NEIGHBOURHOOD CHARACTERISTICS AND HEALTH

NEIGHBOURHOOD CHARACTERISTICS AND HEALTH: AN EXAMINATION OF FOUR HAMILTON, ONTARIO NEIGHBOURHOODS

by

JACLYN RHODES B.A. (HONOURS)

Thesis

submitted in partial fulfillment of

the requirements for the Degree

Master of Arts (Geography)

McMaster University

MASTER OF ARTS (2010) McMaster University

(Geography) Hamilton, Ontario

TITLE: Neighbourhood Characteristics and Health: An Examination of Four Hamilton, Ontario Neighbourhoods

AUTHOR: Jaclyn Rhodes, B.A. (McMaster University)

SUPERVISOR: Professor Dr. John Eyles

NUMBER OF PAGES: xi, 132

Abstract

The purpose of this project is to perform a thorough quantitative analysis of the data that examines the relationship(s) between five health outcomes (emotional distress, BMI level, health satisfaction, self-assessed health status, and chronic conditions), six socio-demographic/economic characteristics (age, gender, employment status, education level, and tenure) and numerous environmental quality variables, in order to determine: are there any linkages between perceived neighbourhood environmental characteristics, perceived housing characteristics, socio-demographic characteristics, and the participants' health status?

The data (n=671) included participants living in one of four Hamilton neighbourhoods (Chedoke-Kirkendall, the Downtown Core, Northeast Industrial, and the Southwest Mountain). Participants were asked questions about how they perceive their neighbourhood, both physically and socially, and their health.

The analysis included cross-tabulations, testing of the means, and logistic regression models and the hypothesis that self-reported health, measured in a variety of ways, *will* vary by neighbourhood, mediated by the socio-demographic/economic factors, proved to be correct in various regression models run on the data: self-reported Emotional Distress (GHQ) is mediated by age and income; self reported BMI is mediated by age, education, gender, and tenure; self-reported Health Satisfaction is

mediated by age; self-reported Self-Assessed Health Status is mediated by age; and self-reported Chronic Conditions are mediated by age and education.

The findings from this project will increase knowledge about how perceived social and physical aspects of neighbourhoods may influence individual and population health status will provide information to inform health planning and policy decisions in ways which are better suited to the socio-demographically/economically distinct neighbourhoods.

Acknowledgements

First, I would like to thank my supervisor, Dr. John Eyles, for his remarkable support, patience, and encouragement. I would also like to thank Dr. Kathi Wilson for her expertise in quantitative research methods, especially the guidance she provided using SPSS and her tremendous patience with me while I was learning. Dr. Eyles and Dr. Wilson allowed me to carry out my analysis using their data set, and provided me with the necessary tools to undertake a thesis of this nature. I would also like to acknowledge Ann Wallace, for her guidance and encouragement, which never went unnoticed, and Dr. Walter Peace, whose enthusiasm for the subject inspired me to study Human Geography in the first place.

I would like to thank my family, especially my Mom, my Stepfather, and my sister, for their continuous support, encouragement, and unconditional love; as well as my late-father, whom along with my Mom always emphasized the importance and value of learning. I would also like to thank my dearest friend, Annabelle, whom has always stayed by my side and was a friendly face when I needed it the most.

Table of Contents

List of Tables

List of Figures

Chapter One: Introduction and Background

Introduction

There is increasing awareness among health researchers and policy-makers that the local environment has a significant influence on people's health (Poortinga et al., 2007). The environment is composed of both physical and social dimensions, including the neighbourhoods in which we reside (Yen and Syme, 1999). These physical and social dimensions are interdependent, with the subsequent environment resulting from the "...interaction between natural and man-made components, social processes, and the relationships between individuals and groups" (Yen and Syme, 1999:288). A number of studies have found linkages between neighbourhood characteristics and a range of health outcomes, revealing that the physical and social environments of neighbourhoods can contribute to individuals' health status (Odoi et al. 2005; Luginaah et al. 2001).

According to Wen et al. (2006), there are two levels of approaches underlying the link(s) between place of residence and health, one at the neighbourhood level and one at the individual level. At the *neighbourhood* level, included are physical and social aspects of the neighbourhood environment, availability of services, etc. At the *individual* level, it is the perceptions of these environmental measures that may act as linkages

between neighbourhood socio-economic status and health (Wen et al., 2006).

