Variables

This section lists the variables used in my analysis and explains how they were cleaned for analysis and interpretation. A goal of this thesis is to expand the literature regarding sociodemographic characteristics related to driving cessation and life satisfaction. The inclusion of sociodemographic characteristics in my analysis is inspired by Evan and Brown's (2003) conceptual framework PROGRESS, which refers to place of residence, race/ethnicity/culture/language, occupation, gender/sex, religion, education, socioeconomic status, and social capital. PROGRESS is a framework designed to foster the inclusion of sociodemographic factors that impact health and life outcomes. The framework also helps ensure the application of an equity lens in the conduct, reporting, and use of research (O'Neill et al., 2014). Including these factors opens the opportunity to ensure resources are distributed to resolve inequalities measurably (O'Neill et al., 2014). In this thesis, I analyze the impact of PROGRESS factors on older Canadian's travel behaviour and their life satisfaction.

### 3.3.1 Driving status

The CLSA collects transportation-related data. It asks participants to describe their driving status. Response options include never having a driver's license, having a driver's license with restrictions, or having a driver's license at one point in their life but not currently. This thesis focuses on those who had a driver's license at the time of data collection and those who had a driver's license at one point but did not have one at the time. I dichotomized this variable to represent the two categories as current and former drivers, excluding those who have never driven.

## 3.3.2 Life satisfaction

Drawing from Ed Diener and colleagues' Satisfaction with Life Scale (1985), the CLSA collects data on participants' life satisfaction. In this thesis, I utilize this data to understand the impact of driving cessation on older adults' life satisfaction in Canada. More specifically, I use the statement "I am satisfied with my life." to create a "life satisfaction" dependent variable for my analysis. The response options collected include "disagree," "neither agree nor disagree," and "agree."

The SWLS includes five statements: "In most ways, my life is close to my ideal," "The conditions of my life are excellent," "I am satisfied with my life," "So far, I have gotten the important things I want in life," and "If I could live my life over, I would change almost nothing." A critique of using the entire SWLS is that the fifth statement, "If I could live my life over, I would change almost nothing," solicits a judgement in response to the past, which more strongly implies a summary evaluation over the years rather than the present life satisfaction (Pavot & Diener, 2008). Pavot & Diener (2008) suggest that if the research is particularly interested in the respondent's satisfaction with his or her current life, the data can be examined without the fifth item. Driving cessation typically happens in older age; therefore, I am

particularly interested in older adults' present life satisfaction rather than over their lifetime. Based on my research interest, I follow Diener & Pavot's suggestion not to use the fifth statement. Moreover, the statement "I am satisfied with my life" is clearly connected to life satisfaction. It has also been proven as a reliable measure of life satisfaction (Diener, 2018). For these reasons, I employ the statement as my dependent variable. In a study using the CLSA to measure life satisfaction among older adults in rural and urban areas, St. John et al. (2021) found that life satisfaction was not normally distributed, with most participants being satisfied with life. As a result, the researchers dichotomized the score into those who were satisfied and those who were not. Therefore, I constructed a binary variable to dichotomize the statement "I am satisfied with my life." capturing respondents' agreement with the statement.

# 3.3.3 Activity participation

The CLSA also collects information on activity participation among older Canadians. I am particularly interested in the relationship between driving cessation and activity participation. To examine the relationship, I use the CLSA question, "In the past 12 months, have you felt like you wanted to participate more in social, recreational, or group activities?" as a dichotomous yes or no variable. I also created a variable to represent the number of activities participants participate in during their typical week. This variable includes family, sport, church, education, service, neighbourhood, volunteer, and any other recreational activities.

#### 3.3.4 Sociodemographic characteristics

The variables in my analysis were selected based on the PROGRESS framework.

# 3.3.4.1 Race/ethnicity

As previously discussed, differences in ethnicity/race can often lead to differences in options regarding income, education, and accessibility to services such as transportation. Cultural differences may also influence choices and decisions. Research shows that visible minorities are

more likely to cease driving at older age, even at similar levels of driving performance. In my analysis, I use the question, "People living in Canada come from many different cultural and racial backgrounds. Are you..." from the Socio-Demographic Characteristics (SDC) section. Multiple responses were allowed including White, Chinese, South Asian (e.g. East Indian, Pakistani, Sri Lankan), Black, Filipino, Latin American, Southeast Asian (e.g. Cambodian, Indonesian, Laotian, Vietnamese), Arab, West Asian (e.g. Afghan, Iranian), Japanese, Korean, North American Indian, and Other. Based on the data distribution, I recategorized the variables as White, Black, and Other.

#### 3.3.4.2 Retirement status

Retirement status is also adjusted for in my analysis. I use the "At this time, do you consider yourself to be completely retired, partly retired, or not retired?" from the Retirement Status (RET) section. For my analysis, I dichotomized the variable to compare those fully retired with those not yet retired.

#### 3.3.4.3 Sex/gender

As research has historically focused on differences in sex rather than gender identity, the initial baseline questionnaire of the CLSA collected data on sex rather than including the concept of gender identity. The baseline asks: "Are you male or female?" which may only reflect biological differences rather than capture gender identity. Given that one cannot ascertain whether respondents answered this self-reported question based on their sex assigned at birth or gender identity, I use the term 'sex/gender' and men and women in this thesis. While this is a limitation in my current study, the CLSA has since updated the follow-up questionnaires to recognize both sex and gender in the data.

#### 3.3.4.4 Religion

I use the "What, if any, is your religion?" question from the Socio-Demographic (SDC) section to capture religious affiliation. The response categories included several religions, but I dichotomized the variable to capture whether someone was religious. This thesis seeks to expand the purview of transportation research by considering the impact of cultural factors, specifically religious affiliation, on driving status and life satisfaction among older adults.

# 3.3.4.5 Education

To capture education level, I employed the question, "What is the highest degree, certificate, or diploma you have obtained?" from the Education (ED) section. I then created a dichotomous variable to reflect who has received at least a post-secondary degree and who has not.

#### 3.3.4.6 Income

As previously mentioned, income can influence both driving cessation and life satisfaction (Cheung, 2015; Choi et al., 2012; Dickerson et al., 2007; Nordbakke & Schwanen, 2015; Ragland et al., 2004; Rosenbloom, 2001). This study adjusts for total household income using the question: "What is your best estimate of the total household income received by all household members, from all sources, before taxes and deductions, in the past 12 months?" from the Income (INC) section, with response categories including \$20,000 or less; \$20,000 or more, but less than \$50,000; \$50,000 or more, but less than \$100,000; \$100,000 or more, but less than \$150,000; \$150,000 or more.

#### 3.3.4.7 Partnership status

Partnership status can vary and impact driving status and life satisfaction, especially later in life. The CSLA collects information on partnership status, which I dichotomized as partnered or not partnered.

