AGING, DEPRIVATION, AND HEALTH: A “TRIPLE JEOPARDY”
FACED BY THE OLDER POPULATION

by

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Abstract

It is crucial to understand the factors that influence the health of Canada’s rapidly aging population. This thesis examines social and material deprivation among the older population in Canada, focusing on a case study of Kingston, Ontario, as well as the intersections between indicators of deprivation and health. A Canadian area-based deprivation index developed by Robert Pampalon was used to measure deprivation. Data were obtained from the Institut national de santé public de Quebec, the Canadian Institute for Health Information, the Canadian Community Health Survey, and the Canadian Census. Firstly, these data were used to examine relationships between deprivation indicators, aging and health. The percentage of the population in fair or poor health increases with age, as does the likelihood that this group will experience one or more indicators of deprivation. Secondly, the spatial patterns of deprivation were compared to the areas where the older population is living in Kingston. Social deprivation is positively correlated with areas with a higher percentage of those 75 years of age or more, whereas material deprivation is negatively correlated with these areas. Collectively, these results indicate that the older population in Kingston is facing a triple jeopardy of declining health, declining resources, and living in areas that are socially deprived. This population seems to be asset-rich, in that they own their own homes, but cash-poor. Overall, these findings contribute to our understanding of aging and the burden of deprivation faced by the older population. In order to facilitate healthy aging, it is important to take into account the social and material environments where the older population resides as part of an effort to maximize the health and wellbeing of this vulnerable population.
Co-Authorship

This thesis is the work of Keltie Gale in collaboration with her supervisor, Dr. Mark Rosenberg.
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# Table of Contents

Abstract.................................................................................................................................................. ii  
Co-Authorship....................................................................................................................................... iii  
Acknowledgements ............................................................................................................................... iv  
List of Figures ....................................................................................................................................... viii  
List of Tables ......................................................................................................................................... ix  
List of Abbreviations ............................................................................................................................ x  
Chapter 1 Introduction .......................................................................................................................... 1  
1.1 Population health and the lens of deprivation .................................................................................. 2  
1.2 Research questions ........................................................................................................................... 3  
1.3 Thesis organization ........................................................................................................................... 4  
1.4 Contribution ..................................................................................................................................... 5  
Chapter 2 Literature Review .................................................................................................................. 5  
2.1 Theories of Social Contact .............................................................................................................. 7  
2.2 Area-based Socioeconomic Measures ............................................................................................ 15  
2.2.1 Deprivation Indices Internationally .......................................................................................... 18  
2.3 Pampalon’s Canada-wide deprivation index .................................................................................... 24  
2.4 Links between deprivation, health, and aging ............................................................................... 31  
2.4.1 Teasing out the area vs. individual effects of deprivation on health ........................................ 32  
2.4.2 Adding the dimension of aging ................................................................................................. 35  
2.5 Filling a gap in the literature .......................................................................................................... 37  
Chapter 3 The Older Population ........................................................................................................... 38
3.1 Data .........................................................................................................................38
  3.1.1 Limitations ...........................................................................................................39
3.2 Demographics ..........................................................................................................40
3.3 The health of the older population .........................................................................41
3.4 Health, Deprivation, and Aging in Canada .............................................................43
  3.4.1 Social deprivation ...............................................................................................44
  3.4.2 Material deprivation ..........................................................................................47
3.5 Health, deprivation, and aging in Kingston ............................................................48
  3.5.1 Social deprivation ...............................................................................................49
  3.5.2 Material deprivation ..........................................................................................52
3.6 Conclusion ................................................................................................................53

Chapter 4 A Case Study of Kingston ...........................................................................55
  4.1 A case study approach ............................................................................................55
  4.2 Study Area ...............................................................................................................57
    4.2.1 Deprivation in Kingston ..................................................................................59
    4.2.2 The older population in Kingston ....................................................................61
  4.3 Statistically Linking Aging and Deprivation in Kingston .......................................62
    4.3.1 Demographic Data ..........................................................................................62
    4.3.2 Deprivation Scores ..........................................................................................63
  4.4 Method I ..................................................................................................................63
    4.4.1 Results ..............................................................................................................64
  4.5 Method II ................................................................................................................64
4.5.1 Results..................................................................................................................65

4.6 Limitations .................................................................................................................65

4.6.1 The deprivation index .........................................................................................65

4.6.2 Statistics vs. experience .....................................................................................68

4.6.3 Kingston as a Case Study Area .........................................................................69

4.7 Conclusion ................................................................................................................70

Chapter 5 Discussion and Conclusions ........................................................................71

5.1 Triple Jeopardy ...........................................................................................................71

5.2 A Heterogeneous Older Population .......................................................................72

5.2.1 Gender ..................................................................................................................74

5.3 Asset-Rich, Cash-Poor ............................................................................................75

5.4 Policy Implications ..................................................................................................76

5.5 Future Directions ....................................................................................................77

5.6 Conclusions ...............................................................................................................78

Appendix A Index of Multiple Deprivation Domains and Indicators .........................80

Appendix B Reference Maps .........................................................................................83

Bibliography ....................................................................................................................85
List of Figures

Figure 3-1 Fair and poor self-reported health in Kingston (CCHS Cycle 4.1) ..................42
Figure 3-2 Fair and poor self-reported health in Canada (CCHS Cycle 4.1) .................42
Figure 3-3 Population reporting having a regular doctor (CCHS Cycle 4.1) ...............43
Figure 3-4 Living arrangements of those in fair or poor health (CCHS Cycle 4.1) .........46
Figure 3-5 Marital status of those in fair or poor health (CCHS Cycle 4.1) .................46
Figure 3-6 Education level of those in fair or poor health (CCHS Cycle 4.1) ..........47
Figure 3-7 Income of those in fair or poor health (CCHS Cycle 4.1) .........................48
Figure 4-1 Social deprivation in Kingston ....................................................................60
Figure 4-2 Material deprivation in Kingston ...............................................................61
List of Tables

Table 2.1 Indicators used in UK deprivation indices (Census Dissemination Unit, 2011) .................................................................20

Table 2.2 Principal components of the deprivation index in Canada (Pampalon et al. 2009, 181) ..........................................................30

Table 3.1 The older population in Kingston, Ontario, and Canada (Statistics Canada 2012) ....................................................................40

Table 3.2 Indicators of deprivation divided by age, gender, and poor health (CCHS Cycle 4.1) .................................................................45

Table 3.3 Deprivation indicators compared to age (CCHS Cycle 4.1) ..............................................................................................50

Table 3.4 Deprivation indicators compared to self-reported health (CCHS Cycle 4.1) .................................................................51

Table 4.1 Demographic overview of the case study area compared to Ontario and Canada (Statistics Canada 2012, Statistics Canada 2007) ..........................................................................................58

Table 4.2 Summary output for regression of social deprivation and the older population .................................................................66

Table 4.3 Summary output for regression of material deprivation and the older population ........................................................................67
## List of Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABSM</td>
<td>Area-based socioeconomic measure</td>
</tr>
<tr>
<td>CCHS</td>
<td>Canadian Community Health Survey</td>
</tr>
<tr>
<td>CIHI</td>
<td>Canadian Institute for Health Information</td>
</tr>
<tr>
<td>CMA</td>
<td>Census Metropolitan Area</td>
</tr>
<tr>
<td>DA</td>
<td>Dissemination Area</td>
</tr>
<tr>
<td>IMD</td>
<td>Index of Multiple Deprivation</td>
</tr>
<tr>
<td>INSPQ</td>
<td>Institut national de santé publique de Québec</td>
</tr>
<tr>
<td>PCA</td>
<td>Principal component analysis</td>
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<td>QoL</td>
<td>Quality of life</td>
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Chapter 1

Introduction

As the number of older people in Canada increases, it is becoming vital to understand the factors that influence the overall wellbeing of this vulnerable population. Currently, those over the age of 75 make up 6.8% of the total Canadian population and are a rapidly growing cohort which is predicted to constitute 11.2% of the total population by 2031 (Statistics Canada 2012; Statistics Canada 2008). The Canadian Government’s main response to these figures has been to encourage healthy aging and to focus on aging-in-place. In their characterization of healthy aging, physical, mental and social wellbeing are framed as central factors, along with other variables such as independence and quality of life (Public Health Agency of Canada 2006). Especially given this broad definition, it is crucial to understand what the different aspects of aging will look like, what changes will occur with aging, and how these changes influence the overall wellbeing of individuals and populations.

In order to further our knowledge of the wellbeing of the older population, it is essential to examine deprivation and its impacts on this demographic. Many older people face the reality of declining levels of social support and interaction with their communities in conjunction with declining resources and declining health. The elements of this “triple jeopardy” intersect to create a specific context within which individual aging is taking place. This thesis examines the intersections of deprivation, aging, and health in order to better understand this context.
1.1 Population health and the lens of deprivation

A population health approach grounds this thesis. According to the Public Health Agency of Canada, this approach to health “aims to improve the health of the entire population and to reduce health inequities among population groups” (Public Health Agency of Canada 2012). The population group in question in this work is the older population, especially the oldest-old, a term regularly used in Canadian research to refer to the population 75 years of age or over. Unless otherwise specified, the term older population is used to refer to this same group.

Population health offers a broad notion of the concept of health, which takes into account social, economic, and physical environmental factors (Public Health Agency of Canada 2012). This interpretation of health is central to the focus on deprivation in this study. By looking at area social and material deprivation, environmental factors that may impact health are worked into the measures being used.

Deprivation as a theoretical concept emerged in Britain in the 1980s championed by Peter Townsend. He saw deprivation as “a state of observable and demonstrable disadvantage relative to the local community or the wider society or nation to which the individual, family or group belongs” (1987, 125). He also developed a framework for distinguishing between two forms of deprivation: social and material. Both of these forms of deprivation are closely linked to the overall wellbeing of individuals and communities. Social deprivation is defined as not having access to “ordinary social customs, activities and relationships” (Townsend 1987, 127) and serves to generalize “the condition of those who do not or cannot enter into ordinary forms of family and other social relationships”
Material deprivation is defined as “not having the material goods of modern life or the immediately surrounding material facilities or amenities” (Townsend 1987, 127).

Given the definition of deprivation as a relative concept, this thesis incorporates the idea of relativity throughout. The idea is inherent in the deprivation data used. To complement this structure, age and health data are manipulated to show relativity. The comparison categories are area-based for some indicators and age and gender based for others.

While all analyses in this thesis are done using population data, the idea of heterogeneity among the older population must not be forgotten. This is a population intersected by age, gender, marital status, living arrangements, income, education, and life experiences. Each of these factors, along with others, influences not only the presence or absence of deprivation and poor health but also the way these issues manifest in an individual’s life.

1.2 Research questions

This thesis aims to answer three key questions:

1. What are the relationships between health, age, and indicators of deprivation in Canada and specifically in Kingston?

2. Is there a statistical relationship in Kingston between the spatial distribution of the older population and area-based deprivation?

3. What is the nature of such a relationship and does the relationship differ between social and material deprivation in Kingston?
In order to address these questions, statistical data on deprivation, age, and health were retrieved from various Canadian public organizations. All these data were analysed to provide context and to answer the research questions directly. By answering the first research question, context is provided for the subsequent case study of Kingston, which strives to answer questions two and three. The results were interpreted within the framework of theoretical deprivation, recognizing the limitations of purely statistical analysis.

1.3 Thesis organization

This thesis is set up in such a way that it is designed to answer the proposed research questions. Beginning with a literature review, it will outline various theories of social contact, examine area-based socioeconomic measures focusing on deprivation indices, explain the development and use of Pampalon’s deprivation index, and conclude with a look at the research examining the links between deprivation, age, and health. Chapter three provides a detailed overview of the older population in Canada, using Canadian Community Health Survey data to examine the links between health, age, and indicators of deprivation. The fourth chapter is a case study of Kingston, examining the spatial distributions of the older population and deprivation. Finally, chapter five presents a discussion of the results and conclusions. Additional material can be found in the appendix at the end of the thesis to support the general conclusions and provide more detail for some of the findings presented.
1.4 Contribution

This thesis addresses several uncertain aspects of the relationships among deprivation, aging, and health. The case study of Kingston addresses a gap in the literature given that this relationship has not been tested in Canada. A thorough context of health, aging, and deprivation is explored in Canada and Kingston, examining marital status, living arrangements, education, and income as indicators of deprivation. Knowledge generated from this work will contribute towards a better understanding of the factors affecting experiences of aging, in particular the idea of healthy aging.
Chapter 2

Literature Review

Many fields of research seek to understand the influences affecting the health of both individuals and populations. One area of inquiry has focused on the social environment in which individuals reside and their social contact. Founded on fundamental theories of social contact, this work has shown that many different measurements of social connection are linked to health. Higher levels of social interaction and support, lower levels of social deprivation, and greater network resources have all been correlated with better health outcomes (Berkman et al 2000). Health and wellbeing can be influenced by the area in which an individual resides as well as that individual’s socioeconomic characteristics (Sooman and Macintyre 1995; Richardson et al 2013; Rosenberg 2013; Poortinga, Dunstan, and Fone 2008; Shott et al 2012).