According to Ellaway et al. (2009), evidence is building that a neighbourhood's impact on the health of individual residents is independent of some socio-demographic/economic characteristics, such as age, gender, and income. However, Arah (2009) asserts that the health of individuals,

> "...cannot be seen in isolation but must be placed in the rich contextual web such as the socioeconomic circumstances and other health determinants of where they were conceived, born, bred, and how they shaped and were shaped by their environment and communities..." (235).

In addition, other socio-demographic/economic characteristics, including income and education, have each been shown to have an effect on who stays in good health, becomes ill and/or dies prematurely as an adult (Arah, 2009).

Since the early 1990s, there has been a renewed interest in exploring how different types of neighbourhoods can impact health (Luginaah et al., 2001). However, according to researchers, there still remains much to be evaluated about the influence of various neighbourhood, and individual characteristics in neighbourhoods, on health (Luginaah et al., 2001; Yen and Syme, 1999). Moreover, there remains a lack of research which thoroughly examines the importance of various social and environmental determinants of health relating to the

health outcomes investigated in this research project, including: emotional distress, Body Mass Index (BMI), health satisfaction, self-assessed health status, and chronic conditions (Wilson et al., 2009). According to Wen et al. (2006), "...it may be the case that social and physical characteristics have differential levels of importance for different health outcomes, for different populations, and in different neighbourhoods" (2585), but more research is needed.

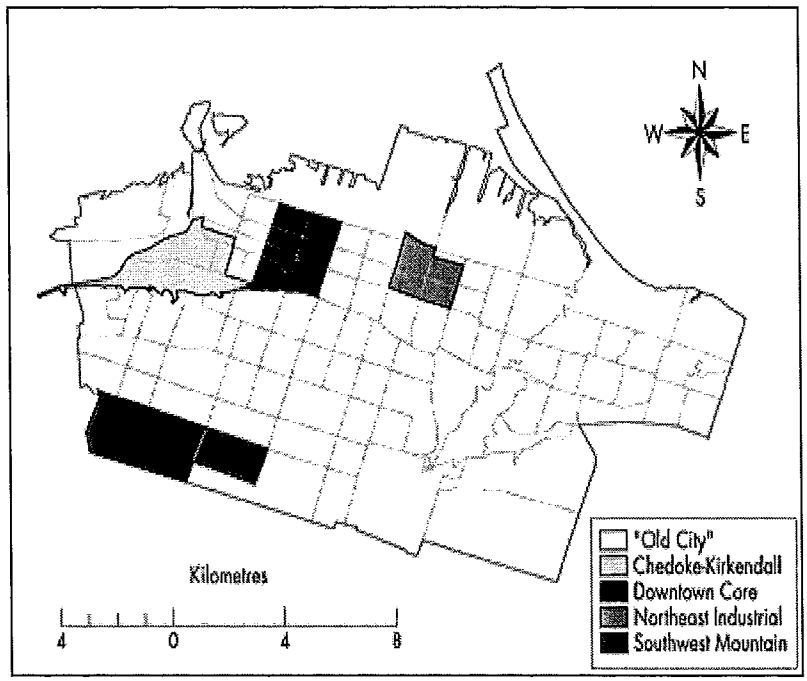
Background

As research has already been conducted examining the role of various social and environmental determinants of health on a more national and/or global scale, there is increasing interest in investigating determinants of health and health outcomes at the local level. Therefore, this study will build on the knowledge relating to the association between neighbourhood characteristics and health. Four different neighbourhoods in Hamilton, Ontario have been examined: Chedoke-Kirkendall (high income, high diversity), the Downtown Core (low income, high diversity), Northeast Industrial (low income, low diversity), and the Southwest Mountain (high income, low diversity) (Wilson et al., 2003) (See: Figure 1). These neighbourhoods were selected due to their socio-demographic/economic and ethnic diversity. The purpose of this project is to determine: are there any linkages between perceived neighbourhood environmental characteristics, perceived housing characteristics, socio-

demographic characteristics, and health status? This project will examine health status and inequalities at the neighbourhood level, focusing on Hamilton, Ontario, investigating the health outcomes reported from the four Hamilton neighbourhoods identified (Odoi et al., 2005). I hypothesize that each of the five health outcomes: emotional distress, Body Mass Index, health satisfaction, self-assessed health status, and chronic conditions, *will* vary by neighbourhood, mediated by environmental and housing quality factors, as well as the socio-demographic/economic factors outlined above.