### 3.3.4.8 Self-rated health

I employ a self-rated health question from the General Health section of the CLSA to capture health status. Self-rated health questions generally capture elements of physical and psychological health (Elawadi, 2021; Fayers & Sprangers, 2002; Jylhä, 2009; Krause & Jay, 1994; Ocampo, 2010). Moreover, Anstey et al. (2005) found that self-rated health was the most reliable predictor of cessation while using the Australian Longitudinal Study on Aging (ASLA). The CLSA asks: "In general, would you say that your health is excellent, very good, good, fair, or poor?" For my analysis, I dichotomize the variable to "Excellent/Very good/Good" and "Fair/Poor", reflecting good or poor health.

# 3.3.4.9 Can-ALE

The Can-ALE (Canadian Active Living Environments) data provides measures that indicate the level of friendliness for active living and walkability of neighbourhoods. In my analysis, I employ the Can-ALE variable from the CLSA that represents the ALE class, or categorical value characterizing the favourability of the ALE on a scale from 1 (very low) to 5 (very high). Communities with higher ALE scores are those whose built environments are conducive to physical activity, which tend to be densely populated, have very connected street patterns, and have a variety of walking destinations (Ross et al., 2018). Ultimately, my inclusion of this variable is an effort to analyze the impact of ALE-related features on older adults' driving cessation and life satisfaction.

### 3.4 Models

The equations for each model are below.

**Model 1**: The odds of not having a driver's license by sociodemographic characteristics (results in Table 3).

$$\log \left(\frac{p(x)}{1-p(x)}\right) = \beta_0 + \beta_1 x + \beta_2 x_2 + \dots + \beta_9 x_9 + \beta_{10} x_1 x_{10} + \varepsilon$$

Where  $\left(\frac{p(x)}{1-p(x)}\right) =$  odds of outcome happening (ratio of chances of success to chances of

failure)

log-odds of y happening (also known as the logit function)

Y = Driving cessation (binary)

- $x_1$  = Age category;
- $x_2$  = Province/region;
- $x_3 = \text{Race/ethnicity};$
- $x_4 = \text{Sex/gender};$
- $x_5$  = Retirement status;
- $x_6$  = Partnership status;
- $x_7$  = Total household income before tax;
- $x_8$  = Religion;
- $x_9$  = Self-reported general health;
- $x_{10}$  = Can-ALE Class

 $\beta_1...\beta_{10}$  = Coefficients; the expected change in log odds of having the outcome per unit change in x.

**Model 2**: The associations between driving cessation and life satisfaction by sociodemographic characteristics (results in Table 4).

$$\log \left(\frac{p(x)}{1-p(x)}\right) = \beta_0 + \beta_1 x + \beta_2 x_2 + \dots + \beta_{10} x_{10} + \beta_{11} x_1 x_{11} + \varepsilon$$

Where  $\left(\frac{p(x)}{1-p(x)}\right) =$  odds of outcome happening (ratio of chances of success to chances of

failure)

log-odds of y happening (also known as the logit function)

Y = Life satisfaction (binary)

 $x_1$  = Driving cessation;

- $x_2$  = Age category;
- $x_3$  = Province/region;
- $x_4 = \text{Race/ethnicity};$
- $x_5 = \text{Sex/gender};$
- $x_6$  = Retirement status;
- $x_7$  = Partnership status;
- $x_8$  = Total household income before tax;

 $x_9$  = Religion;

 $x_{10}$  = Self-reported general health;

 $x_{11}$  = Can-ALE Class

 $\beta_1...\beta_{10}$  = Coefficients; the expected change in log odds of having the outcome per unit change in x.

Model 3: The desire for more activity among former drivers by sociodemographic

characteristics (results in Table 5).

$$\log \left(\frac{p(x)}{1-p(x)}\right) = \beta_0 + \beta_1 x + \beta_2 x_2 + \dots + \beta_9 x_9 + \beta_{10} x_1 x_{11} + \varepsilon$$
  
Where  $\left(\frac{p(x)}{1-p(x)}\right) =$  odds of outcome happening (ratio of chances of success to chances of

failure)

log-odds of y happening (also known as the logit function)

Y = Desire for more activity participation (binary)

 $x_1$  = Age category;

- $x_2$  = Province/region;
- $x_3 = \text{Race/ethnicity};$
- $x_4 = \text{Sex/gender};$
- $x_5$  = Retirement status;
- $x_6$  = Partnership status;
- $x_7$  = Total household income before tax;
- $x_8$  = Religion;
- $x_9$  = Self-reported general health;
- $x_{10}$  = Activities per week
- $x_{11}$  = Activities per week

 $\beta_1...\beta_{11}$  = Coefficients; the expected change in log odds of having the outcome per unit change in x.

Model 4: Life satisfaction among former drivers (results in Table 6).

$$\log \left(\frac{p(x)}{1-p(x)}\right) = \beta_0 + \beta_1 x + \beta_2 x_2 + \dots + \beta_9 x_9 + \beta_{10} x_1 x_{10} + \varepsilon$$

Where  $\left(\frac{p(x)}{1-p(x)}\right) =$  odds of outcome happening (ratio of chances of success to chances of

failure)

log-odds of y happening (also known as the logit function)

Y = Life satisfaction (binary)

 $x_1$  = Age category;

 $x_2 = \text{Province/region};$ 

- $x_3 = \text{Race/ethnicity};$
- $x_4 = \text{Sex/gender};$
- $x_5$  = Retirement status;
- $x_6$  = Partnership status;

 $x_7$  = Total household income before tax;

 $x_8$  = Religion;

 $x_9$  = Self-reported general health;

 $x_{10}$  = Can-ALE Class

 $\beta_1...\beta_{10}$  = Coefficients; the expected change in log odds of having the outcome per unit change in x.

# Chapter 4: Results

This chapter presents the results of a cross-sectional analysis of driving cessation among older adults using data from the Canadian Longitudinal Study on Aging (CLSA). Specifically, it answers the questions: 1. What are the reasons for driving cessation among older Canadians? 2. Among the older Canadian population, how do older current and former drivers vary by sociodemographic characteristics? And, how does driving cessation impact older Canadians' life satisfaction and desire for more activity participation? And 3. what is the association between the built environment (especially regarding walkability and a favourable Can-ALE score) and driving cessation among older Canadians?

The results presented in this section aim to summarize driving cessation among older adults and its impacts. This section presents the logistic regression model results and the reasons for driving cessation among former drivers. This analysis aims to provide researchers, practitioners, and policymakers with a profile and characterization of older Canadians who have stopped driving. A characterization of older Canadians' driving status and the relationship between driving cessation and quality of life indicators can inform avenues for further research, transportation policy, and program initiatives related to driving cessation so that the aging population can age in place, as they prefer while maintaining their quality of life and social connectedness.