Using area-based socioeconomic measures allows researchers to estimate individual challenges when the data necessary to do so on an individual scale is lacking. It also allows for the exploration of the contextual factors that may affect health independently of individual factors. The relationships between area-based measures and health have been demonstrated in numerous studies examining a variety of health indicators and health outcomes (see Section 2.4 for examples). Higher levels of deprivation are correlated with poorer health. These tools have also been used to study the older population, showing patterns that are consistent with those seen in the broader population.
2.1 Theories of Social Contact

Over the past 60 years, a variety of theories have emerged in an attempt to explain human social contact and its effects on daily life. These theories come from several disciplines and have been incorporated into research and society in numerous ways. Beginning with anthropology in the late 1950s, social network theory became solidified in the 1970s through the work of epidemiologists who focused on the network of relationships surrounding an individual and the social support the individual gained from this network. In the 1980s, the concept of deprivation, both material and social, began to gain popularity. Around the same time, social capital theory was developed, followed in the early 1990s by a new conceptualization of this theory. All of this work attempted to explain the effects of social relationships on the lives of individuals (see below).

The ideas at the foundation of social network theory originally came from anthropologists who were looking for a new way to conceptualize relationships between individuals when these relationships proved not to be based on traditional categories such as kin groups, tribes or villages (Berkman et al. 2000). In his study of class in a Norwegian island parish, Barnes develops the concept of the social network as it is still recognized. He describes the network as the following:

Each person is as it were, in touch with a number of other people, some of whom are directly in touch with each other and some of whom are not. Similarly each person has a number of friends, and these friends have their own friends; some of any one person’s friends know each other, others do not. I find it convenient to talk of a social field of this kind as a network. The image I have is of a set of points some of which are joined by lines. The points of the image are people, or sometimes groups, and the lines indicate which people interact with each other (1954, 43).
Barnes goes on to emphasise the lack of external boundary that characterises a network; individuals are not bound by kinship or by geography.

This notion of a network is also used by Bott in her study of English family structure, where she found the concept of a network much more appropriate than that of an organized group (1957). The ideas behind social network theory were picked up and applied to health by epidemiologists in the 1970s, specifically Cobb in his examination of the health effects of social support (1976) and Cassel in his discussion of physiological stressors and the potential for social support from the social environment and social circumstances to mediate the health effects of these stressors (1976).

Social network theory continues to be used currently. It is an approach that focuses on “characteristic patterns of ties between actors in a social system rather than on characteristics of the individual actors themselves” and which attempts to determine the effects of network social structures on the behaviour of individuals (Berkman et al. 2000, 845). Though the individual’s characteristics can affect patterns and behavioural outcomes, these patterns and outcomes remain the focus as opposed to the individual characteristics. Networks can be analysed at a variety of scales, often placing an individual at the centre or looking at networks of networks in communities. There has been an assumption in much of the literature using social network theory that the benefit of networks comes from the social support they provide (Berkman et al. 2000). This can be seen in the epidemiological origins of the theory, which focused entirely on social support. More recently, Berkman et al. have proposed expanding these ideas to include the greater social and cultural context in which the network is embedded as well as social
influence, engagement, contact, and access to resources that may be derived from networks (2000).

Deprivation as a theoretical concept was championed in the 1980s by Peter Townsend. In his 1987 paper titled simply “Deprivation,” the concept is defined as “a state of observable and demonstrable disadvantage relative to the local community or the wider society or nation to which an individual, family or group belongs” (125). Fundamental to this definition is the idea of relativity. Deprivation is not a concept that can be measured against an absolute standard but must account for an individual’s surrounding environment. It is also important to note that this idea is distinguishable from poverty in its application to physical, environmental, or social conditions and to specific circumstances, whereas poverty focuses solely on resources and general circumstances.

Townsend also distinguished between material and social deprivation. Social deprivation is defined as “not having access to ordinary social customs, activities and relationships” and provides a means for “generalising the condition of those who do not or cannot enter into ordinary forms of family and other social relationships” (1987, 128). In other words, social deprivation refers to “the fragility of the social network, from the family to the community” (Pampalon, Hamel, and Gamache 2009, 86). Material deprivation, on the other hand, is defined as “not having the material goods of modern life or the immediately surrounding material facilities or amenities” (Townsend 1987, 127). The two forms of deprivation often coexist but can act independently of one another. Individuals may face different levels or types of deprivation in different environments (e.g., in their homes or their workplaces) and can experience multiple
deprivation. Due to these particularities, deprivation must be examined within the more general context of an individual’s life.

As a result of the focus on the relative nature of deprivation, this theory depends on geography. It can be applied at many scales, from an individual within a community to a group compared to the wider society, but is most commonly used to compare small geographic areas. Deprivation indices use aggregate data on small geographic areas to create composite measures which are used to classify these areas based on level of deprivation compared to each other. The history of these indices dates back at least to 1971 when the Department of the Environment in the United Kingdom began using census data to try to identify disadvantaged areas, though their work was not specifically linked to deprivation as this theory would not be solidified until the following decade (Schuurman et al. 2007). Townsend created his own deprivation index for use in the UK, especially for use in public health planning, as did Carstairs and Jarman (cited in Niggebrugge et al. 2005). Currently, deprivation indices exist in a wide variety of countries, as is discussed in section 2.2 on area-based socioeconomic measures.

Social capital theory is another idea that emerged in an effort to explain the effects of social contact on the lives of individuals. There are two main schools of thought about social capital, each with their own definition of the term. Bourdieu’s definition is much more commonly used in sociology, whereas Putnam’s definition is more widely used across a variety of fields, especially in public health and policy planning.
The first contemporary analysis of social capital as a theoretical concept came from Pierre Bourdieu in the 1980s and was first published in English in 1985 (Portes 1998). Bourdieu defined social capital as “the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition” (1986, 248). He goes on to explain that these relationships exist only in practical terms and are based on material and symbolic exchanges. Bourdieu’s focus is decidedly individual and economic and he points to the “profits” that individuals can receive because of group membership. This idea can be broken down into two factors: the social relationship and the benefits of that relationship. Social relationships themselves, especially group membership, give individuals access to the resources possessed by others in the group. The benefits that can come from relationships depend on the amount and quality of those resources (Portes 1998). When taken together, these factors determine the volume of social capital possessed by an individual.

Bourdieu continually links social capital to economic capital and to a lesser degree cultural capital. He even goes as far as stating that “the profits which accrue from membership in a group are the basis of the solidarity which makes them possible” (1986, 249). He is careful to explain that group membership is not usually pursued in order to gain the profits of membership but that acquisition of social capital through group membership requires a deliberate investment of economic and cultural capital on the part of the individual. Though the timelines associated with exchanges of the different forms
of capital may vary greatly, Bourdieu emphasises the idea of a transaction underlying each of them.

The slightly more recent writing of Robert Putnam expands the concept of social capital from something possessed by individuals to a feature of communities, as well as deemphasizing the economic aspects of the theory. Putnam defines social capital as “features of social organizations, such as networks, norms, and trust, that facilitate coordination and cooperation for mutual benefit” (1993, 36). He focuses on “civicness” in neighbourhoods, towns, cities and even entire countries as a key indicator of social capital, emphasizing the collective nature of this concept (Portes 1998). In his argument that social capital has steadily declined in the United States since the 1960s, Putnam points to decreasing voter turnout, declining church attendance, falling union membership, lower engagement in parent-teacher associations, and irregularity in volunteering as indicators of a population less civically engaged in their communities and therefore a population with lower social capital (1995). He believes that the correct policy agenda can reverse these trends and help build social capital, which in turn may have the power to overcome issues of poverty, unemployment and corruption (Putnam 1993).

As Portes points out, “as a property of communities and nations rather than individuals, social capital is simultaneously a cause and an effect” (1998, 19). Though higher social capital is supposed to lead to economic development, lower levels of crime, and higher levels of cooperation, it also seems to stem from these factors. Cities that have strong economies and are well governed are identified as having high social capital. These are the same cities that are used as examples of how to increase social capital.
Poorer cities facing a variety of social issues have lower social capital because of these issues but these low levels of social capital are also blamed as the cause of the problems. The directionality in which social capital functions is lacking from Putnam’s explanation of the theory, as are the ways in which factors other than “civicness” affect outcomes.

In spite of these issues, Putnam’s ideas of social capital are still relevant to a discussion of social contact, especially as it relates to health outcomes. Carpiano proposes rethinking these ideas under the term of social cohesion in order to be able to distinguish between Bourdieu’s definition of social capital and Putnam’s ideas (2006). Carpiano then defines social cohesion as “patterns of interaction (e.g. the degree of interaction between neighbourhood residents and a community’s network ties) and the associated values linked to – or emanating from – these interactions (such as familiarity, interpersonal trust, and norms of reciprocity)” (2006, 167). This definition draws heavily on Putnam and retains the collective nature of the concept as it relates to communities as opposed to individuals. Being able to work with both the definitions of social capital and social cohesion allows researchers to account for situations where the two may not coexist. An example of this would be a socially cohesive neighbourhood where residents know and trust each other and share similar values but certain individuals do not rely on others for acquiring resources that they would be unable to attain on their own. These individuals live in an area with high levels of social cohesion but do not have strong social capital.

The importance of understanding a variety of theories of social contact is evident when researchers need to select the most relevant theory for their research goals. Certain differences are fundamental to the theories, for instance, the presence or absence of a
bounded geography. By definition, social networks are not contained by geography and can spread far beyond a single area or even a single country. Bourdieu’s version of social capital focuses strongly on the individual, meaning that the geographic area is downplayed. In contrast, Putnam’s version of social capital focuses exclusively on areas, as he looks at social capital as a feature of geographically bound communities. Geography is also important to the idea of deprivation, especially when measured for small areas relative to each other. Even when examining individual deprivation, the concept only applies as observed relative to the local community.

As a result of the geographically bound nature of the theories, the ideas of Townsend and Putnam are central to this thesis examines conditions experienced in a certain area as opposed to relationships between individuals. Deprivation includes the material conditions and the social conditions that exist, with the social conditions including typical social customs, activities, and relationships. Putnam’s social capital focuses solely on the social conditions, though recognizes that these are affected by material conditions. The social conditions considered by Putnam are less about individual interactions and highlight levels of engagement within a community and to the broader society. This difference in the way conditions are conceptualized can be seen in the ways that these two theories attempt to quantify social conditions. Putnam emphasizes collective activities, such as voter turnout, volunteerism, and union membership in order to measure social capital. Deprivation indices measure the proportion of individuals in an area experiencing a certain condition, living alone for example. These different indicators are clearly based on the nature of the social conditions of interest to each theorist.
Social network theory and Bourdieu’s social capital theory also differ in their focus, though they are both centred on individual relationships. Social network theory places emphasis on numbers of relationships and the web of interactions between those in a network. The theory has most often been used in studies measuring social support, with those with a larger, more active network assumed to be receiving a higher level of support (Berkman et al. 2000). While Bourdieu also looks at individual relationships and groups, the attention is shifted away from the actual relationships to the benefits that are gained from these relationships. In this conceptualization, all relationships are not equal as each relationship does not provide equal benefits.

As is clearly shown by the various theoretical conceptualizations of social contact, this phenomenon has a major impact on the lives of individuals and communities. Each of these theories serves a purpose and has a specific context in which it is most appropriately used. In this research, the concept of deprivation will be used. It is the most fitting theoretical framework for examining the role of individual and area-based factors that affect the study population in question.