The following chapter, Chapter Two: Literature Review, examines some of the research investigating the relationship between environmental and housing quality and health, while exploring the literature linking environmental quality and housing quality to the five health outcomes being examined. Chapter Three: Setting, Methods, and Data, discusses how the data examined for this thesis was collected and will outline the steps of the data analysis. Chapter Four: Results, reveals the outcome(s) of each of the methods discussed in the previous chapter. Next, Chapter Five: Summary and Discussion, discusses the results of the study and the information that has been revealed through the analysis of the data, interpreting the findings and relating them to the literature. Finally, Chapter Six: Conclusions, summarizes the discussion of the findings and outlines the limitations of the research and its contributions.

Figure 1: Study neighbourhoods in Hamilton, Ontario Canada



(Source: Wilson et al. 2003).

Chapter Two: Literature Review

The purpose of this chapter is to examine some of the research investigating the relationship between environmental quality and health, including housing quality and health. In addition, literature linking environmental quality and housing quality to the five health outcomes being examined in this project is also explored.

Environmental Quality

Health outcomes can vary by neighbourhood according to its environmental quality. According to Jia et al. (2009), an individual's quality of health is not only determined by their socio-demographic characteristics, their health behaviours, and their disease status, but also by the physical and social environmental characteristics of their neighbourhood.

According to Miles and Song (2009), a good *physical* environment is one that provides residents with a mixture of nearby destinations that can be easily walked to; safe, connected streets with sidewalks; and simple access to public transit. In addition, they define a good *social* environment as, "...one that does not include a substantial proportion of disadvantaged households...[and] provides access to good schools and public services, safe streets, and economic prospects" (Miles and Song, 2009:493). On the other hand, poorer neighbourhoods are, "...more likely to have poorly maintained public spaces and show signs of vandalism, graffiti, litter,

public drunkenness, [and] drug-dealing in the streets (Miles and Song, 2009:494). Therefore, poor social environments do not provide the social resources required to maintain social order, leading to feelings of fearfulness and isolation among residents (Miles and Song, 2009). Furthermore, there is also evidence that how residents perceive features of their local environment, in terms of quality, may be an important determinant of their health (Ellaway et al., 2001). Studies examining the quality of the neighbourhood environment have determined that perceived neighbourhood problems (crime, lack of green space, low access to amenities) are associated with the reporting of poor health (Poortinga et al., 2007).

Miles and Jacobs (2008) argue that by looking at neighbourhoods, or at the *community level*, certain land uses within the built environment (residential, commercial, etc.) can have an impact on the *interpersonal level*, which includes such stressors as physical disorder among the neighbourhood, traffic congestion, problems with housing conditions, noise, and poor indoor and outdoor air quality. From the *interpersonal level*, these stressors in turn influence the *individual and population levels*, which include the adverse health affects experienced by neighbourhood residents. Also, a study conducted by Sampson and Raudenbush (2004), indicates that objectively rated neighbourhood problems are positively correlated with self-perceived neighbourhood problems.

Sampson and Raudenbush (2004) also indicate that a range of socio-demographic/economic factors influence self-perceived neighbourhood environments, such as income (Sampson and Raudenbush, 2004). At the neighbourhood level, homogeneity of lower socio-economic status residents is significantly linked to rundown and/or dangerous physical environments and reduced access to services and facilities (Feldman et al., 2009).

It has also been uncovered that lower socio-economic environments indicate,

> "...overall life hardship that includes living in a distressed, unsafe, and unpleasant neighbourhood, may be reflected in perceptions of stress and feelings of anger and hostility. It is conceivable that the higher prevalence of a sense of powerlessness, fatalism, frustration, and low self-efficacy among low-SES people living in poorer neighborhoods" (Wen et al., 2006:2577).

Feldman et al. (2009) find that lower-income families living in poorer neighbourhoods experience poorer health than lower-income families living in more affluent neighbourhoods.