# 4.1 Descriptive Analysis

The sample size has been restricted to participants aged 65 and older who were current or former drivers of the baseline wave collected in the years 2011-2015. The total size of the sample is 13,757, with 13,058 current drivers and 699 former drivers. A small percentage of those with missing data have also been excluded. With these exclusions, the sample of former

drivers is relatively small, which has certain implications for the results. For example, results from a small sample may be less generalizable.

# 4.1.1 Description of the sample

Table 4.1 describes the distribution of the sample. Based on my descriptive analysis, the sample predominantly (60%) consists of individuals aged 65 to 74, with less (38%) in the 75 to 84 age group, and just 2% are over 85. Most of the sample (95%) still hold a driver's license, suggesting a relatively high level of current drivers. This sample is slightly more male-skewed. It is also overwhelmingly white, with very small representations of blacks (1%) and other racial or ethnic groups (2%). The distribution across Canadian provinces is relatively balanced. There is a near-even split between those with and without post-secondary education. Most of the sample (42%) falls into the \$50,000-\$99,999 income bracket, with a smaller percentage in the lower and higher income categories. 90% of the sample reports good health, indicating overall positive health status among the group. Most of the sample is also retired, which reflects the sample's age distribution and typical life stage. About a third of the sample is interested in increasing their level of activity participation. Lastly, most of the population lives with others, lives in an urban area, is partnered, religious, and is satisfied with life.

Age category	
65-74	60%
75-84	38%
85+	2%
Current driver's license	95%
Race/ethnicity	
White	97%
Black	1%
Other	2%
Provinces	
Atlantic Provinces	20%
British Columbia	19%
Ontario	23%
Prairie Provinces	21%
Québec	17%
Household income (before tax)	
<\$20,000	5%
\$20,000-\$49,999	32%
\$50,000-\$99,999	42%
\$100,000-\$149,999	14%
>\$150,000	7%
Excellent/Very good/Good health	91%
Female	46%
Post-secondary degree	49%
Urban environment	88%
Living alone	29%
Partnered	66%
Retired	91%
Religious	80%
Satisfied with life	90%

Desire for more activity participation

35%

Table 4.1. Overall sample by sociodemographic categories.

# 4.1.2 Characterizing Driving Status

This thesis defines driving cessation as participants no longer possessing a driver's license. Table 4.2 summarizes sociodemographic characteristics according to driving status. After 65, the percentage of driver's license holders steadily declines. The group aged 75-84 had the highest number (425) of former drivers. There is also a greater number of female (479) than male (220) former drivers. British Columbia, Ontario, and Québec have higher ratios of former drivers than the Prairies and Atlantic region. Driving cessation was also more reported by those in urban areas. This is likely because the large cities associated with these provinces are urban areas that are generally more accessible and offer more transportation alternatives to cars. For education, we see more former drivers (438) without a post-secondary degree than those with a secondary degree (261). Among current drivers, there is a fairly even split between those with a post-secondary degree and those without. Following education trends, most former drivers are in the lower income categories, making less than \$50,000. Most of the CLSA sample is White, and we do not see much difference in driving status between races or ethnicities. Most former drivers are completely retired. Generally, this distribution aligns with the literature.

Table 4.2. Driving status by sociodemographic characteristics (PROGRESS).

	Current Driver (n=13,058)	Former Driver (n=699)
65-74	8,032 (97%)	232 (2%)
75-84	4,861 (92%)	425 (8%)
85+	165 (80%)	57 (20%)
Female	5,857 (92%)	479 (7%)
Male	7.201 (97%)	220 (3%)
Race/ethnicity		
White	12,614 (95%)	665 (5%)
Black	68 (93%)	5 (7%)
Other Description	376 (93%)	29 (7%)
Province	2.47.6 (0.5%)	107 (50)
British Columbia	2,476 (95%)	137 (5%)
Ontario	2,937 (95%)	160 (5%)
Québec	2,168 (93%)	158 (7%)
Atlantic Provinces	2,681 (96%)	125 (4%)
Prairie Provinces	2,796 (96%)	119 (4%)
Education		
No post-secondary degree	6,510 (94%)	438 (6%)
Post-secondary degree	6,548 (96%)	261 (3%)
<\$20.000	540 (820/)	122 (1997)
\$20,000	540 (82%)	122 (18%)
\$20,000-\$49,999	4,098 (92%)	340 (8%)
\$100,000-\$77,777	5,662 (97%)	1/6 (3%)
\$100,000-\$149,999	1,837 (98%)	39 (2%)
>\$150,000	921 (98%)	22 (2%)
Retirement status	11 878 (05%)	681 (5%)
Not retired	1,180 (98%)	18 (2%)
Can-ALE class	, ( ,	
1	3 593 (97%)	119 (3%)
2	4,417 (96%)	190 (4%)
3	3,533 (94%)	222 (6%)
4	1,004 (91%)	97 (9%)
5	473 (87%)	68 (13%)
Partnership status		
Partnered Nat northered	8,807 (97%)	251 (2%)
Living situation	4,231 (90%)	448 (10%)
	5 200 (010()	<b>500</b> (0.10()
Living with others	5,398 (91%)	539 (9.1%)
Concred backth	12,820 (97%)	412 (3.1%)
Excellent/Very good/Good	11 976 (96%)	544 (4%)
Fair/Poor	1.082 (87%)	155 (13%)
Religious	, , ,	
Religious	10.447 (95%)	578 (5%)
Not religious	2.611 (96%)	121 (4%)
Satisfied with life	11,744 (95%)	577 (4.7%)
Desire for more activity participation	4,516 (95%)	257 (5.4%)

Given the links between driving status and activity participation in the literature, I also explored the distribution of weekly activity participation across driving status (Table 4.3). Current drivers are less represented in the lower frequencies (0-3), and individuals with a driver's license generally engage in more weekly activities than former drivers. The results are expected given that driving and access to transportation facilitate participation in various activities.

	Current Driver (n=13,058)	Former Driver (n=699)
Activities per week		
0	1,458 (11%)	140 (20%)
1	2,545 (19%)	151 (22%)
2	3,191 (24%)	176 (25%)
3	2,790 (21%)	118 (17%)
4	1,759 (13%)	65 (9.3%)
5	870 (6.7%)	26 (3.7%)
6	340 (2.6%)	16 (2.3%)
7	81 (0.6%)	6 (0.9%)
8	24 (0.2%)	1 (0.1%)
Mean	2.41	1.99

Table 4.3 Weekly activities by driving status.