2.2 Area-based Socioeconomic Measures

Area-based socioeconomic measures (ABSMs) are tools designed to provide socioeconomic data of a geographic area, rather than of individuals. These measures can include a single variable, such as neighbourhood income, or can include multiple components compiled in an index. The early use of ABSMs began in England in the second half of the nineteenth century to examine the geography of health, particularly the differences between urban and rural areas and wealthy and poor areas (Denny and
Davidson 2012). By the 1930s, social analyses were being conducted in the United States using data aggregated by census tract, and by the 1950s, these data were being used to examine patterns in health (Denny and Davidson 2012). In the early 1970s, the Department of the Environment in the UK was using census data to identify the areas where a higher proportion of the inhabitants were exposed to inferior social and economic conditions (Schuurman et al. 2007).

In the last two decades, there has been a significant rise in the use of ABSMs, especially in public health and the allied social sciences (Denny and Davidson 2012). Often researchers encounter a lack of individual level socioeconomic data in information systems focused on health and wellbeing. In order to overcome the lack of data, an ecological approach can be used, with aggregate data of relatively small geographic areas substituting for individual data (Pampalon and Raymond 2000). Though many studies indicate that individual economic data show stronger relationships to several health indicators, using area-based measures can act as an appropriate proxy and can serve as a tool for examining inequalities when faced with a lack of individual data (Pampalon, Hamel, and Gamache 2009). These measures can produce estimates of inequalities that are statistically reliable and are consistent with the inequalities seen in analysis of individual data (Pampalon, Hamel, and Gamache 2009).

Furthermore, there has been an increasing emphasis on the conceptual and theoretical role of “place” in health. This has not only contributed to the rise in the use of ABSMs to understand the contextual influences of place on health, but has also facilitated the production of evidence needed for place-based health interventions (Denny and
It is important to keep in mind that “individual and area-based socio-economic indicators do not reflect the same reality; they are based on different constructs and they contribute independently to the health gaps observed” (Pampalon, Hamel, and Gamache 2009, 86). In other words, ABSMs reflect neither “exclusively individual characteristics … [nor] only contextual phenomena” (Denny and Davidson 2012, 5).

It is also important to understand that these data reflect the socioeconomic context at the time of collection, which may not coincide with the time period of interest in a study (Krieger et al. 2003). This problem can be mitigated by the relatively frequent collection and publishing of census data upon which ABSMs are often based, allowing for updated data.

For ABSMs to serve as valid proxy measures for individual data, scale becomes an important factor. When working with larger areas, there is a much higher risk that the individuals in the area are not socioeconomically homogeneous enough to provide accurate data. There is a positive correlation between higher levels of homogeneity within each area and greater reliability of the aggregated data to act as a proxy (Denny and Davidson 2012). Schuurman et al. show that there is a statistically significant difference between the populations identified as being in a certain socioeconomic category when the data are analyzed at the level of the census tract versus at the level of the dissemination area in Canada, showing that the size of the individual data measurement areas affects the results of an ABSM (2007). Given this relationship, it is
important for researchers using ABSMs to be thoughtful in selecting their scale and to use the smallest geographic area upon which data are available.

Researchers must keep in mind the area-based nature of these measures in interpreting the results of ABSMs. These tools are not designed to target individuals and do not allow users to identify individuals’ socioeconomic status. The Guidance Document published alongside the Index of Multiple Deprivation 2010 results in the UK clearly states that in each area, there are individuals who are deprived and individuals who are not deprived; the goal of the tool is not to identify these individual differences (Lad 2011a).

Finally, a note on language is required. While academics often discuss deprived areas, it is not the area itself that ABSMs identify as deprived. These tools are used to classify populations group by geographic area; the outcome of these tools is affected by the circumstances and lifestyles of the people living in that area, not by the area itself. While it is recognized that physical environment is important to health and wellbeing, teasing out the impact of the environment is not the goal of ABSMs.

2.2.1 Deprivation Indices Internationally

In Canada, ABSMs have historically used neighbourhood income as the sole indicator of social disparity, while internationally more robust systems have been developed, specifically deprivation indices (Pampalon et al. 2009). Once a deprivation index is developed for a certain area, it is often a relatively simple, inexpensive way to measure the socioeconomic conditions in that area given that these indices are usually based on widely available census data and a method of statistical analysis that can be
followed from the original development (Testi and Ivaldi 2009). Deprivation indices use indicators that are shown to be linked to either material or social deprivation and combine these indicators to create an aggregate score for each area in question. These scores can then be used to rank the areas, showing the most and least deprived. This ranking is essential to account for the inherently relative nature of deprivation.

In the United Kingdom, there are several well established deprivation indices. The Townsend, Jarman, and Carstairs indices were all designed to work within the health arena, specifically to identify areas with greater than average health needs and examine differences in general practitioner workload (Niggebrugge et al. 2005). All three indices use census data collected every ten years and are still used in the UK (Census Dissemination Unit, 2011).

The Jarman index does not focus specifically on the concept of deprivation but was developed with a view to identifying underprivileged areas (Niggebrugge et al. 2005). Originally published in 1983, it used indicators that have since been linked to both material and social deprivation. The Townsend Index was originally published by Townsend, Phillimore, and Beattie in their 1988 book entitled Health and Deprivation: Inequality and the North. The Carstairs Index followed shortly after, published by Carstairs and Morris in 1991. Table 2.1 shows the indicators that were included in each of these indices as well as the past version of the United Kingdom Department of the Environment (DoE) index.

While each of these indices uses similar indicators, there are some discrepancies to note. Each of the indices measures unemployment in the population 16 years of age
and over, but the Carstairs index makes the distinction of only measuring male unemployment. Carstairs also measures low social class differently than the Jarman index, though both use the employment category identified in the census to classify social class.

Another long standing deprivation index in the UK is the DoE index. This index has changed significantly in the new millennium. Previously, the index included six variables and was comparable to the Townsend, Jarman, and Cartairs indices.

**Table 2.1 Indicators used in UK deprivation indices (Census Dissemination Unit, 2011)**

<table>
<thead>
<tr>
<th></th>
<th>Jarman</th>
<th>Townsend</th>
<th>Carstairs</th>
<th>DoE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unemployment</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Household overcrowding</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Lone pensioner households</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Single parent households</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Individuals born in the New Commonwealth</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Children under 5 years of age</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heads of households in low social classes</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>One year migrants</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Households with no car ownership</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>
Households with no home ownership | X |
Households lacking basic amenities | X |

Notes:
Household overcrowding is defined as more than one person per room.
One year migrants refers to people who had a different address one year before the census data was collected.
Lacking basic amenities is defined as no exclusive use of a bath or shower and an inside toilet.

(Census Dissemination Unit 2011). This index was replaced by the index of multiple deprivation (IMD), the most recent version being the IMD2010 (Lad 2011b). The index now includes 38 indicators grouped into seven different domains: income, employment, health, education, crime, access to services, and living environment. Scores and ranks for each area are calculated for each of these domains as well as overall, providing a multiple deprivation score (Lad 2011b). See Appendix A for a complete listing of the indicators used in the IMD2010.

The IMD is not without critique, particularly in the choice of domains and indicators. A study by Niggebrugge et al using the IMD2000 showed that the access to services domain was negatively correlated with the other five indicators (the crime domain was not included in the IMD2000), suggesting that access should not be combined into a composite score along with the other domains (Niggebrugge et al. 2005). When compared to a more detailed analysis of travel times and transportation availability, the access domain was seen to lack predictive power. This trend was especially strong in rural areas, which is important to note given that access to primary
care is a more pressing public health issue in these areas. Given the challenges within the access domain, Niggebrugge concludes that the IMD2000 needs to be used with caution when assessing health service accessibility in rural areas (Niggebrugge et al. 2005).

Another well established and well used index is the New Zealand small-area index of relative socioeconomic deprivation (NZDep). This index was developed in 1995 after government and social agencies called for a socioeconomic measure that used small geographic areas, as the previous index did not provide data at a fine enough scale to identify small pockets of deprivation (Salmond and Crampton 2012). The tool was intended to inform resource allocation, research, and advocacy and was quickly taken up by health researchers and government planners, especially at the local level. In the most recent iteration of the index, NZDep2006, there are nine indicators used, with data coming from the census: receiving a means-tested benefit, households with “equivalized” income below a certain threshold, people not living in their own home, single-parent families, unemployment, qualifications, households below an “equivalized” bedroom occupancy threshold, no access to a telephone, and no access to a car (Salmond and Crampton 2012). The median population size for the census areas used is approximately 90 persons, but in order to produce robust values from the index, some areas are combined so as to have a minimum population of 100 persons (Salmond and Crampton 2012). Areas are ranked and divided into a ten-point scale or, less frequently, into quintiles.

This index is widely used in New Zealand, especially by health researchers and social service planners as a variable of interest or a confounding variable. For example,
the Ministry of Health and the district health boards used NZDep in the health needs assessment for the country. The central government has also used this index as a weighting factor in its distribution of resources, in order to direct funding to the areas of highest need (Salmond and Crampton 2012). There are plans to continue updating this index with each new census. These are typically five years apart but the devastating earthquake in Christchurch in 2011 has postponed the current census to 2013.

Other countries have been developing a variety of deprivation indices in recent years. Havard et al. published their work on a small area index for use in France in 2008. Similar to the IMD in the UK, the French index uses nineteen variables which are classified based on the aspect of socioeconomic status they intend to examine. The classifications are income, employment, housing, family and household, and education level (Havard et al. 2008). Many of the indicators used appear to capture different parts of the same issue; for example, primary residences with more than one person per room and mean number of people per room are both included in the index, as are households without a car and households with two or more cars. While this has the potential to provide a greater level of detail in the data, the exact purpose of these seemingly overlapping indicators is unclear. Additionally, the French index focuses very strongly on material deprivation, with only two of the indicators used directly related to social deprivation (single-parent families and foreign population) (Havard et al. 2008). While the study shows a positive correlation between social deprivation and unemployment, household overcrowding, low education level, and low income, these variables are more strongly associated with material deprivation.
There have also been attempts to develop a deprivation index in Spain, along with the use of a modified Townsend index since the early 1990s. This new index uses data at the level of the municipality and includes unemployment, illiteracy, and private vehicle ownership as indicators (Daponte-Codina et al. 2008). These three indicators are also used in the Townsend index but Townsend includes home ownership as well. Self-reported health has been associated with deprivation using this index (Daponte-Codina et al. 2008). Other indices in Spain use a similar structure and similar indicators. One index used illiteracy, social class, and overcrowding (Benach and Yasui 1999), while another used illiteracy, unemployment, and the percentage of manual labourers (Sánchez-Cantalejo, Ocana-Riola, and Fernández-Ajuria 2008). Each of these indices has a focus on material deprivation. While indicators such as education and employment can be related to social deprivation, they are much more strongly related to material deprivation.

While these examples do not provide an exhaustive review of all of the ABSMs currently in use internationally, they provide a sampling of the most well used deprivation indices as well as some more recent developments. They collectively show that while there are certain patterns that emerge across the structure of many indices, there is no standard index. Each index is influenced by the context in which and purpose for which it is created, as well as by the available data in each location.

2.3 Pampalon’s Canada-wide deprivation index

Given the presence of well-developed and consistently used deprivation indices internationally, particularly in the UK and New Zealand, it is surprising that there is not a
long-standing system for measuring socio-economic characteristics in Canada (Pampalon and Raymond 2000).

At the provincial level, one example of a deprivation index is the socio-economic factor index (SEFI) developed for use in Manitoba. It uses four factors from the Canadian census at the level of the dissemination area: household income, unemployment, no high school graduation, and single-parent families (Chateau et al. 2012). This choice of indicators is consistent with other material deprivation indices reviewed above, which tend to include indicators of income, employment, and education. Studies in Manitoba using SEFI showed that the proportion of single-parent families is strongly associated with material deprivation, reinforcing the idea that SEFI focuses on this type of deprivation (Chateau et al. 2012). Also using SEFI, results have been correlated with several health measures, including premature mortality rate, potential years of life lost, life expectancy, and self-reported health (Chateau et al. 2012).