Researchers have also linked other socio-demographic factors (examined in this study), such as gender, to explain varying perceptions of a neighbourhood's environmental quality (Ellaway et al., 2001). For example, Molinari (1998) found that women are more likely to base their perceptions of their neighbourhood's environmental quality on its *social* quality (unemployment, access to health care, youth violence), whereas

men are more likely to base their perceptions of their neighbourhood's environmental quality on its *physical* quality (air quality, water quality, waste disposal). In addition, some researchers have also hypothesized that the neighbourhood environmental quality is more significant for women because they are more likely to stay home caring for children and performing other domestic tasks, while men are typically more reliant on workplace networks, and are more influenced by their employment status than their neighbourhood's environmental quality (Poortinga et al., 2007).

Housing Quality

Housing quality, although part of environmental quality, has been examined in its own right. Housing quality is important, as it has been shown to influence residents' physical and mental health (Petticrew et al., 2009). Housing can be separated into two categories: housing quality indoors and housing quality outdoors. According to Veitch (2008), the average Canadian spends up to 90 percent of their time indoors, which includes their time spent at home. There are many potential affects on health and well being associated with long exposures to indoor environmental conditions, especially concerning indoor air quality, lighting, and noise (Veitch, 2008). For example, poor lighting indoors, particularly a lack of natural light, has been associated with an increased risk for depression and with higher mortality rates for cardiac patients (Veitch, 2008).

Furthermore, high noise levels within the home, from nearby traffic, and/or an airport, etc., have been associated with memory impairment, physiological stress responses, and decreased cardiovascular health (Veitch, 2008). Furthermore, the existence of hazards within the home, the amount of time spent inside the home, and the individual and neighbourhood level of disparity each contribute to residents' health (Pevalin et al., 2008).

The physical housing stock within neighbourhoods has been experiencing changes since World War II, due to technological advancements, consumer demand, and housing policy modifications (Jacobs et al., 2009). Since the mid-nineteen-hundreds, housing changes have been primarily centered on "...improved durability, energy conservation, general comfort, and security, as well as aesthetics" (Jacobs et al., 2009). Canada's National Building Code, overseen by the Canadian Commission Building and Fire Codes, is updated every five years and presents legal standards to which all buildings, including homes, must adhere (Veitch, 2008). The most current objective of this program is that every building code must contribute to "...either health, safety, accessibility, or fire and structural protection of the building" (Veitch, 2008:285). However, Canada's National Building Code narrowly defines health as the prevention of illness resulting from indoor settings, sanitation, noise, vibration, or contact with toxins, as the building codes

are meant to "...establish minimum acceptable conditions, not optimal conditions" (Veitch, 2008:285). More specifically, Brower (1996) argues that quality housing should satisfy six functions: shelter (affordable, structurally sound, protection against weather and intruders), housekeeping (cost and effort efficient in food preparation and storage, care and maintenance, waste disposal), accommodation (size, arrangement, equipment), connection (to other households, employment, services), meaning (character, appearance, conditions), and recreation (opportunity to relax, rest, recreate) (Macintyre et al., 2002).

Furthermore, the World Health Organization (WHO), has compiled a list of twenty-five housing risk factors that could impact peoples' health, included under five categories: *physical factors* (neighborhood/building noise etc.), *chemical factors* (smoke and/or allergens exposure, etc.), *biological factors* (humidity, mold, dust mites, insect infestations, etc.), *building factors* (home accidents or injuries, sanitation, etc.), and *social factors* (crowding, fear of crime, etc.) (Jacobs et al., 2009). Primarily, the categories relevant to this research project are physical factors, building factors, and social factors, as these factors can be measured in a more subjective way, by examining residents' self-perceptions. However, chemical factors and biological factors are typically measured in a more objective way, requiring technical instruments and physician involvement (Veitch, 2009; Jacobs et al., 2009).

Similarly, the American Housing Survey (AHS) has outlined numerous housing and neighbourhood quality factors can affect health, including: "...window and floor conditions, lighting in public areas, trash, proximity to noxious and other non-housing land uses, potential stressors (e.g., crime, noise, odours), and indicators of community investment (e.g., nearby building conditions) (Jacobs et al., 2009). Evans (2003) states that it is these preceding characteristics of stressful housing that can exaggerate pre-existing psychological illness in those residents exposed to them.