To investigate further, I examined the distribution of weekly activity participation by driving status and built environment features such as high density, accessibility, and walkability. Figure 2 shows the analysis of weekly activities by Can-ALE score and driving status. Can-ALE seems to have some relationship with trips for former drivers but not for current drivers. Former drivers with higher Can-ALE scores tend to participate in more activities than those with lower scores. While we see a slight difference between drivers and former drivers in activity participation, it may not be related to ALE.



Figure 2. Weekly Activities by Can-ALE Score and Driving Cessation.

Table 4.4 summarizes the results of model 1, which examines the odds of not having a driver's license based on sociodemographic characteristics. The results indicate that the odds of not having a driver's license significantly increase in older age. Compared to those aged 65-74, those aged 75-84 are 2.77 times (p-value = <0.001) more likely to no longer drive. People over 85 are 7.59 times (p-value = <0.001) more likely to no longer drive. Second, females are almost two times (OR 1.97, p-value <0.001) more likely to stop driving than males. Those with lower incomes are also more likely to stop driving at an older age. Compared to those in the \$50,000-\$99,999 bracket, individuals with incomes between \$20,000-\$49,000 are almost two times (OR 1.94, p-value (<0.001) more likely to stop driving. Those with less than \$20,000 are over four times (OR 4.37, <0.001) more likely to stop driving. As expected, those with Fair/Poor health were almost 3 times (OR 2.87, <0.001) as likely to stop driving compared to those in Excellent/Very good/Good health. Lastly, those with a higher Can-ALE score (representing a more favourable Active Living Environment) are associated with an increased likelihood of driving cessation. Specifically, for each unit increase in the Can-ALE scale, the odds of ceasing driving rise by 36% (OR 1.36, p-value < 0.001). This finding is statistically significant and indicates a clear relationship: as the environment becomes more conducive to active living, individuals are more likely to stop driving.

Some relationships examined did not produce significant results. For example, there is no relationship between driving cessation and race/ethnicity. I also examined education in my models, but found no significant relationships. Given that there was no significant relationship between education and driving cessation and that education is often correlated with income, I removed education from my final models. Similarly, I did not find significant relationships between the outcomes and living situation. Given the lack of significance and the correlation
living situations can have with partnership status and built environment characteristics, I removed living situations from my final models. There was a significant relationship between driving cessation and partnership status. Those partnered were less likely (OR 0.66, <0.001) to stop driving than those not.

Ultimately, in line with the literature, older adults who have stopped driving were more likely to be women, have lower household incomes, and have poor health. Previous literature has yet to analyze the effects of religion on driving cessation. This analysis aimed to examine the relationship between being religious and stopping driving. However, I found no significant relationship between being religious and driving.

Table 4.4. Logistic regression results depict vario	various SDC effects on driving cessation (dependent variable).			
		OR	95% CI	p-value
Age category				
65-74 years		-	-	-
75-84 years		2.77	2.33, 3.29	< 0.001
85+ years		7.59	5.10, 11.1	< 0.001
Sex/gender				
Male		-	-	-
Female		1.97	1.64, 2.37	< 0.001
Race/ethnicity				
White		-	-	-
Black		0.84	0.28, 2.02	0.7
Other		1.34	0.86, 2.00	0.2
Province/region				
Atlantic Provinces		-	-	-
British Columbia		0.97	0.74, 1.28	0.8
Ontario		1.21	0.93, 1.57	0.2
Prairie Provinces		0.80	0.61, 1.05	0.11
Québec		1.31	1.01, 1.70	0.046
Household income				
\$50,000-\$99,999		-	-	-
\$100,000-\$149,999		0.81	0.56, 1.14	0.2
>\$150,000		1.01	0.61, 1.59	>0.9
\$20,000-\$49,999		1.94	1.59, 2.38	< 0.001
< \$20,000		4.37	3.30, 5.79	< 0.001
Retirement status				
Retired		-	-	-
Not retired		0.40	0.24, 0.63	< 0.001
Partnership status				
Not partnered		-	-	-
Partnered		0.66	0.54, 0.80	< 0.001
General health				
Excellent/Very good/Good		-	-	-
Fair/Poor		2.78	2.33, 3.51	< 0.001
Religious affiliation				
Not religious		-	-	-
Religious		0.96	0.78, 1.20	0.7
Can-ALE		1.36	1.26, 1.47	< 0.001
McFadden	0.067			
CoxSnell	0.044			
Nagelkerke	0 089			

ole 4.4. Logistic regression results de	pict various SDC effects on driving	cessation (dependent variable).

n = 13,757

#### 4.1.2 Reasons for Driving Cessation

While there are many reasons to cease driving, the CLSA collects data on the following factors related to driving cessation, including need, enjoyment, safety, medical advice, availability of public transit, driving history, renewal requirements, physical condition or limitations, vision, confidence, and cost. The CLSA asks former drivers, "What factors or events led you to stop driving?" with multiple responses allowed. Figure 3 summarizes the reasons for driving cessation among the sample. Interestingly, the most common reason for driving cessation was not needing to drive. Given that multiple responses were allowed, this could coincide with other reasons, such as physical conditions and limitations. The second most common reason was related to safety. Third, physical conditions and limitations and deteriorating vision. Notably, former drivers also commonly report gas and car maintenance costs. Along with other Canadian studies, the CLSA shows that one of the lowest factors of driving cessation was someone else advising them to stop (Hassan et al., 2022).



Figure 3. Reasons for driving cessation among older Canadians.

Further investigation shows differences in reasons for driving cessation by sex/gender, income, and Can-ALE-related characteristics. First, the most common reason for driving cessation among men is safety, compared to women, who report no longer needing to drive. Women are also likelier to no longer enjoy driving. Moreover, men have more health-related reasons to stop driving than women. Women also have more financial reasons to stop driving compared to men. Regarding income, those with \$20,000 or less household income most commonly report financial reasons and no longer having the need to drive. In groups with lower income, fewer report physical or medical-related reasons. As income increases, there are more safety and health-related reasons reported. Interestingly, the \$100,000 - \$150,000 total household income group reported the highest percentage of health-related medical reasons reported.

Regarding Can-ALE favourability, those who live in the most favourable environments for active living report that they no longer have the need to drive (35%). Favourable active living environments are characterized by high walkability and accessibility, making it conducive to transition away from the need to drive. Those living in areas less favourable to active living more commonly reported safety reasons than those living in more favourable active living environments. Notably, 'improved quality of public transit' as a reason to stop driving is mostly present at Can-ALE Class 5. The inability to renew driver's licenses, nervousness, and reduced confidence are consistently low across all groups. I also investigated differences by age, partnership and retirement status. Yet, I cannot make inferences between these associations because information regarding this information at the point of driving cessation is unavailable.