Robert Pampalon, working at the Institut national de santé publique de Québec (INSPQ), has developed the only national tool available for research on deprivation across Canada. He clearly stated when he began his project that his goal was to develop a deprivation index that “has explicit conceptual foundations, that can be incorporated into databases in the health and social services sector, and that can be used to track those inequalities in health and well-being that are associated with deprivation” (Pampalon and Raymond 2000, 104). Originally developed for use in Quebec, the index has now been expanded for use across Canada.
In order for the index to provide the best proxy for individual indicators, the spatial unit on which it is based needs be as small as possible. This scale ensures the highest degree of homogeneity among the residents of the area. In Canadian census data, the smallest spatial unit is the dissemination area (DA). These areas are based on population and generally contain between 400 and 700 persons (Pampalon et al. 2009).

In the first stage of the construction of Pampalon’s index, the DAs used covered 93 percent of the Canadian population. Those DAs that were excluded covered those with no population, those with more than 15 percent of the total population in collective households or institutions, those that were lacking socio-economic data, and those in Nunavut or on a First Nations reserve (Pampalon et al. 2009). In the second stage of the index development, obtained deprivation values were projected onto additional DAs that had originally been excluded, leading to an index that that covers close to 98 percent of the total Canadian population residing in 47,464 DAs (Pampalon et al. 2009).

The indicators used to construct the index needed to meet four criteria: have known links to health based on a literature review; have previously been used as geographic proxies; have a clear link to material or social deprivation; and be available in Canadian census data at the level of the DA (Pampalon et al. 2009). Using these criteria, six indicators were identified for use in constructing the index: the proportion of people with no high school diploma; the employment/population ratio; average income; the proportion of individuals living alone; the proportion of individuals who are separated, divorced, or widowed; and the proportion of single-parent families (Pampalon et al. 2009).
The indicator selection criterion of previous use as a geographic proxy provides a wide variety of potential indicators. Gordon provides a list of variables that have been used in British deprivation indices, indicating that each of these variables has been used as a geographic proxy, and classifies these variables based on their links to material or social deprivation (2003). This classification indicates that each of the variables also meets the criterion to have a clear link to material or social deprivation. Material variables include overcrowding in the home, no car, lack of access to basic amenities, home not owner-occupied, home not self-contained, no central heating, living below the occupancy norm, children in unsuitable accommodation, and living on derelict land. The social deprivation indicators identified are unemployment, youth unemployment, single parent households, low social class, unskilled workers, single pensioners, elderly households, dependents, proportion of the population from the new commonwealth, children under five, migrants, educational participation at the age of seventeen, children in low-earning households, income support, low educational attainment, long-term unemployment, and house contents insurance (Gordon 2003). In the United States, deprivation indices are far less prevalent than in the U.K, though studies on deprivation have used some of the same indicators. These indicators include neighbourhood social class composition, education level, unemployment rate, and average income (Krieger et al. 2003).

In their examination of seven deprivation indices, Schuurman et al. show that each of the indicators included in Pampalon’s index has previously been used as a geographic proxy in a deprivation index (2007). This study also makes the case for using these
indicators at the smallest geographic unit at which data is available. This argument strengthens the case for the use of the indicators chosen by Pampalon, as this is the unit already for use in the index.

The study by Niggebrugge et al. shows that including geographic access to services in an index intended to be used in public health fields, as was done in the IMD, confounds the issue of deprivation (2005). Other aspects of deprivation that are included in the IMD have been directly linked to worse health outcomes, with some mechanisms identified. The four access to service indicators included in the IMD are the distances to the nearest post office, large food shop, general practice surgery, and primary school. While a lack of access to these services may make poor health worse, it does not cause ill health, contrary to what studies show of the other indicators (2005). Niggebrugge et al. make the case for keeping access to services a separate, though clearly related, concept to material deprivation and not including it in deprivation indices. Given Pampalon’s criteria that indicators have a known link to health, it is logical to exclude access to services as a potential indicator in the index.

Other studies linking health and deprivation support Pampalon’s choice of indicators. Curtis suggests that high levels of poverty, higher unemployment rates, and social fragmentation and social isolation are all positively associated with higher levels of psychiatric hospital use (2006). Populations with low income, high unemployment, low educational attainment, and low standards of housing are known to have worse health than the overall population (Krieger et al. 2003). In Italy, living alone, unemployment, dependency ratio, and percentage of people who are separated, divorced, or widowed
were used as geographic proxies shown to be linked to psychiatric service use. Single parent families and level of education were included in a follow up study that broadened the index and are also linked to psychiatric service use (Tello et al. 2005).

Taken together, these studies clearly show the justification behind Pampalon’s choice of six indicators. The final decision criterion for the indicator choice is the availability of the data in the Canadian census at the level of the dissemination area. This is the most practical of the criteria, as it simply ensures that the data needed will be available at the necessary scale.

For each chosen indicator, the population aged 15 years and older is considered. All of the indicators except for the proportion of single parent families were adjusted according to the age-sex structure of the Canadian population using direct standardization in order to ensure that the variation seen is socio-economic rather than demographic (Pampalon et al. 2009).

Once each indicator had been adjusted, certain indicators were transformed in order to normalize their distributions. Following this process, the integration of the indicators was completed using principal component analysis (PCA). This method produced a factor score for each component, which represents the value of the component in each DA. The DAs were ranked by factor score then divided into quintiles, with each quintile representing 20 percent of the overall population. Grouping the DAs helps ensure statistical accuracy in analyzing social inequalities (Pampalon et al. 2009).

The Canada-wide PCA showed that the index can be broken down into a two-component factor structure. As is shown in Table 2.2, each of the components
summarizes approximately one third of the variation associated with the indicators included in the index, accounting together for a total of 67 percent of the variation (Pampalon et al. 2009). The values shown in the table are saturations and should be interpreted as correlation coefficients between the indicator and the component. Each component is clearly related to one aspect of deprivation; the first component primarily shows variation associated with education, employment, and income, while the second component shows variation in being separated, widowed, or divorced, living alone, or being a member of a single-parent family. This division is consistent with the division between material and social deprivation (Pampalon et al. 2009).

**Table 2.2 Principal components of the deprivation index in Canada (Pampalon et al. 2009, 181)**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Component</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Material</td>
<td>Social</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>-0.83</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Employment</td>
<td>0.71</td>
<td>-0.19</td>
<td></td>
</tr>
<tr>
<td>Income</td>
<td>0.82</td>
<td>-0.27</td>
<td></td>
</tr>
<tr>
<td>Living alone</td>
<td>-0.01</td>
<td>0.84</td>
<td></td>
</tr>
<tr>
<td>Single, widowed or divorced</td>
<td>-0.16</td>
<td>0.87</td>
<td></td>
</tr>
<tr>
<td>Single parent family</td>
<td>-0.34</td>
<td>0.65</td>
<td></td>
</tr>
<tr>
<td>Explained variance</td>
<td>34%</td>
<td>33%</td>
<td></td>
</tr>
<tr>
<td>Cumulative variance</td>
<td>34%</td>
<td>67%</td>
<td></td>
</tr>
</tbody>
</table>
Since its creation, this deprivation index has been widely used across the health and social service fields, with a specific focus on public health. Pampalon identifies four main types of use of the index: “describing geographic variations in deprivation, illustrating inequalities in population health status and service use according to deprivation, supporting the development of health reports and policies, and guiding regional resource allocation” (Pampalon et al. 2012, S18).

Overall, these analyses have shown some simple spatial trends in deprivation. The outlying parts of a region tend to show high levels of material deprivation, while urban centres seem to have a higher burden of both material and social deprivation downtown and lower levels of both forms of deprivation in suburbs (Pampalon et al. 2012).

2.4 Links between deprivation, health, and aging

It is widely recognized that social relationships have important and powerful effects on physical and mental health (Berkman et al. 2000). Throughout the literature, there is a wide variety of links that have been found between different indicators of social contact or social support and specific aspects of health. Some examples include links to mental health (Fone, Lloyd, and Dunstan 2008; Rhodes et al. 2004), mortality (Pampalon, Hamel, and Gamache 2008; Sundquist, Bajekal, and Johansson 1997), cancer screening and survival (Haynes, Pearce, and Barnett 2008; Logan and Mcilfatrick 2011), environmental health (Crouse, Ross, and Goldberg 2009), cardiac health (Greenwood et al. 1996), and birth weight (Reime et al. 2006). There has also been work done linking social factors to overall health (Curtis, Setia, and Quesnel-Vallee 2009; Haines et al. 2009; Jen et al. 2010; Moore et al 2011), though this body of work leaves many areas still
to be investigated. Furthermore, low social contact has been shown to be correlated with higher incidence of psychiatric service use (Curtis et al. 2006; Tello et al. 2005). Throughout this literature, higher levels of social contact and social support and better social relationships are linked to better health outcomes. This trend appears to be consistent throughout the variety of health measures that are examined and across the different indicators of social contact that are used.

**2.4.1 Teasing out the area vs. individual effects of deprivation on health**

There are numerous studies specifically examining whether the links between deprivation and health are a result of area deprivation or are solely an expression of individual characteristics. Overall, these studies conclude that deprivation at the area level is correlated to health independently of individual characteristics, reinforcing the use of deprivation indices to explore contextual influences on health.

A study in the UK exploring behavioural and psychosocial factors related to self-reported health compared the results of an individual deprivation measure that used education, housing tenure, and car ownership as indicators and an area-based deprivation measure using a Glasgow-specific index based on 29 deprivation indicators (van Jaarsveld, Miles, and Wardle 2007). This study focused exclusively on material deprivation. The study found neighbourhood deprivation to be more strongly related to behavioural than to psychosocial factors, whereas individual deprivation was strongly related to both. Neighbourhood deprivation was a risk factor for poor self-reported health after controlling for individual deprivation and vice versa, showing that these two types of deprivation have independent effects on health.
Another study in the UK also examined the potential mediating effects of individual characteristics on the relationship between area deprivation and health but focused on individual social capital (Verhaeghe and Tampubolon 2012). Social capital was assessed using a survey with questions focused on generalized trust, social participation, and network resources. This allowed the researchers to examine both Putnam’s conceptualization of social capital (the “social cohesion perspective”) and Bourdieu’s ideas of social capital (the “network resource perspective”) (Verhaeghe and Tampubolon 2012, 355). Deprivation was measured using the index of multiple deprivation. A mediation effect was found to be present but relatively small. The negative effects of neighbourhood deprivation on self-reported health were slightly diminished after controlling for individual social capital but remained significant. In particular, the domains of education, income, and health from the IMD were most strongly related to self-reported health. Again, this study points to the importance of examining area-level deprivation.

These findings have also been supported by work done in Canada at vastly differing geographic scales. One study examined a single community in Calgary to explore the effects of varying deprivation on health at this small scale (Godley et al. 2010). A random telephone survey was used to collect information on self-reported health, as well as demographic factors. Deprivation was measured using census data at the DA level and four indicators: median family income, incidence of low income as defined by the Statistics Canada low income cut-offs, the percent of lone parent
households, and average education. The findings showed that in Calgary, area deprivation has a relationship to health independent of individual characteristics.

A study at a contrasting scale did a 22-year follow-up study of more than 500,000 Canadians in ten Ontario cities between 1982 and 2004 (Ross, Oliver, and Villeneuve 2013). Area deprivation was determined using Pampalon’s deprivation index but was measured at the level of the census tract as opposed to the dissemination area. This change was made due to the stable nature of census tracts over time and the use of historical data. Individual data were collected from tax records and the health outcome examined was mortality (180,000 deaths over the follow up period). Results showed that living in a socially or materially deprived neighbourhood was associated with an elevated mortality risk independent of individual characteristics. For example, among those with lower income, living in the least socially deprived areas showed a survival gap of 10 percent over those living in the most socially deprived areas. Looking at materially deprived neighbourhoods, the gap was 7 percent.

Another study examined the role of socio-geographic mobility on the links between area deprivation and health. Curtis et al. were exploring the idea of health selection, a process in which people in poorer health, especially those with chronic conditions, are more likely to move into or remain in deprived areas, whereas those in better health are more likely to move into or remain in less deprived areas (Curtis, Setia, and Quesnel-Vallee 2009). Using data from the National Population Health Survey and from Pampalon’s deprivation index, they examined restriction of activity due to chronic conditions and psychological distress as health outcomes. The association between each
of these outcomes and area-deprivation was much smaller but still significant when controlling for individual characteristics. The clearest result was that those in psychological distress were more likely to move to areas that are more socially and materially deprived, suggesting that the connection between area deprivation and psychological distress may be a result of selective migration effects.