Jacobs et al. (2009) have compiled a list of five trends relating housing quality to health, including three that are applicable to this project: housing age and amenities (quality of both); housing proximity to open space or noxious and/or high-traffic facilities, noise, and neighbourhood air quality; and general health status, especially by race/ethnicity.

Housing that does not meet its occupant's perceived and actual needs can have a negative impact on health status. For example, recent attention between city planners and public health researchers has linked housing to such health conditions as a high Body Mass Index. This being a result of fewer opportunities to exercise, including walking, and the convenience of driving to school, to shop, and/or to work (Jacobs et al., 2009). Also, Jacobs et al. (2009) point out that indoor housing quality can

also influence obesity, as climate controlled homes (with the use of air conditioning and/or heating) can result in the body using less energy.

As well as at the neighbourhood level, socio-economic status, including indicators such as income, education, employment, and tenure, has been consistently linked with poorer housing conditions and poorer health (Feldman et al., 2009). Moreover, "...the large health differences among lower-income and minority families compared with other populations suggest housing conditions may contribute to chronic disease in some populations" (Jacobs et al., 2009:599). An individual's health status is not only determined by their socio-demographic characteristics, their health behaviours, and their disease status, but also by the physical and social environmental characteristics of their neighbourhood and of their home (Jia et al., 2009; Jacobs et al., 2009). Studies have determined that perceived neighbourhood and housing problems are associated with the reporting of poor health at the individual level and at the community level (Poortinga et al., 2007; Miles and Jacobs, 2008). By examining Hamilton, a city with a range of population and neighbourhood socio-demographic/economic characteristics, there is an opportunity to uncover possible patterns of how residents perceive these characteristics and any association they may have to their health.

Determinants of Health and Health Outcomes

Recently, there has been increasing literature documenting the relationship between a person's place of residence and their health (Wen et al., 2006). Although some studies have suggested that, "...residents' self-reports of their neighbourhood environment may be less revealing than are objective assessments" (Wen et al., 2006:2575), others have shown that residents' perceptions of their neighbourhood environment uncovers distinctive perceptions that are more revealing of individual health than the objective neighbourhood studies (Wen et al., 2006). A list of the social determinants of health has been compiled since the 1974 Lalonde report: New Perspective on the Health of Canadians. Since then, the Public Health Agency of Canada has increased the list from four social determinants of health to twelve social determinants of health, including some of the characteristics examined in this study: income, education, employment, physical and social environments, personal health measures, and gender (Wilson et al., 2008). The five health outcomes chosen for this project: emotional distress, Body Mass Index (BMI), health satisfaction, self-reported health status, and chronic conditions were selected because they have been shown to be important indicators of health and have already been linked in the literature as being health outcomes that can be influenced by residents' perceptions of their neighbourhood characteristics (Wilson et al., 2008).

Emotional Distress

Many mental health problems, including depression, anxiety, and alcohol and drug abuse have been linked to poor housing design and noise (Pevalin, 2008). Researchers have also found linkages between perceptions of neighbourhood characteristics and emotional health (Wilson et al., 2003). One method of quantitatively measuring emotional distress, used for this study, is to determine a GHQ score. A GHQ score greater than or equal to 4 indicates emotional distress that can be a result of an inability to cope with daily demands (dissatisfaction with neighbourhood, money uncertainties, illness event in the past twelve months, not being born in Canada, financial difficulties in the past twelve months, home needing repairs, no community participation, smoking, use of health services, unemployment) (Keller-Olaman et al., 2005). In addition, Wen et al. (2006) report that negative perceptions of the neighbourhood environment are linked with depression, anxiety, and other mental health conditions. Moreover, a study conducted in Norway shows that over a ten-year study period,

"...perceived improvement in social environment paralleled the improvement in mental heath" (Wen et al., 2006:2576).

Body Mass Index

According to Ross et al. (2007) and Matheson et al. (2007), the rate of obesity in Canada has been consistently increasing, at a rapid rate,

over the last twenty-five years. According to The National Institutes of Health (2009), Body Mass Index (BMI) is a measure of body fat based on height and weight. A BMI score of 25 to 29.9 indicates a person is overweight, while a BMI of 30 or higher indicates obesity (National Institutes of Health, 2009). Researchers have only recently begun to examine the relationship(s) between neighbourhood socioeconomic factors, urban form, and BMI (Ross et al., 2007). They note that aside from the genetic and metabolic factors influencing increasing BMI rates, neighbourhoods also have an important role:

> "Socioeconomic, cultural, and environmental factors influence health-related behaviours, which in turn influence weight. It is these influences - the interplay between adult BMI, social position, behavior, and environment – that are the principle focus…BMI is a function of individual characteristics, (e.g., age, income level, immigrant status, exercise patterns, diet) along with neighbourhood (e.g., neighbourhood education level, density of dwellings) and metropolitan area contexts (e.g., sprawl)" (Ross et al., 2007:500).