Reasons for Driving Cessation by Sex/Gender

Figure 4. Reasons for Driving Cessation by Sex/Gender.



Figure 5. Reasons for Driving Cessation by Household Income.



Reasons for Driving Cessation by Can-ALE Favourability

Figure 6. Reasons for Driving Cessation by Can-ALE Favourability.

Table 4.5 summarizes the associations between driving cessation and life satisfaction. Current drivers may be more satisfied with life, but these results are not statistically significant. Interestingly, Québec is the only province where participants are more likely than people in Atlantic Canada (OR 1.45, <0.001) to be satisfied with life. Females are less likely to be satisfied with life than males (OR 0.78, <0.001). Those with higher household incomes (before tax) are more likely to be satisfied with life. More specifically, those with a total household income between \$100,000 and \$150,000 are more likely to be satisfied with life (OR 1.49, <0.001) than those with a total household income before tax between \$50,000 and \$100,000. Similarly, those who are partnered are more likely to have satisfaction with life (OR 1.46, p-value = <0.001). Interestingly, in this model, a higher score on the Can-ALE scale is associated with decreased odds of higher life satisfaction. Specifically, each unit increase in the Can-ALE scale is linked to an 8% (OR 0.92, p-value <0.001) decrease in the odds of having higher life satisfaction. This finding is statistically significant, suggesting a meaningful inverse relationship between the favourability of the Active Living Environment and reported life satisfaction in this sample. Unsurprisingly, those with good health are more likely to report satisfaction with life.

		OR	95% CI	p-value
Driving status				
Former driver		-	-	
Current driver		1.18	0.94, 1.47	0.2
Age category			,	
65-74 years		-	-	-
75-84 years		1.18	1.05, 1.34	0.006
85+ years		1.41	0.89, 2.36	0.2
Sex/gender				
Male		-	-	-
Female		0.78	0.69, 0.88	< 0.001
Race/ethnicity				
White		-	-	-
Black		0.88	0.47, 1.80	0.7
Other		0.78	0.58, 1.05	0.10
Province/region				
Atlantic		-	-	-
British Columbia		0.88	0.73, 1.06	0.2
Ontario		0.83	0.69, 0.99	0.035
Prairie Provinces		0.85	0.71, 1.02	0.076
Québec		1.45	1.18, 1.79	< 0.001
Household income				
\$50,000-\$99,999		-	-	-
< \$20,000		0.60	0.47, 0.75	< 0.001
\$20,000-\$49,999		0.87	0.76, 1.00	0.052
\$100,000 - \$150,000		1.49	1.21, 1.84	< 0.001
> \$150,000		1.36	1.05, 1.81	0.025
Retirement status				
Retired		-	-	-
Not retired		0.74	0.61, 0.90	0.002
Urban environment				
Rural		-	-	-
Urban		0.93	0.77, 1.11	0.4
Partnership status				
Not partnered		-	-	-
Partnered		1.46	1.28, 1.67	< 0.001
General health			,	
Excellent/Very good/Good		-	-	-
Fair/Poor		0.25	0.22, 0.29	< 0.001
Religious affiliation		0.20	,,	(0.001
Not religious		-	-	-
Religious		1 29	1 12 1 48	<0.001
Can-ALE		0.02	0.87 0.97	0.001
McFadden	0.067	0.92	0.01, 0.21	0.002
CoxSnell	0.044			
Nagalkarka	0.044			
Ivageinei Ke	0.089			

n = 13,757

Table 4.6 shows the logistic regression results and the associations between sociodemographic characteristics and the desire to participate in more activities among those who have stopped driving. In this model, the dichotomous dependent variable represents the desire to participate in more social, recreational, and group activities. According to the model, there are no significant relationships between sociodemographic characteristics and the desire to participate in more activities among those who have stopped driving aside from those with poor health. Those with Fair/Poor health were almost twice as likely (OR 1.91, <0.001) to desire more activity participation than those with Excellent/Very good/Good health.

		OR	95% CI	p-value
Age category				
65-74 years		-	-	-
75-84 years		0.71	0.50, 1.01	0.050
85+ years		0.54	0.25, 1.120	0.01
Sex/gender				
Male		-	-	-
Female		1.03	0.72, 1.49	0.9
Race/ethnicity				
White		-	-	-
Other		1.87	0.91, 3.86	0.088
Province/region				
Atlantic provinces		-	-	-
British Columbia		1.11	0.65, 1.89	0.7
Ontario		0.89	0.53, 1.50	0.7
Prairie provinces		0.87	0.50, 1.50	0.6
Québec		0.65	0.38, 1.11	0.12
Household income				
\$50,000-\$99,999		-	-	-
< \$20,000		1.12	0.52, 235	0.8
\$20,000-\$49,999		1.03	0.34, 2.77	0.9
\$100,000 - \$150,000		1.12	0.52, 2.35	0.8
> \$150,000		1.03	0.34, 2.77	>0.9
Retirement status				
Retified		-	-	-
Not retired		1.10	0.38, 2.97	0.9
Partnership status				
Not partnered		-	-	-
Partnered		0.76	0.51, 1.13	0.2
General health				
Excellent/very good/Good		-	-	-
Fair/Poor		1.91	1.31, 2.79	< 0.001
Religious affiliation				
Not religious		-	-	-
Religious		1.17	0.75, 1.84	0.5
Can-ALE		0.94	0.81,1.09	0.4
Weekly Activity		0.93	0.83, 1.03	0.2
McFadden	0.034			
CoxSnell	0.044			
Nagelkerke	0.059			

Table 4.6. Logistic regression results of former drivers' desire for more activity participation (dependent variable) by SDC.

n = 699

Table 4.7 shows the logistic regression results and the associations between

sociodemographic characteristics and life satisfaction among those who have stopped driving. In this model, the dichotomous dependent variable represents life satisfaction. Similar to the results in Table 4.5, there are no significant relationships between sociodemographic characteristics among those who have stopped driving aside from those with poor health. Those with Fair/Poor health were less likely (OR 0.17, <0.001) to be satisfied with life than those with Excellent/Very good/Good health.