It is evident from these studies that area-based deprivation is related to health outcomes independently of individual characteristics. While individuals clearly make up the populations studied in each areas, the contextual factors present in the area and represented here by area deprivation have an influence on health. These findings support the use of area-based measures for exploring population health.

### 2.4.2 Adding the dimension of aging

Adding a critical dimension to this thesis, some work has been done looking at the connections between deprivation, health, and aging. Deprivation indices are developed to measure deprivation in the total population and area, not specifically focused on the issues facing the older population. This issue becomes especially pressing when we consider that health status declines with age.

A trio of studies by Iain Lang examine results of the English Longitudinal Study of Ageing (ELSA) in relation to deprivation. ELSA is a national survey designed to study the relationships between health, functioning, and socioeconomic factors of a probability sample of non-institutionalized people over the age of 50 (Lang et al. 2008a). Deprivation measures for these studies came from the IMD, adjusting for health, lifestyle, and other socio-demographic confounders using data from ELSA. One study examines cognitive
function using individual cognitive function scores (Lang et al. 2008a). A second study focuses on incident mobility disability, measured in ELSA using changes in the results of a gait speed test for those 60 years of age or over (Lang et al. 2008b). A third study assesses the effects of area deprivation on frailty, using data from ELSA on a frailty index based on 58 potential deficits (Lang et al. 2009). All three of these studies show that poorer health outcomes for older people are associated with living in deprived areas, independent of individual characteristics.

Another UK study examined quality of life among those 75 years of age or over compared to area deprivation (Breeze et al. 2005). Quality of life (QoL) interviews were conducted and designed to include four dimensions of the UK version of the sickness impact profile: home management, mobility, self-care, and social interaction. The interviews also included the 17-item Philadelphia Geriatric Morale Scale, a tool specifically developed for use with older people. Area deprivation was measured using the Carstairs index. A clear link was found between living in a deprived area and a worse sickness impact profile, as well as a higher risk of poor morale, even when controlling for health status. These results support the idea that area deprivation is linked to the health and functioning of the older population.

Another UK study also examined quality life in the older population, focusing on four different domains: physical, psychological, social, and environmental (Mõttus et al. 2012). QoL was assessed using a 26-item version of the World Health Organization QoL measure. The IMD was used to measure deprivation. Deprivation was associated with perceived quality of life in the physical and environmental domains, independent of
various confounders and individual characteristics. Deprivation was not associated with quality of life in the psychological or the social domains, though the social domain was covered by only three variables and may have been too specific a measure to be able to associate with broader measures such as area deprivation. This study suggests that quality of life, especially the physical aspects of this indicator which include health measures, is related to area deprivation.

2.5 Filling a gap in the literature

It is clear through a review of the literature that social contact is an important factor influencing health. Area-based socioeconomic measures, specifically deprivation indices, provide a method for measuring the effects of material and social deprivation, serving as proxy measures for individual data as well as providing contextual information. While some connections have been found between deprivation, health, and aging, especially in the UK, there is still much to be explored in this area.

This thesis seeks to expand our knowledge in health geography, health studies and gerontology by connecting area-based deprivation, aging, and health in a specific case study. The project results presented in chapters three and four provide further evidence of the links among the burden of deprivation and poor health among the older population in Canada.
Chapter 3

The Older Population

This chapter will provide an overview of the demographics of the older population in Canada as well as in Kingston and shows a closer examination of certain deprivation and health indicators among this population.

3.1 Data

The health data for this portion of the study comes from the Canadian Community Health Survey (CCHS), Cycle 4.1, 2007-2008, online microdata files (Health Statistics Division, 2011). The CCHS includes Canadians 12 years of age and over, excluding those who live on Indian Reserves and Crown lands, those living in institutions, and full time members of the Canadian Forces. This cycle of the survey was selected over a more recent cycle because of its larger sample size. The 2007-2008 cycle surveyed 131,061 Canadians, whereas the 2010 annual component only surveyed 62,909 people. These data include 925 observations in the City of Kingston, 117 of which are people 75 years of age or older. The data from CCHS were used with the weights on to provide estimates of the trends examined in the total population in question.

The health measure used from CCHS is self-reported health, rated as excellent, very good, good, fair, or poor. Self-reported health is a commonly used measure of health status; many studies have shown that it is a good predictor of morbidity and mortality and is highly correlated with other continuous measures of health (Gerdtham et al 1999;

### 3.1.1 Limitations

While the Canadian Community Health Survey provides a wealth of data for researchers in Canada, it does come with certain inherent limitations. The first limitation relevant for this work is the population excluded from the survey. These data exclude people living in institutions. When dealing with the older population, it is important to consider which part of the older population is likely to be living in institutions. It is likely to be the least healthy part of this population who reside there, creating a health bias in the sample.

The exclusion of people living in institutions has implications not only for the results seen when examining health statistics from these data but also for the results seen from examining living arrangements. The part of the aging population who are in the poorest health are likely to be those who are the least able to live on their own. Conversely, if a person in this situation has a partner with whom they live, this partner may be able to provide some level of care, delaying or entirely removing the need to enter an institution for care.

In the results examining the housing situation of the total Canadian population and the proportions in fair or poor health, a lower percentage of people 75 years of age or older were seen to be living alone. This may be reflective of the trend of institutionalization of those in this age category in the poorest health as opposed to a real trend.
The second main limitation of using CCHS data is related to the case study focus on Kingston. When using the public use micro data files, the system will not provide results if there are categories with too few observations. The sample in Kingston includes only 965 observations, only 117 of whom are 75 years of age or older. Due to the sample size, it is only possible to conduct two-way cross tabulations for Kingston, limiting the interactions that can be explored. For instance, it was not possible to generate comparable results for Kingston to those reported comparing age, health, deprivation indicators, and gender across Canada.

It is also important to note that the CCHS data for Kingston represents the entire region of the Kingston Frontenac Lennox and Addington public health unit. This does not have an exact overlap with the Kingston CMA but does cover the majority of the same area. Given the value of the CCHS data and the added benefit of health information to this study, these slight geographic differences can be overlooked.

3.2 Demographics

As Table 3.1 shows, the older population makes up a significant portion of the overall Canadian population. It is evident that women are a larger proportion of this population.

Table 3.1 The older population in Kingston, Ontario, and Canada (Statistics Canada 2012)

<table>
<thead>
<tr>
<th></th>
<th>Kingston CMA</th>
<th>Ontario</th>
<th>Canada</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

40
| Percentage of the total population 65 years or over | 16.3 (7.2% male, 9.1% female) | 14.6 (6.5% male, 8.1% female) | 14.8 (6.6% male, 8.2% female) |
| Percentage of the total population 75 years of over | 7.6 (3.1% male, 4.5% female) | 6.8 (2.8% male, 4.0% female) | 6.8 (2.7% male, 4.1% female) |

The history of poverty among the older population in Canada is telling of the changing nature of this issue. Throughout the 1970s and 1980s, of all age groups it is the older population who has seen the greatest decline in poverty rates (Moore and Rosenberg 1997). These changes reflect real increases to the value of Old Age Security (OAS) and Guaranteed Income Supplements (GIS), as well as the Canada Pension Plan (CPP) and other government transfers (Moore and Rosenberg 1997). As a result of these policy changes, the average income for the older population was well above the Statistics Canada low-income cut-off by 1990 (Dooley 1994).

### 3.3 The health of the older population

Figure 3-1 shows the percentage of those in fair or poor health in each age category in Kingston, along with Figure 3-2, which shows this pattern for the older population in Canada collectively and for males and females. The trend of increasing percentages of people in fair or poor health in the older age categories reflects declining health with age.
Figure 3-1 Fair and poor self-reported health in Kingston (CCHS Cycle 4.1)

Figure 3-2 Fair and poor self-reported health in Canada (CCHS Cycle 4.1)

Figure 3-3 shows the percentage of the overall Canadian population by age who has a regular doctor. There is a higher proportion who report having a regular doctor when looking at the population in fair or poor health, though this difference is very slight.
among the population 65 to 74 years and those 75 years or more. Having a regular doctor can be an indicator of poorer health, due to the fact that poorer health generally requires more trips to the doctor.

![Graph showing population reporting having a regular doctor by age group.](image)

**Figure 3-3 Population reporting having a regular doctor (CCHS Cycle 4.1)**

### 3.4 Health, Deprivation, and Aging in Canada

In order to examine the interactions between health and deprivation in the older population across Canada, data from CCHS showing health and specific deprivation indicators have been stratified by age and gender. Four indicators of deprivation from the deprivation index were manipulated to be bivariate variables. Using the question “In general, would you say your health is excellent, very good, good, fair, or poor?” those respondents answering fair or poor were separated. Percentages of those in excellent, very good, or good health were compared to percentages of those in fair or poor health.
for each variable. The data were divided into age categories of 20 to 64 years, 65 to 74 years, and 75 years and over. These results were also separated by gender.

The data for each of the individual deprivation index indicators reflects the overall trend of declining health with age. What is important to observe in these data are the differences that age and gender make in relation to poor health in analyzing the variables of deprivation. Table 3.2 shows the complete results of this analysis. Graphs below explore these results and identify key trends in these data.

### 3.4.1 Social deprivation

The social deprivation indicators examined are living arrangements (Figure 3-4) and marital status (Figure 3-5). The proportion of single-parent families is also included in the deprivation index; this indicator has been excluded from this analysis due to a lack of relevance to the experiences of the older population. Living alone is compared to those living with others. The percentages of people who are single, widowed, or divorced are compared to those who are married or in common law relationships.

Overall in the 20 to 64 years and 65 to 74 years age categories, there are more people living alone in fair or poor health. In the 75 years or more age category, there are fewer people living alone in fair or poor health. These results follow the same pattern for males. For females, there are fewer people living alone in fair or poor health in both the 65 to 74 age category and the 75 years or more category.
Table 3.2 Indicators of deprivation divided by age, gender, and poor health (CCHS Cycle 4.1)

<table>
<thead>
<tr>
<th></th>
<th>Age 20 to 64 Years</th>
<th>Age 65 to 74 Years</th>
<th>75 Years of Age or More</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Living arrangements</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Living with others</td>
<td>9.1</td>
<td>8.9</td>
<td>9.3</td>
</tr>
<tr>
<td>Living alone</td>
<td>13.1</td>
<td>12.6</td>
<td>13.7</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married or common law</td>
<td>8.8</td>
<td>8.7</td>
<td>8.9</td>
</tr>
<tr>
<td>Single, widowed, or divorced</td>
<td>11.2</td>
<td>10.8</td>
<td>11.7</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary education or greater</td>
<td>8.7</td>
<td>8.3</td>
<td>9.1</td>
</tr>
<tr>
<td>No secondary school diploma</td>
<td>24.0</td>
<td>25.3</td>
<td>22.7</td>
</tr>
<tr>
<td>Average income</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greater than $20000</td>
<td>8.1</td>
<td>7.9</td>
<td>8.4</td>
</tr>
<tr>
<td>Less than $20000</td>
<td>26.6</td>
<td>29.3</td>
<td>24.7</td>
</tr>
</tbody>
</table>
There are more people single, widowed, or divorced who report fair or poor health across all age categories. This trend appears in both males and females, though the percentages of those single, widowed, or divorced and who are married or in common
law relationships in fair or poor health is almost equal for females 75 years of age and over, showing a difference of only 0.3%.

3.4.2 Material deprivation

Material deprivation indicators included in this analysis are education (Figure 3-6) and income (Figure 3-7). Excluded is employment as the majority of the older population is retired. Education is divided between those who have no high school diploma and those who have secondary education or more. Income is divided between those with incomes less than $20000 and those with greater incomes.

![Education level of those in fair or poor health (CCHS Cycle 4.1)](image)

**Figure 3-6 Education level of those in fair or poor health (CCHS Cycle 4.1)**

This graph clearly shows the large differences between the percentages of people with or without a high school diploma reporting fair or poor health. This trend holds for both genders but the differences in the percentages are smaller for women. This is likely
related to the lack of emphasis and access to education women experienced, especially those women who now make up the older population.

The same pattern is evident in the income data. Those with incomes over $20000 a year are less likely to be reporting fair or poor health than those with incomes lower than $20000. This is unsurprising, given the well documented association between lower income and poorer health.