However, individual characteristics, single-handedly, including social position and health behaviours, are unable to entirely explain differences in BMI (Ross et al., 2007). Previous studies examining the relationship between BMI and the environment have concentrated on two extensive aspects: "sociodemographic characteristics of neighbourhoods and overall urban form (density, land-use mix, and street connectivity)" (Ross et al., 2007:500). The research that has been conducted has revealed that suburban neighbourhoods, which are often inaccessible on

foot or on bicycles, have led to a decrease in physical activity and thus, an increase in many residents' body weight (Ross et al., 2007). Brown et al. (2009) theorize that neighbourhoods with lower population densities and a lack of mixed land uses are less appealing to walk in; whereas in more densely populated neighbourhoods, driving is less appealing due to traffic congestion, limit parking, etc.

Roman et al. (2009), report that lower-income residents, particularly those from minority populations, are less physically active, have higher BMI levels, and have poorer overall health than the general population. Therefore, access to parks and recreational facilities is linked to lower BMI levels, as parks provide lower-income individuals and neighbourhoods with free and/or affordable opportunities for physical activity (Brown et al., 2009).

Also, technological advances (e.g., transportation, etc.) have lead to an increasing availability of affordable, high-caloric foods (Matheson et al., 2007). This, coupled with socioeconomic disparities, has had a significant influence on dietary quality, as the healthier food choices tend to be less affordable than their high-caloric food counterparts (Matheson et al., 2007).

Health Satisfaction

According to researchers, health satisfaction is an important indicator of wellbeing (Barger et al., 2008). Barger et al. (2008:179), along

with the World Health Organization (WHO), define subjective wellbeing as, "...a critical component of...health assessments, and a rigorous understanding of well-being determinants is a precondition for policy interventions to promote health and well-being." Many socio-demographic (e.g., age gender, ethnicity, etc.) and socioeconomic factors (e.g., income, education, employment, etc.), influence health satisfaction and wellbeing (Barger et al., 2008). Moreover, the most significant health and life satisfaction indicators determined by Barger et al. (2008) include employment status, disability, and self-rated health. However, Xiao and Barber (2007), state that health satisfaction is most strongly correlated with access to health care, along with satisfaction with health care providers and the overall quality of the health care being provided. Therefore, Xiao and Barber (2007:719) argue that health satisfaction "...encompasses a number of dimensions...namely, access to care, professional staff (interpersonal interaction) and quality of care (technical competence)..." and that socio-demographic and socioeconomic factors are less important than the specific characteristics of the health care setting (Xiao and Barber, 2007).

Self-Reported Health Status

One of the socio-economic/demographic characteristics this study examines, income, significantly influences numerous health outcomes, such as individuals' stress and emotional well-being, their Body Mass

Index, and their self-reported health status (Lee and Moudon, 2008; Petticrew et al., 2009). Researchers that have been studying associations between neighbourhood characteristics and self-reported health status have determined that residents of more affluent neighbourhoods are more likely to report better health than residents of poorer neighbourhoods; most likely a result of aspects such as better access to collective (e.g., amenities) and individual (e.g., healthier food options) resources (Stafford and Marmot, 2002). Although wealthier residents may promote high quality amenities and services, potentially improving the self-reported health of all residents, poorer residents of more affluent neighbourhoods often report worse health than poorer people living in more deprived neighbourhoods (Stafford and Marmot, 2002). This is a result of poorer residents' inability to afford the same goods and services as the wealthier residents (Stafford and Marmot, 2002). The quality of a neighbourhood itself is linked to self-reported health status, as residents' perceptions of their neighbourhood may mediate the health effects of living in a poorer neighbourhood (Petticrew et al., 2009).