		OR	95% CI	p-value
Age category				
65-74 years		-	-	-
75-84 years		1.68	1.05, 2.70	0.031
85+ years		2.41	0.87, 7.97	0.11
Sex/gender				
Male		-	-	-
Female		0.94	0.57, 1.53	0.8
Race/ethnicity				
White		-	-	-
Other		1.00	0.39, 2.92	>0.9
Province/region				
Atlantic provinces		-	-	-
British Columbia		0.39	0.18, 0.79	0.011
Ontario		0.70	0.33, 1.45	0.3
Prairie provinces		0.97	0.44, 2.11	>0.9
Québec		1.50	0.66, 3.42	0.3
Household income				
\$50,000-\$99,999		-	-	-
< \$20,000		1.30	0.63, 2.70	0.5
\$20,000-\$49,999		1.59	0.92, 2.74	0.092
\$100,000 - \$150,000		7.38	1.94, 48.9	0.011
> \$150,000		0.61	0.20, 2.15	0.4
Retirement status				
Retired		-	-	-
Not retired		4.89	0.81, 98.3	0.2
Partnership status				
Not partnered		-	-	-
Partnered		1.34	0.78, 2.31	0.3
General health				
Excellent/Very good/Good		-	-	-
Fair/Poor		0.17	0.11, 0.27	< 0.001
Religious affiliation				
Not religious		-	-	-
Religious		0.69	0.37, 1.23	0.2
Can-ALE		0.85	0.70,1.04	0.12
McFadden	0.15			
CoxSnell	0.129			
Nagelkerke	0.215			

Table 4.7. Logistic regression results of former drivers' life satisfaction (dependent variable) by SDC.

n = 699

Overall, the top reasons to stop driving include no longer needing to drive, safety, health, and financial related reasons. There are sociodemographic differences regarding reasons to stop driving. Men (19%) most commonly report safety, while 19% of women report no longer needing to drive. Men were also more likely to report health-related reasons compared to women. On the other hand, women more commonly reported financial-related reasons compared to men. There are also differences across income; those with lower income most commonly report financial-related reasons for driving cessation. Interestingly, those who live in the most favourable environments for active living most commonly report no longer needing to drive. More specifically, those in the Can-ALE class 5 are three times more likely to report 'no longer needing' to drive than most others. Conversely, those living in environments that are less favourable to active living commonly report safety-related reasons. These findings imply that areas with low Can-ALE scores may be less safe than areas with higher Can-ALE scores.

Ultimately, the results regarding driving cessation align with what has been previously found in the literature. Older adults who have stopped driving were more likely to be women, have lower household incomes, and have poor health. Regarding the relationship between driving cessation and life satisfaction, this research did not find a significant relationship. Additionally, this research did not find a significant relationship between sociodemographic characteristics and the desire to participate in more activities or life satisfaction among those who have stopped driving. While these models don't necessarily show clear or significant relationships with life satisfaction and desire for more activities, there's very clear evidence that those in high ALE classes are giving up driving more voluntarily than people in lower classes, who, presumably are more likely to need a car to reach desired destinations.

## Chapter 5: Discussion and Conclusion

This chapter concludes the thesis. It discusses the results and study limitations, offers concluding thoughts, and suggests future research.

## 5.1 Discussion

This thesis characterizes older adults' driving cessation and its relationship to life satisfaction in the Canadian context, drawing on data from the Canadian Longitudinal Study on Aging. Doing so provides a national snapshot of older adults' driving cessation, extending the literature on its impact on outcomes such as life satisfaction, which previously had limited insights, especially in the Canadian context. Below, I discuss the results and implications.

This thesis investigated reasons for driving cessation among older Canadians. Interestingly, "I no longer need to drive" was among the most common reasons for driving cessation among the CLSA subsample. This finding was surprising as it does not necessarily align with previous literature. In the case of this research, it is important to remember that the CLSA survey allows multiple responses related to the reason for driving cessation. As a result, no longer needing to drive may coincide with other reasons for driving cessation, such as physical conditions. Ultimately, safety concerns remain the top reason to stop driving. Interestingly, in this study, men more commonly reported safety-related concerns, while women more commonly reported 'no longer needing to drive' as their reason to stop driving. Unsurprisingly, financial reasons were most commonly reported by those in lower total household income categories. Future research can further investigate the "other" reported reasons for driving cessation among older Canadians.

Interestingly, those living in areas with favourable ALE scores most commonly report 'no longer needing to drive' as their reason for driving cessation. Areas with favourable ALE scores are known to be accessible and walkable, which can help people meet their needs without

driving. In this study, older adults living in areas with favourable ALE scores forgo the need to drive. Seemingly, they can live well and meet their needs without driving. To support older adults' driving cessation transition, policy should therefore prioritize building communities with favourable ALE scores. Communities with favourable ALE scores have built environments that are conducive to physical activity resulting from walking, cycling, and the use of public transportation. In other words, policy should prioritize building dense environments that foster accessibility, walkability, and safety for older adults to meet their needs and live well without driving. Prioritizing these communities in Canada will support older Canadians in thriving later in life, even if they are no longer driving.

Policy and programs should consider these differences in reasons for driving cessation while planning programs and policies to meet the transportation needs of older adults who have stopped driving. Policy and programs should also focus on meeting older adults' transportation needs across various modes while prioritizing safety. Gaining a better understanding of reasons for driving cessation is essential in developing suitable and adequate transportation infrastructure for the aging population.

This thesis also explored the relationship between other sociodemographic characteristics and driving cessation. It aimed to extend research by using Evan and Brown's PROGRESS framework, which inspired the inclusion of several sociodemographic characteristics in my analysis. With the PROGRESS framework as my guide, I included elements related to place of residence, race/ethnicity/culture/language, occupation, gender/sex, religion, socioeconomic status, and social capital in my analysis. This framework helped me ensure the application of an equity lens in my research and analysis. In this thesis, I analyzed the impact of PROGRESS factors on older Canadians' driving cessation and their life satisfaction. The results indicated that

only some of these factors have significant relationships to driving cessation or life satisfaction. However, based on my research goals and objectives, they were worth considering in my analysis.

In line with existing literature, the results show that former drivers are more likely to be older and female. They are also more likely to have lower household income and be of poorer health. In my review of the literature, I did not find research related to religious affiliation and driving cessation. Given my research goals and objective, I included a religion variable in my model. However, it did not produce significant results. In the future, considering religion may not be effective when investigating associations related to driving cessation.

This thesis also examined the influence of the built environment on driving cessation using the Can-ALE class index. The results suggest that a higher Can-ALE score, indicating a more favorable Active Living Environment, is linked to an increased likelihood of driving cessation. This positive association could be due to enhanced walkability and greater access to amenities or services, which may reduce the need or desire to drive. These findings highlight the role that environmental factors, particularly accessibility and walkability, play in driving behavior, suggesting that features of active-living-friendly environments may support both active lifestyles and driving cessation.

The results of this study, along with existing literature, demonstrate a clear connection between driving cessation and favorable ALE features like density and walkability. For older adults who may no longer be able to drive, the accessibility and walkability of their community are key to meeting their daily needs. Thus, policies should consider the importance of maintaining proper sidewalks, crosswalks, pedestrian signals, and public transportation options to create accessible, walkable environments for older adults.