Collectively, these data show that there is a clear relationship between these four deprivation indicators, health, and age in the national data.

3.5 Health, deprivation, and aging in Kingston

Because of data limitations in the CCHS, it is not possible to do the same cross-tabulations for Kingston as have been shown for Canada. Instead, each of the four deprivation indicators of interest has been examined compared to age (Table 3.3) and
compared to self-reported health (Table 3.4) for Kingston and for Canada to provide a comparison.

3.5.1 Social deprivation

When examining living arrangements, a bivariate distinction is made between living alone and living with others. In Canada overall, there is a notable increase in the proportion of the population living alone in older age. Among those between 20 and 64 years of age, 12.7 percent live alone, compared to 23.0 percent of those 65 to 74 years of age, and 38.1 percent of those 75 years of age or over.

Comparing living arrangements to self-reported health, there is an observable increase in lower health status among those living alone. Overall in Canada, the marked increase occurs among those in fair or poor health. In Kingston, this increase is specific to those reporting poor health.

In reviewing the results for marital status, being single, widowed, or divorced is contrasted with being married or in a common law relationship. In both Canada as a whole and in Kingston, the age category with the lowest percentage of people who are single, widowed, or divorced is 65 to 74 years. This pattern may reflect the fact that distinctions are not made between being single, widowed, or divorced, which arise from different conditions and are potentially more common or less common at different life stages. In both geographic areas, the population 75 years of age and over shows the highest proportion of those in the single, widowed, or divorced category.
Table 3.3 Deprivation indicators compared to age (CCHS Cycle 4.1)

<table>
<thead>
<tr>
<th></th>
<th>Kingston 20 to 64 Years</th>
<th>Kingston 65 to 74 Years</th>
<th>Kingston 75 Years or More</th>
<th>Canada 20 to 64 Years</th>
<th>Canada 65 to 74 Years</th>
<th>Canada 75 Years or More</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income – Less than $20000</td>
<td>7.8</td>
<td>9.4</td>
<td>17.2</td>
<td>7.3</td>
<td>14.4</td>
<td>21.5</td>
</tr>
<tr>
<td>Education – No high school diploma</td>
<td>5.5</td>
<td>9.3</td>
<td>18.0</td>
<td>4.7</td>
<td>21.2</td>
<td>31.5</td>
</tr>
<tr>
<td>Living Arrangements – Living Alone</td>
<td>Not available</td>
<td>Not available</td>
<td>Not available</td>
<td>12.7</td>
<td>23.0</td>
<td>38.1</td>
</tr>
<tr>
<td>Marital Status – Single, Widowed, or Divorced</td>
<td>33.3</td>
<td>24.8</td>
<td>42.3</td>
<td>33.6</td>
<td>28.6</td>
<td>48.7</td>
</tr>
</tbody>
</table>
Table 3.4 Deprivation indicators compared to self-reported health (CCHS Cycle 4.1)

<table>
<thead>
<tr>
<th></th>
<th>Kingston</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Canada</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Excellent</td>
<td>Very Good</td>
<td>Good</td>
<td>Fair</td>
<td>Poor</td>
<td></td>
<td>Excellent</td>
<td>Very Good</td>
<td>Good</td>
</tr>
<tr>
<td>Income – Less than $20000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>7.0</td>
<td>7.4</td>
<td>7.0</td>
<td>13.5</td>
<td>34.0</td>
<td></td>
<td>5.6</td>
<td>5.9</td>
<td>9.9</td>
</tr>
<tr>
<td>Education – No high school diploma</td>
<td>3.0</td>
<td>4.0</td>
<td>8.7</td>
<td>14.5</td>
<td>12.5</td>
<td></td>
<td>4.2</td>
<td>5.1</td>
<td>9.4</td>
</tr>
<tr>
<td>Living Arrangements – Living Alone</td>
<td>14.4</td>
<td>13.1</td>
<td>15.5</td>
<td>12.7</td>
<td>21.7</td>
<td></td>
<td>12.3</td>
<td>11.8</td>
<td>14.7</td>
</tr>
<tr>
<td>Marital Status – Single, Widowed, or Divorced</td>
<td>43.1</td>
<td>41.6</td>
<td>43.6</td>
<td>25.3</td>
<td>55.6</td>
<td></td>
<td>42.4</td>
<td>41.8</td>
<td>41.8</td>
</tr>
</tbody>
</table>
For Canada overall, there appears to be no relationship between health and marital status, given that the proportions of the population who are single, widowed, or divorced are within one percentage points across the five health categories. In Kingston, there is a greater variation among these proportions. Among those in excellent, very good, or good health, there is only a variation of two percentage points, ranging between 41.6 percent and 43.6 percent. Among those reporting fair health, 25.3 percent are single, widowed, or divorced, whereas 55.6 percent of those in poor health are in this category. It may be significant to note that in Kingston specifically, there appears to be a relationship between this variable and poor health.

3.5.2 Material deprivation

When investigating the potential connections between education and age or health, those with no high school diploma are compared to those with at least a high school diploma. The same trend is observed in Canada and in Kingston when comparing education to age; the older population have a much higher proportion with no high school diploma. This pattern is unsurprising given the increasing emphasis on education over the last few generations. What is notable is the low percentage of the population with no high school diploma in Kingston. Among those 65 to 74 years, the proportion with no high school diploma in Kingston is 9.3 percent, compared to 21.2 percent for the population of Canada. In the 75 years of age or more category, these percentages are 18.0 percent and 31.5 percent respectively, showing that Kingston has a relatively highly educated older population.
When comparing education to health, a general trend towards poor health among those with no high school diploma emerges. This trend is more clearly defined for Canada as a whole but can also be seen in Kingston. Again, the proportions of the population with no high school diploma in Kingston are lower than for Canada as a whole.

Income and age are interesting factors to examine together due to the changes that occur in labour force participation among the older population. This group is generally relying on pensions (e.g., the Canada Pension Plan [CPP]) and the federal financial transfer systems (i.e., Old Age Security [OAS] and the Guaranteed Income Supplement [GIS]). Across Canada and in Kingston, the older population has a higher percentage of people with incomes less than $20000 a year, as might be expected. This proportion is slightly lower in Kingston than it is in Canada as a whole, but this is consistent with the median income of Kingston being higher than that of Canada as a whole.

Low income is a well-known predictor of poor health and this analysis does not show differently. There is a clear trend towards higher proportions of the population in poor health among those whose incomes are less than $20000 a year. In Kingston, it is specifically those in poor health who are the most notable, with 34.0 percent having incomes less than $20000 a year, compared to 13.5 percent of those in fair health. In Canada overall, these percentages are 28.3 percent and 19.1 percent respectively.

3.6 Conclusion

Using the data from the Canadian Community Health Survey, it is clear that there are relationships between aging, health, and indicators of deprivation. In both the
Canadian and Kingston contexts, the older population is in poorer health, as well having lower incomes, being less educated, and being more likely to live on their own and be single, widowed, or divorced. Those in poorer health are also more likely to have lower incomes, less education, and be living on their own. These factors are all interrelated and combine to create certain experiences of aging. The following chapter explores the spatial relationships between deprivation and aging in Kingston, which builds on the context provided here.
Chapter 4

A Case Study of Kingston

This chapter provides a quantitative analysis of deprivation and the older population in Kingston, Ontario. Using data from the Census and the Canadian Institute for Health Information (CIHI), the relationships between these concepts are tested. This study is exploratory in nature, as the relationships between deprivation and the older population have not previously been tested in the Canadian context although other aspects of deprivation at the national and CMA levels have received considerable attention in a series of reports by CIHI. Using a case study of Kingston, Ontario, we are able to examine the potential associations between deprivation and aging.

This chapter outlines the methodological approach used in this research, as well as the study area, data sources, quantitative analysis methods, the results of these analyses, and the limitations of this work.

4.1 A case study approach

This project uses a case study approach, focusing on one census metropolitan area as the study area. A case study offers researchers the chance to examine “a single instance … of a phenomenon in order to explore in-depth nuances of the phenomenon and the contextual influences on the explanations of that phenomenon” (Baxter 2010, 81). In this case, the phenomenon under exploration is the connections between deprivation and aging.
For this thesis, a case study approach was selected due to the importance of context on experiences of aging and health. As Baxter explains, a case study is a useful tool for examining these contextual conditions, as well as a tool for use in situations when the researcher is unable to manipulate the behaviour of those in the study (Baxter and Jack 2008). By selecting a bounded case, geographically bounded in this instance, greater emphasis can be placed on context as this aspect of the case is stable (Bryman 2004). By focusing on a single case, researchers have the opportunity to explore multiple facets of an issue and to do so through a variety of lenses (Baxter and Jack 2008).

The appropriateness of a case study is emphasized by the previous research that has been done in this field. Some links have been shown between deprivation, health, and aging but these connections have not yet been shown in Canada or using Pampalon’s deprivation index (see section 2.4.2 of this thesis for examples of existing research). A case study allows the researcher to explore an under-researched area, as well as to confirm that results from other studies are applicable in a new context (Bryman 2004). This thesis work aimed to accomplish both these goals.

A common concern in case study research is the idea of generalizability. Case studies are sometimes conceptualized as statistical studies where n=1 (Baxter 2010). While this is appropriate statistical terminology, dismissing case studies because of the small sample size misses the importance of depth within a case study, as well as the importance of context (Baxter 2010; Bryman 2004). By focusing on providing an in-depth examination of the phenomenon in question, as well as emphasizing patterns and linkages, it should be quite clear what comparisons can be made to contexts outside of the
case (Bryman 2004; Baxter 2010). A case should be viewed as “neither entirely unique nor entirely representative of a phenomenon” (Baxter 2010, 86). A reader of the results of a case study should be able to determine whether or not the study findings have the potential to be applicable in a different situation (Baxter and Jack 2008).

For the case study used in this thesis, context has been provided using a deprivation index, as well as demographic and health data. One of the uses of deprivation indices is to provide a tool for examining the context in which individuals are living. When discussing the context of a case study, the notion of context goes beyond what a deprivation index can provide. Context in this case refers to the combination of deprivation, aging, overall demographics, and health. The results of each of these facets of study can be combined to allow for an in-depth understanding of the context in the case study area.

4.2 Study Area

Kingston, Ontario was chosen as the case study area. With a population of 159,561 in the 2011 census, the Kingston Census Metropolitan Area (CMA) represents a mid-sized Canadian city (Statistics Canada 2012). It is located approximately 250 km from Toronto and 300 km from Montreal on the major highway between these cities (highway 401), as well as being approximately 200 km from Ottawa. The CMA encompasses the City of Kingston as well as some of the surrounding rural areas. The population of Kingston is growing at a slower rate than the overall Ontario population, with 4.7 percent growth occurring between 2006 and 2011 compared to 5.7 percent growth in Ontario (Statistics Canada 2012). Kingston is a relatively old, white
community. Table 4.1 shows the demographic data of the Kingston CMA compared to data for Ontario and Canada.

**Table 4.1 Demographic overview of the case study area compared to Ontario and Canada (Statistics Canada 2012, Statistics Canada 2007)**

<table>
<thead>
<tr>
<th></th>
<th>Kingston CMA</th>
<th>Ontario</th>
<th>Canada</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Population</strong></td>
<td>159,561</td>
<td>12,851,821</td>
<td>33,476,688</td>
</tr>
<tr>
<td><strong>Median Age</strong></td>
<td>41.4</td>
<td>40.4</td>
<td>40.6</td>
</tr>
<tr>
<td><strong>Percentage of the total</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>population 65 years of age or older</td>
<td>16.3 (7.2% male, 9.1% female)</td>
<td>14.6 (6.5% male, 8.1% female)</td>
<td>14.8 (6.6% male, 8.2% female)</td>
</tr>
<tr>
<td><strong>Percentage of the total</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>population 75 years of age or older</td>
<td>7.6 (3.1% male, 4.5% female)</td>
<td>6.8 (2.8% male, 4.0% female)</td>
<td>6.8 (2.7% male, 4.1% female)</td>
</tr>
<tr>
<td><strong>Percentage of the total</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>population self-identified as a visible minority (2006)</td>
<td>5.8</td>
<td>22.8</td>
<td>16.2</td>
</tr>
<tr>
<td><strong>Median after-tax family income (2006)</strong></td>
<td>$60,889</td>
<td>$62,288</td>
<td>$57,178</td>
</tr>
</tbody>
</table>
4.2.1 Deprivation in Kingston

As part of the Canadian Population Health Initiative, the Canadian Institute for Health Information (CIHI) has produced brief reports on deprivation in many CMAs. As part of the report on Kingston, they produced the maps seen in Figure 4-1 and Figure 4-2. These maps show social deprivation and material deprivation scores respectively, with the DAs colour-coded by quintile. Appendix B contains two reference maps to help follow the discussion below for those who are unfamiliar with the Kingston CMA.

As can be seen by the concentration of the darkest blue areas in Figure 4.1, social deprivation is concentrated in the city core on either side of Highway 10 (Division Street/Perth Road) in the area above Highway 2 (Princess Street) and below Highway 401. Other areas of high social deprivation are found farther north, mainly between Highway 10 and Highway 15, to the east of Highway 10 towards Highway 14, and concentrated on either side of Highways 4 and 6 above and below Highway 401. The least deprived areas in dark grey are found surrounding the core south of Highway 2 and mainly along the lakeshore.

Material deprivation is much more visibly concentrated in the city core on either side of Highway 10 (Division Street) below Highway 401. With the exception of a small number of scattered DAs in the west and north that show high material deprivation, the DAs surrounding the core mainly fall in the lowest and second lowest quintiles of material deprivation.
Figure 4-1 Social deprivation in Kingston
4.2.2 The older population in Kingston

As seen in Table 4.1, the population 65 years of age and older in Kingston made up 16.3 percent of the total population in 2011, up from 15.3 percent of the population in 2006 (Statistics Canada 2012; Statistics Canada 2007). Of this 16.3 percent, 9.1 percent
were female and 7.2 percent were male. The age group 75 years of age and older constituted 7.6 percent of the total population, 4.5 percent female, 3.1 percent male (Statistics Canada 2012). Of those 65 years of age and over, 17.2 percent had household incomes below $20,000 (Health Statistics Division 2011).

The Census asks respondents 15 years and over how many hours per week they spend “providing unpaid care or assistance to seniors of one’s own household, to other senior family members outside the household, and to friends or neighbours in the previous week. This unpaid care excludes volunteer work for an organization or work without pay in a business. In Canada overall, 5.7 percent of the population are engaged in 5 or more hours of unpaid care work per week to assist seniors. In Kingston, this figure is 5.39 percent. The figures in every time category (0 to 5 hours, 5 to 9 hours, 10 to 19 hours, and 20 hours or more) and for both genders are lower (Statistics Canada 2008). This may indicate that the older population in Kingston is receiving less informal care, as a lower percent of the total population is providing this type of care.

4.3 Statistically Linking Aging and Deprivation in Kingston

4.3.1 Demographic Data

Demographic data were obtained from Statistics Canada and is from the 2006 Population Census. The 2006 Census was used in order to correspond to the deprivation scores, which were calculated using data from this same census. The percentage of the population of each DA 75 years of age or older was calculated.
4.3.2 Deprivation Scores

An area based index for social and material deprivation developed by Pampalon for the Canadian context was used to obtain deprivation scores. These data were obtained from the Institut National de Santé Publique du Québec (INSPQ) and the Canadian Institute of Health Information (CIHI). As part of the Canadian Population Health Initiative, CIHI has been using the INSPQ deprivation index to analyze the relationship between socioeconomic status and health, with results published in a series of reports entitled *Exploring Urban Environments and Inequalities in Health*.

The scores are calculated using census data at the dissemination area level and are reported as a quintile or a centile after sorting. The Kingston CMA is divided into 254 DAs. One DA was excluded from the data because it has no permanent population. Fifteen DAs were excluded from the data due to a lack of deprivation scores as a result of missing census data, leaving 238 DAs. The population in each DA ranges from 219 people to 2295 people, with an average population of 605 people and a median of 535 people.

4.4 Method I

The first method of comparison between deprivation and the distribution of the oldest-old used social and material deprivation scores reported as quintiles. The percentage of the population 75 years of age and older was calculated for each dissemination area and was sorted into quintiles. Using these two scores, contingency tables were created and used to test the association between deprivation and the oldest-old using a Chi-square test. This test serves as a preliminary analysis to examine if there
is a statistical relationship between the distribution of the oldest old and social and material deprivation when both data sets are organized in quintiles as categorical data.

4.4.1 Results

Social Deprivation:
\[ \chi^2 = 27.352 \ (0.038 < p, \ df=16) \]

Material Deprivation:
\[ \chi^2 = 25.426 \ (0.063 > p, \ df=16) \]

The result of the Chi-square test for social deprivation shows that the distribution of social deprivation and the percentage of the older population is statistically significantly \((p<0.05)\) different from the expected distribution if there was no association. This suggests an association between where the older population in Kingston is residing and the distribution of social deprivation.

The result of the test for material deprivation and the percentage of the older population is only statistically significant at \(p<0.10\). This suggests that there may be an association between material deprivation and the geographical distribution of the older population.

4.5 Method II

The second method used deprivation scores sorted into centiles (i.e., 1 to 100). These were regressed against the percentage of the population 75 years of age or older for each dissemination area. In this test, special attention was paid to the \(r^2\) values, which indicate whether or not there is a correlation between the distribution of the oldest-old
and the distribution of deprivation. These scores also show the strength of the correlation and whether or not it is statistically significant.

4.5.1 Results

Social Deprivation: $r^2 = 0.232$

Material Deprivation: $r^2 = -0.206$

The results of the regression analysis show that both area social and material deprivation are statistically significantly correlated with the percentage of the older population in each area. For social deprivation, there is a positive correlation; however, material deprivation shows a negative correlation. While neither of these correlation coefficients is strong at 0.232 and -0.206, the statistical significance shows that these are nevertheless important relationships. Table 4.2 and 4.3 show the full results of the regression analysis.

4.6 Limitations

While the analyses show some clear trends in the relationships between deprivation and aging, there are certain limitations to this research. The following section will outline the main limitations found in the deprivation index itself and the reliance on statistical analysis to approximate experience.

4.6.1 The deprivation index

Pampalon’s deprivation index is an important tool to have available to researchers in Canada. The development of this measure for the total Canadian population is one of
Table 4.2 Summary output for regression of social deprivation and the older population

SOCIAL DEPRIVATION - SUMMARY OUTPUT

<table>
<thead>
<tr>
<th>Regression Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple R</td>
</tr>
<tr>
<td>R Square</td>
</tr>
<tr>
<td>Adjusted R Square</td>
</tr>
<tr>
<td>Standard Error</td>
</tr>
<tr>
<td>Observations</td>
</tr>
</tbody>
</table>

ANOVA

<table>
<thead>
<tr>
<th></th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>Significance F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
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<td>389.4375</td>
<td>13.39022</td>
<td>0.000312</td>
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<tr>
<td>Residual</td>
<td>235</td>
<td>6834.675</td>
<td>29.08372</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>236</td>
<td>7224.113</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Coefficients

<table>
<thead>
<tr>
<th>Coefficients</th>
<th>Standard Error</th>
<th>t Stat</th>
<th>P-value</th>
<th>Lower 95%</th>
<th>Upper 95%</th>
<th>Lower 95.0%</th>
<th>Upper 95.0%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
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<td>0.729309</td>
<td>6.143</td>
<td>3.43E-09</td>
<td>5.916964</td>
<td>3.043326</td>
<td>5.916964</td>
</tr>
<tr>
<td>X Variable 1</td>
<td>0.042765</td>
<td>0.011687</td>
<td>3.659265</td>
<td>0.000312</td>
<td>0.065789</td>
<td>0.019741</td>
<td>0.065789</td>
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</tbody>
</table>
Table 4.3 Summary output for regression of material deprivation and the older population

MATERIAL DEPRIVATION - SUMMARY OUTPUT

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<tr>
<th>Regression Statistics</th>
<th></th>
</tr>
</thead>
<tbody>
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</tr>
<tr>
<td>R Square</td>
<td>0.0426</td>
</tr>
<tr>
<td>Adjusted R Square</td>
<td>0.038526</td>
</tr>
<tr>
<td>Standard Error</td>
<td>5.425067</td>
</tr>
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<td>Observations</td>
<td>237</td>
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</table>

<table>
<thead>
<tr>
<th>ANOVA</th>
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</tr>
</thead>
<tbody>
<tr>
<td>df</td>
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<tr>
<td>SS</td>
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<td>MS</td>
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<td>F</td>
<td>10.45639</td>
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<td>Significance F</td>
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</table>

<table>
<thead>
<tr>
<th>Coefficients</th>
<th>Standard Error</th>
<th>t Stat</th>
<th>P-value</th>
<th>Lower 95%</th>
<th>Upper 95%</th>
<th>Lower 95.0%</th>
<th>Upper 95.0%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
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<td>0.667037</td>
<td>12.97115</td>
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<td>7.338101</td>
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<td>7.338101</td>
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<tr>
<td>X Variable 1</td>
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<td>-3.23363</td>
<td>0.001398</td>
<td>-0.07053</td>
<td>-0.01713</td>
<td>-0.07053</td>
</tr>
</tbody>
</table>
its strengths but is also a limitation in the case of this research. An issue which remains unanswered is whether one should use a deprivation index which is relevant to the total population or whether an age-specific deprivation index is a more relevant tool to use when examining the older population. Not all of the six indicators included in the index are applicable to the older population. Employment is included as indicator of material deprivation, as well as single-parent families as an indicator of social deprivation. A deprivation index that was designed to reflect the social and material experiences of the older population might provide results that would express themselves differently, both statistically and geographically.

4.6.2 Statistics vs. experience

Another limitation to this work is in the quantitative study design. Statistical analyses do not necessarily reflect experiences of aging, declining health, and deprivation. While these data can provide a very strong context for the exploration of these issues, each person’s experiences of these ideas will be personal to them. Not everyone who resides in a deprived area will be experiencing deprivation, while people who reside in areas that according to the deprivation index are not deprived may be experiencing deprivation. The intersections of deprivation and aging will play themselves out differently for each individual, though the statistical analysis provides the context in which these interactions occur.
4.6.3 Kingston as a Case Study Area

There are certain limitations that are inherent to the Kingston CMA as a choice of case study area. The older population in Kingston may be significantly different from the older population of other Canadian cities for a number of reasons. Kingston is a relatively wealthy community, including a fairly well-off older population. Three large employers in the Kingston area are post-secondary institutions, the military, and Corrections Canada, all of which provide stable employment leading to stable pensions for their long term employees.

Furthermore, the older population in Kingston is a highly educated population. As seen in Table 3.3, there is a much lower percentage in Kingston than in Canada overall of those with no high school diploma among people 65 years of age or more.

Kingston has a much lower percentage of people from visible minority groups than Canada as a whole and particularly when comparing Kingston to larger cities. This trend is even more pronounced among the older population. These differences may limit the applicability of the results seen in Kingston to larger Canadian cities.

Another limitation of Kingston as a case study area is the concentration of student housing found in the core of the city. There is a very high percentage of students in the downtown area, which has the potential to affect material and social deprivation measures in this area. Students tend to have low income and to be tenants as opposed to permanent residents.

A final limitation of Kingston as a case study area is the urban and rural makeup of the CMA. The deprivation indicators are serving as proxy measures for social and
material deprivation but these phenomena can present themselves quite differently in different settings. High material deprivation may manifest differently in a rural area than it does in an area showing high material deprivation in the core of a city. In a larger city where the CMA is entirely urban, these differences would not be an issue, but the Kingston CMA includes both urban and rural areas.

4.7 Conclusion

The results of the case study show that there is a relationship between area-based deprivation and the areas where the older population reside in Kingston. People aged 75 years or more are more likely to be living in socially deprived areas of the CMA, but they are less likely to be living in materially deprived areas of the city. While there are certain limitations to these results, including the application of the deprivation index to the older population, the statistically significant relationships show important patterns and provide essential context for understanding experiences of aging when cities are divided into small areas.
Chapter 5

Discussion and Conclusions

In Chapters 3 and 4, the results pertaining to each of the three research questions outlined in the introduction were presented. CCHS data revealed increasing fair or poor health with age, as well as the increase in fair or poor health among those living with an indicator of deprivation. Using Pampalon’s deprivation index, we see the spatial relationship between areas where the older population are living and areas identified as deprived in Kingston. This relationship is positive with social deprivation and negative with material deprivation, indicating that the older population is more likely to be living in socially deprived areas but less likely to be living in materially deprived areas. In this chapter, the overall outcomes of the research, as well as policy implications and future directions are presented.