This research also explored the relationship between driving cessation and life satisfaction but found no statistically significant relationship. This may be due to over-adjusting the model. While it is valuable to produce statistically significant results, this research aimed to include PROGRESS-related variables in my research. Therefore, I included these variables in my model. Confirming the findings in the literature, older adults were more likely to become more satisfied with life as they aged. This research also found that higher income is associated with life satisfaction. Being partnered is also positively associated with life satisfaction. Poor health is negatively associated with low life satisfaction. Interestingly, a more favourable Can-ALE score is associated with slightly lower odds of being satisfied with life. The relationship between life satisfaction and Can-ALE was unexpected, and these results may indicate that, in this context, the features that contribute to a more favourable Active Living Environment, such as walkability and accessibility, do not necessarily align with life satisfaction. These results could warrant further exploration into aspects of active living environments and how they might impact life satisfaction in ways that are not immediately obvious.

Lastly, this thesis examined the relationships between driving cessation, life satisfaction, and desire for more activity participation among former drivers. Aside from those with Fair/Poor health, there were no significant relationships between the sociodemographic characteristics and life satisfaction or the desire to participate in more activities, among those who have stopped driving.

Ultimately, the associations between driving cessation and sociodemographic characteristics aligns with what has been previously found in the literature. Older adults who have stopped driving were more likely to be women, have lower household incomes, and have poor health. Regarding the relationship between driving cessation and life satisfaction, this

research did not find a significant relationship. However, it is worth noting that the relationship between the built environment and driving cessation was significant. More specifically, Can-ALE had a significant relationship with driving cessation. The findings regarding reasons for driving cessation are interesting and worth considering when conducting future research and making policy. Women and those with favourable Can-ALE scores most commonly reported 'no longer needing to' drive. Men most commonly reported safety and health-related reasons. It is important context that former drivers with favourable Can-ALE scores most often reported 'no longer needing to drive' as a reason for driving cessation. Given that areas with high Can-ALE scores are conducive to physical activity via walking, cycling, and use of public transit, this could indicate that these areas support older adults' transition to driving cessation. Lastly, this research did not find a significant relationship between sociodemographic characteristics and the desire to participate in more activities or life satisfaction among those who have stopped driving.

# 5.1.1 Limitations

This study has many limitations. First, it is a cross-sectional analysis rather than a longitudinal analysis. Cross-sectional studies have limitations as they use data from one given point in time. On the other hand, longitudinal analysis employs data collected over multiple time points from the same participants to depict changes over time better. One should employ longitudinal methods to understand the timing of cessation and how life satisfaction or other quality-of-life outcomes change after cessation. Longitudinal methods are ideal for understanding the timing and changes related to driving cessation. However, due to the nature and timeline of this project, a cross-sectional analysis was more realistic. Future research on this topic should prioritize longitudinal methods.

Second, there are also limitations within the CLSA data collection process and sample size. The CLSA collection process introduces selection bias. For example, individuals living in

institutions are excluded. Additionally, only landlines were included in this study, which excluded cell phones. The CLSA claims this did not create a significant bias because, based on a survey of residential telephone service conducted by Statistics Canada in 2010, they found very few households with members over 45 years old who did not have a landline. However, this survey was conducted almost ten years before the CLSA was collected. With increased adaptation of technology, even among older populations, there is likely a bias introduced if only surveying landline users. The CLSA sample also underrepresents racialized populations in Canada. Lastly, this thesis analyzes a small sample. Both of these factors limit the generalizability of the findings from this study.

Third, using one part of the entire Satisfaction with Life scale (SWLS) may also be a limitation in this study. The SWLS has been proven to be a reliable measure of life satisfaction in its entirety but also in part (Pavot & Diener, 2008). In this case, the distribution of life satisfaction was not normal. Therefore, the variable was dichotomized. Additionally, the present study aimed to capture older adults' present satisfaction with life rather than the recollection of their past. Therefore, this study focused on the statement "I am satisfied with my life." from the SWLS to capture older adults' present life satisfaction. In the future, research investigating the relationship between driving cessation and life satisfaction can utilize the full SWLS.

Fourth, this thesis uses the baseline wave of data collected from 2011-2015 compared to the more recent follow-up waves collected from 2015-2018 and 2018-2021. This decision was made based on the availability of data and the complexity of joining the various follow-up datasets. Moreover, including the 2016 Can-ALE data in my analysis was important. Based on the Can-ALE collection date, the baseline wave was best aligned. Using the baseline data presented its limitations. For example, gender identity was not initially included in the baseline

survey. While I still investigated the theoretical and historical implications of gender on driving cessation and life satisfaction, this thesis employs a variable that captures the male and female sex. Still, it is essential to analyze the influence of gender identity in addition to sex. Including both variables can help inform transportation and health research and ensure its relevancy to the diversity of the aging Canadian population. Future research should investigate the influence of gender identity-related factors. The follow-up waves of data also included updated and new questions. While the follow-up waves have more recent data and up-to-date survey questions, I analyzed the baseline wave data to include Can-ALE variables. Future research should consider conducting longitudinal analysis and employing the follow-up waves of data.

Lastly, sociodemographic characteristics were included in my analysis based on the PROGRESS framework. Future research could use a more applicable framework and be more selective regarding the confounders. Being more selective while investigating sociodemographics associated with driving cessation should help prevent over-adjusting.

#### 5.1.2 Implications

Overall, the findings in this thesis have many implications. There are many themes to focus on based on the findings in this thesis. First, future research should further investigate the reasons for driving cessation among older Canadians. As we know, driving can play a crucial role in older adults' lives. Therefore, it is essential to understand why older adults stop driving. No longer needing to drive, safety, and financial concerns related to driving were the top findings for cessation. Future research should investigate the context of these reasons further so that policies and programs can better address these concerns.

Specifically, future research should investigate why older Canadians may no longer have the need to drive. Given the link between those with high Can-ALE scores and no longer needing to drive, research should further investigate this relationship. Based on the findings in this study,

we can deduce that features of built environments, such as high density, accessibility, and walkability, are conducive to older adults meeting their needs, even without driving. Therefore, transportation and urban planners should prioritize building communities with high Can-ALE scores.

For example, well-maintained sidewalks and clearly marked crosswalks promote walkability by providing safe, designated spaces for pedestrians. Pedestrian signals also enhance walkability by ensuring safe communication of pedestrian activity. Communities should prioritize these features and design them with older adults in mind. Engaging older adults in focus groups can offer valuable insights into their specific needs, helping to create environments that support their mobility. In addition to walkability, communities should incorporate other features that foster favourable Can-ALE environments, such as traffic circles, speed bumps, and raised crosswalks, which create a buffer between vehicles and pedestrians. Moreover, communities should ensure that public transportation facilities, such as bus stops and train stations, are easily accessible and well-maintained. These stops should be safe, convenient, and equipped with clear transit schedules and route information to assist riders in navigating their journeys.