5.1 Triple Jeopardy

The older population is facing a “triple jeopardy” of declining health, declining resources, and living in areas that are socially deprived. Declining health tends to indicate that an individual requires greater support in order to manage their health. Due to declining resources, those in the older population may not be in a financial situation that would help them maintain their health. This decline is accompanied by a greater likelihood of living in areas that are socially deprived and a greater chance of having fewer support networks to provide formal and informal support for care.
There is also the potential for a reciprocal relationship between health and social interaction. If a health condition makes the facilitation of social interaction more difficult, this aspect of an individual’s life is likely to decline along with their health.

These results are consistent with the literature showing links between overall health and deprivation (e.g. Curtis, Setia, and Quesnel-Vallee 2009) and poorer health in older people living in deprived areas (e.g. Lang et al. 2008a, Lang et al. 2008b, Lang et al. 2009).

Further compounding these issues is survivorship and its impacts on those experiencing it. An individual may outlive their partner, leaving them widowed and potentially living alone, both of which are indicators for area social deprivation. In Canada overall, there is a notable proportion of those 75 years of age and over who are living alone compared to younger age categories. This is mainly related to survivorship.

Furthermore, the older population may outlive many members of their support networks. Even having lived in the same area for many years may not mean that individuals are socially connected to the area anymore, especially if the area was relatively homogeneous in terms of demographics when they originally moved into the area and the individuals have outlived many others in their neighbourhood. Neighbourhoods change demographically, socio-economically and physically while older people age in place.

5.2 A Heterogeneous Older Population

The older population needs to be seen as a heterogeneous population intersected by age, gender, marital status, living arrangements, income, education, and life.
experiences. Each of these factors, along with others, influence not only the presence or absence of deprivation and poor health, but also affect the way an individual is able to cope and adapt with the experiences of aging, declining health and material resources, and shrinking social networks. As shown by Gilhooly et al., personality plays a significant role in healthy or unhealthy aging and can interact with life circumstances in innumerable ways (2007).

Data have shown that health declines with age, with a greater proportion of those 75 years of age or more reporting fair or poor health. This clearly indicates that age is an important factor when examining health, as well as experiences of aging. This is one argument for why a deprivation index specific to the older population may be more relevant. The experiences of those over 65 have the potential to differ quite substantially from experiences earlier in life but these experiences do not become static after 65 or after 75. While the differences between age categories have been recognized, it is important to also recognize that the divisions between categories are artificial and, while they can be helpful to see overall trends in aging, they do not show the individual experiences of aging and the life course.

Each of the indicators of deprivation examined is an individual factor and is likely to be experienced differently by each person. For example being single, widowed, or divorced are each a different experience from each other and for individuals. While there may be some similarities, it is important to recognize the potential differences. Though grouped together for the sake of the deprivation index, these life experiences will affect individuals’ health, processes of aging, deprivation and reactions to these phenomena.
Conversely, these experiences are not necessarily the opposite experiences from someone who is married or in a common law relationship.

5.2.1 Gender

When discussing the older population, gender is an important factor to consider as it shapes resources and experiences. Women tend to live longer and form a greater percentage of the older population, making gender dynamics even more salient. Gender is an organizing societal principle and is embedded in social relationships at all levels. Lifelong inequalities faced by women are exacerbated as they age due to ageism and the intersections of age and gender.

For the generation in question, many women did not work outside the home and those who did often worked in lower paying jobs than men. This pattern was due not only to societal norms and pressure to conform to these norms but can also be attributed to labour market discrimination. This systemic discrimination barred women from better paying jobs and undervalued their domestic contributions. These inequities continue to affect women throughout the life course.

In the case of deprivation indicators, it is the indicators of material deprivation that are the most likely to show the outcomes of lifelong inequity. Due to a lack of access to higher paying jobs, women tend to have lower incomes than men even if they had independent incomes at all. For the older population, this dynamic is reflected in their pensions (or lack thereof) and therefore continues to affect income into later life.

The politics of education during this generation also have a great effect on women. It was much less common for women to be highly educated, which is reflected in
the education variable of the deprivation index. A lack of education also affected women’s employment opportunities, again contributing to lower income throughout the life course and lower pensions later in life.

Because women tend to live longer, older women are more likely than older men to be living alone. This pattern shows up in the analysis of individual deprivation indicators. The societal patterns of care are also important to consider. According to Canadian census data, women spend many more hours than men providing unpaid care for people 65 years of age or older (Statistics Canada 2008). Out of the 5.7 percent of the Canadian population who spend 5 hours a week or more providing unpaid care for the older population, 3.62 percent are female, 2.07 percent are male. These care dynamics may carry through to later in life, when a female partner is more likely to be the primary caregiver for her male partner.

Along with societal changes, the gender patterns seen later in life may change in the coming generations. Women have a continually increasing presence in higher education and much higher labour force participation. These factors, along with the decrease of certain aspects of systemic discrimination, have contributed to the rising salaries of women, raising their earning power much closer to that of men. This will likely affect the gender patterns of the low income portion of the older population, though this change is unlikely to take place within one generation.

5.3 Asset-Rich, Cash-Poor

The results showing that the older population is less likely to be living in areas that are materially deprived is potentially counter to expectations. Data show that the
older population has lower incomes than the total population and that a higher percentage of the older population is living on less than $20,000 a year. Certain studies have examined the impacts of material deprivation on the older population and shown links between the conditions of deprivation and poorer health outcomes (e.g. Breeze et al. 2005; Mõttus et al. 2012; Lang et al. 2009). How do we understand this lack of income in conjunction with a lower likelihood of living in a materially deprived area?

The key to understanding this pattern may be residential mobility and the asset of a house. Many older people have been living in the same home for a long time and own their own homes. Neighbourhoods have the potential to change over time and this change may lead to an increase or a decrease in deprivation scores. Less materially deprived areas tend to be wealthier areas with more expensive real estate. For someone who bought their house in a wealthy area some time ago, owning a home there does not necessarily indicate that they currently have the cash resources to purchase that home.

There may be a relationship between the patterns of assets and cash and the gender variable discussed previously. For example, an older woman who owns her own home may have purchased that home with her husband, who was the primary income earner. If she is now widowed, she may not be receiving a significant income but does have the asset of the house.

5.4 Policy Implications

As health geographers, we need to expand the policy debate to recognize that addressing the health of the older population needs to include not only improvements in health care and financial transfer systems, but also social and material improvements in
the areas where the older population live. By focusing only on the health care system, we are only addressing issues directly related to health. Issues around the financial transfer system, government financial support, and pensions address the issue of declining financial resources for the older population. In order to address the problems surrounding social deprivation and their implications, this also needs to become part of a policy focus.

There are many facets to the issue of social deprivation, especially among a heterogeneous older population. Housing is one issue that could be addressed that may support a decrease in social deprivation among the older population. Appropriate housing at affordable prices could be made available specifically to the older population in areas where they would be able to access the support they require. Transportation services that facilitate the easy movement of the older population would need to accompany this housing.

It is also important to recognize that those who are living alone and single, widowed, or divorced may require more formal health support. Future policies should recognize this and implement systems that will provide the necessary supports for individuals in need. This aspect of policy is especially important due to the focus in government and more broadly on aging in place. If individuals are expected to age in place, they will need appropriate services provided to them in that place in order to do so and to do so easily, healthily, and happily.

5.5 Future Directions

Given the exploratory nature of this research, the relationships that the data have shown need to be examined in more detail. A study focusing on experiences of aging
would provide the missing detail of how individuals experience the issues of declining health, declining resources, and living in areas that are socially deprived, as well as showing further relationships between these topics. Such a study could also explore how those in the older population cope with these issues, what resources are available to them, and what resources they would like to access.

Another future research direction would be to create a deprivation index specifically designed to account for the context of the older population. Are there different factors that contribute to a sense of deprivation in an area for someone 75 years of age or older compared to the rest of the population? The development of a deprivation index specifically for this population could explore this question, as well as creating a tool to further future research in the area of deprivation and aging.

5.6 Conclusions

There is a relationship between health, deprivation, and aging in that as age progresses, deprivation increases and health declines. This places a burden on the older population as they try to manage these changes. Declining financial resources combine with living in socially deprived areas and decreasing health, to place older people in “triple jeopardy”. Of those in fair or poor health, it is the older population who shows the highest levels of each of four relevant indicators used in the area-based deprivation measure. This population is disproportionately dealing with the issue of social deprivation.

Given the rapidly aging population of Canada, these results are significant in dealing with inequities within our population. In order to facilitate aging in place,
particularly healthy aging and high overall wellbeing, we need to modify environments to
make them conducive to these processes. Taking into account the health and financial
transfer systems, we also need to examine possible social and material improvements that
could be made to the areas where the older population reside in order to maximize the
health and wellbeing of this vulnerable population.
## Appendix A

### Index of Multiple Deprivation Domains and Indicators

<table>
<thead>
<tr>
<th>Domain</th>
<th>Indicator</th>
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</thead>
<tbody>
<tr>
<td>Income deprivation</td>
<td>Income support families</td>
</tr>
<tr>
<td></td>
<td>Income-based jobseeker’s allowance families</td>
</tr>
<tr>
<td></td>
<td>Pension credit (guarantee) families</td>
</tr>
<tr>
<td></td>
<td>Child tax credit families</td>
</tr>
<tr>
<td></td>
<td>Asylum seekers receiving subsistence support, accommodation support, or both</td>
</tr>
<tr>
<td>Employment deprivation</td>
<td>Claimants of jobseeker’s allowance</td>
</tr>
<tr>
<td></td>
<td>Claimants of incapacity benefit</td>
</tr>
<tr>
<td></td>
<td>Claimants of severe disablement allowance</td>
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<tr>
<td></td>
<td>Claimants of employment support allowance</td>
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<td></td>
<td>Participants in New Deal between the ages of 18 and 24</td>
</tr>
<tr>
<td></td>
<td>Participants in New Deal aged 25 or over</td>
</tr>
<tr>
<td></td>
<td>Participants in New Deal for lone parents</td>
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<tr>
<td>Category</td>
<td>Measures</td>
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<tr>
<td>----------------------------------</td>
<td>------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Health deprivation and disability</td>
<td>Years of potential life lost (premature death)</td>
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<td>Comparative illness and disability ratio</td>
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<td>Measures of acute morbidity (emergency emissions to hospital)</td>
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<td></td>
<td>Adults under 60 suffering from mood and anxiety disorders</td>
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<tr>
<td>Education, skills, and training deprivation</td>
<td>Average point score of pupils taking English, math, and science, key stage 2 exams</td>
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<tr>
<td>– children and young people</td>
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</tr>
<tr>
<td></td>
<td>Average point score of pupils taking English, math, and science, key stage 3 exams</td>
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<tr>
<td>Education, skills, and training deprivation</td>
<td>Average point score of pupils taking key stage 4 exams</td>
</tr>
<tr>
<td>– adult skills</td>
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</tr>
<tr>
<td></td>
<td>Young people aged 16 and over not in school</td>
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<td></td>
<td>Secondary school absence rate</td>
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<tr>
<td></td>
<td>People under the age of 21 not entering higher education</td>
</tr>
<tr>
<td></td>
<td>People between the ages of 25 and 54 with no or low skills</td>
</tr>
</tbody>
</table>
### Barriers to housing and services – wider barriers

- Household overcrowding
- Homelessness
- Households under the age of 35 whose income makes them unable to enter into owner occupation

### Barriers to housing and services – geographic barriers

- Distance to a general practice surgery
- Distance to a supermarket or convenience store
- Distance to a primary school
- Distance to a post office

### Crime

- Number of reported violent crimes
- Number of reported burglaries
- Number of reported thefts
- Number of reported criminal damage crimes

### Living environment deprivation – indoors

- Social and private housing in poor condition
- Houses without central heating

### Living environment deprivation - outdoors

- Air quality
- Road traffic accidents
Appendix B

Reference Maps

Kingston Region
Kingston Core Area