We also should better understand the financial barriers related to driving and adjust programs and policies accordingly. Finally, it is important to investigate "other" reasons older adults stop driving. With this context, research and policy can better support planning for driving cessation. Older adults should plan for driving cessation. Anticipating and planning for driving cessation may be a key component of the transition and adjustment to driving cessation. Without having a personal vehicle and the ability to pick up the keys and drive at your discretion, more effort and planning may be required to meet your basic needs. While planning for driving

cessation, older adults and their respective networks should consider potential reasons for driving cessation. Considering the reasons can better inform their plans. As discussed earlier, the reasons for driving cessation can vary from no longer needing to drive to financial costs, safety concerns, and physical limitations. Understanding the reasons for driving cessation may be crucial to planning for the transition and measuring the outcomes.

Planning for driving cessation could include familiarizing oneself with and using public transportation. Planning for driving cessation could also encompass having specific plans to maintain social activities and engagement after driving cessation. Planning for driving cessation should also focus on maintaining a sense of control. Future research could further investigate planning for driving cessation in the Canadian context. Research could also focus on measuring the impacts of planning for driving cessation, especially on the former drivers' support networks. Ultimately, planning for driving cessation can help aid the transition while meeting needs and maintaining quality of life.

Given that one of the main reasons for driving cessation among older Canadians is a concern with safety, policy and infrastructure should be "age-friendly" and prioritize safety. Age-friendly communities should have physical and social policies, services, and structures designed to help older adults age actively and healthily. In other words, age-friendly communities should support older adults living safely, having good health, and staying engaged. Age-friendly communities and policies can align with ALE measures while focus on improving safe driving, roads, vehicles, and transportation alternatives designed for older adults' needs. Transportation options should also be affordable and physically accessible. Age-friendly communities generally understand and meet the age-related needs of older adults and recognize that older adults have a lot to offer their community. Prioritizing these areas can foster continued

mobility throughout older age and maintain quality of life. Future research must continue to understand why older adults stop driving older adults' safety concerns related to driving cessation and their mobility needs to build age-friendly communities.

# 5.2 Conclusion

Driving cessation is a reality in older age. In this thesis, I have leveraged a sizeable national dataset to characterize older Canadians' driving cessation and its relationship with their life satisfaction. Ultimately, this research aimed to answer the questions:

- 1. What are the reasons for driving cessation among older Canadians?
- 2. How do current and former drivers vary by sociodemographic characteristics among the older Canadian population? And, how does driving cessation impact older Canadians' life satisfaction and desire for more activity participation?
- 3. What is the association between the built environment (especially as it relates to a favourable Can-ALE score) and driving cessation among older Canadians?

This research also contributes to the literature on reasons for driving cessation. While older Canadians may prefer driving as their main mode of transportation, their need to drive seems to change as they age. According to this study, older Canadians stop driving because they no longer need to drive and have physical limitations, safety concerns, and associated financial costs. These findings also vary by sociodemographic characteristics. Men most often report safety-related reasons for driving cessation, while women more commonly report no longer needing to drive. Additionally, those with lower incomes also report financial-related reasons, which can be attributed to maintenance, insurance, and fuel costs. Future research should continue to focus on understanding older Canadians' reasons for giving up driving. Further investigation should be conducted into older adults' financial costs associated with driving.

Social support for older adults should be prioritized during the driving cessation transition and resources should be directed toward easing the financial burden of driving for older Canadians that are still able to drive.

Reasons for driving cessation also vary by Can-ALE score. Those with more favourable scores report no longer needing to drive, while those with less favourable scores report safety-related reasons for driving cessation. Favourable Can-ALE scores typically represent built environments with high density, accessibility, and walkability, which can support the transition to driving cessation. Research should further explore the relationship between built environment features found in areas with favourable Can-ALE scores and no longer having the need to drive. Research should also continue investigating the relationship between low Can-ALE scores and safety-related reasons for driving cessation. With this information, policymakers can prioritize features found in areas with higher Can-ALE scores in areas with lower Can-ALE scores to support older adults' transition to driving cessation.

I hypothesized that driving cessation is more likely among women, individuals with lower incomes, and those reporting poorer health, which was true in this study and confirms findings in the literature. I also hypothesized that driving cessation is less likely among those with religious affiliations, which I did not find true in this study. Additionally, I hypothesized that driving cessation would be likelier among those living alone, but this relationship was not significant. Living situation can also be closely related to partnership status. Therefore, I decided to remove the living situation variable from my models.

Moreover, I hypothesized that the built environment (as it relates to active living) would positively impact both driving cessation and life satisfaction. Both relationships were significant, but Can-ALE had a negative association with life satisfaction. Research should continue to

explore this relationship. I also hypothesized that driving cessation negatively affects life satisfaction and positively impacts the desire for more activity participation. However, I did not find significant relationships in either case. I hypothesized that the Can-ALE measure of active living friendliness would have increased the likelihood of driving cessation. The results confirm my hypothesis.

This study aimed to expand the literature by examining other sociodemographic characteristics that may influence driving status among older adults. The PROGRESS framework inspired the selection of sociodemographic characteristics. For example, the PROGRESS framework inspired the inclusion of religious affiliation in my models. I hypothesized that religious affiliation would influence driving status, as those with religious affiliation and obligations may be less likely to cease driving. However, in this study, religious affiliation did not significantly influence driving status. While the PROGRESS framework is useful in expanding the examination of various characteristics of health outcomes and behaviours related to the quality of life, a lack of significant relationships found in this research could be due to employing the PROGRESS framework and over-adjusting the model. Therefore, a more applicable framework to leverage may be more effective in examining associations with driving cessation.

Overall, this thesis answered the research questions proposed. It investigated reasons older Canadians stopped driving, characterized older former drivers, and examined the impacts of driving cessation on life satisfaction. While this thesis did not find significant relationships between driving cessation and factors such as life satisfaction or religious affiliation, it did find significant relationships between driving cessation and built environment features. Moreover, this research found a clear relationship between high Can-ALE scores and older adults no longer

needing to drive. Seemingly, older adults living in areas with high Can-ALE scores can meet their needs without driving. These findings provide additional context to the relationship between driving cessation and Can-ALE scores. In other words, these findings provide context on how environments with high density, accessibility, and walkability impact older adults' need to drive. Overall, these findings clearly show how the density, accessibility, and walkability of environments are conducive to older adults meeting their needs without driving. The findings can be used to inform urban and transportation planning policies and improve older adults' transition to driving cessation. Transportation solutions are not one size fits all. Still, there are many paths forward to meet older Canadians' transportation needs and help them live well throughout the stages of older age, especially driving cessation. References

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