Housing also affects self-reported health, both physical health and mental/emotional health (Petticrew et al., 2009). According to Petticrew et al. (2009), studies have shown that housing improvements can lead improvements in self-reported health. For example, a study based in New Zealand demonstrates that by increasing the internal temperature of older

homes, particularly through the installation of insulation, the health and well being of residents showed improvement (Petticrew et al., 2009).

Furthermore, having more space (indoors and outdoors), privacy, and an undisturbed (peaceful/quiet) local environment are associated with greater wellbeing and reduced emotional distress (Petticrew et al., 2009).

Chronic Conditions

It has been reported that there are no key neighbourhood effects on chronic conditions, including long-term illness, functional limitations, and long-term physical limitations (Pickett and Pearl, 2001). However, these researchers did find that socioeconomic status does have an effect on a number of chronic diseases, with neighbourhood deficiencies being associated with an increased risk of long-term illness (Pickett and Pearl, 2001). On the other hand, other researchers have reported linkages between chronic conditions and age, with the odds of reporting one or more chronic conditions more likely in older participants (Wilson et al., 2007). Neighbourhood problems, such as litter, noise, traffic, crime, lighting, etc. have been associated with an increased risk of overall functional loss among neighbourhood residents aged fifty-five years and older, indicating an underlying affect of neighbourhood perceptions on health (Wen et al., 2006).

Therefore, the literature shows that an individual's quality of health is determined by their socio-demographic characteristics, their

health behaviours, their disease status, and by the physical and social environmental characteristics of their neighbourhood (Jia et al., 2009). In addition,

housing quality is important, as it can impact residents' physical and mental health (Petticrew et al. 2009). Moreover, housing that does not meet its occupant's needs can negatively influence health (Jacobs et al., 2009). The five health outcomes examined in this research (emotional distress, BMI, health satisfaction, self-reported health status, and chronic conditions) have been shown to be important indicators of health and have been linked in the literature as being health outcomes that can be influenced by residents' perceptions of their neighbourhood and housing characteristics (Wilson et al., 2008). The proceeding chapter, Chapter Three: Settings, Methods, and Data, discusses how the data was collected and outlines the steps needed to execute the analysis of the data.

Chapter Three: Settings, Methods, and Data

The purpose of this chapter is to discuss how the data examined for this thesis was collected and to outline the steps needed to execute the subsequent analysis of the data.

The study, based on previously conducted surveys, was performed in Hamilton, Ontario, Canada. This city is located on the western tip of Lake Ontario about 37 miles, or 60 kilometers, southwest of Toronto (Keller-Olaman et al., 2005; Wilson et al. 2008). Although Hamilton's current population is over 500 000 residents, at the time the original study was conducted, Hamilton's population was 380 000 (Keller-Olaman et al., 2005).

Both surveys were performed in four Hamilton neighbourhoods: The Downtown Core, Chedoke-Kirkendall, the Industrial Northeast, and the Southwest Mountain (See: Figure 1). The neighbourhoods were selected through a combination of statistical methods and data obtained from the 1996 Census of Canada. Furthermore,

> "Principal Component Analysis (PCA), local indicators of spatial association (LISA), and geographical information systems (GIS) were used to identify neighbourhoods…this analysis was coupled with qualitative interviews with prominent local decision makers and key informants who identified the same neighbourhood areas of interest for study… the selected neighbourhoods displayed various combinations of socioeconomic wealth and social diversity…" (Olaman et al., 2005).

The data was collected through telephone surveys: the first survey in 2001 and the second survey in 2003. The sampling structure was developed using tax assessment records, along with the Canada 411 Internet locater service (Wilson et al., 2007). A preparatory letter was sent to all potential participants, informing them about the study (Wilson et al., 2007). Ultimately, the surveys were administered by the Institute of Social Research (ISR), located at York University, in the city of Toronto (Wilson et al., 2007).

The first telephone survey, conducted from November 2001 to April 2002, was arranged with a random sample of around three hundred participants/households residing in each of the four neighbourhoods (Wilson et al., 2007). Moreover, "The response rate, defined as the number of completed interviews divided by the estimated number of eligible households divided by 100, was 60%" (Wilson et al., 2007:155). Each survey was to be completed by the resident, within a participating household, who had the most recent birthday (Wilson et al., 2007). The survey contained questions that helped to identify the participants' perceptions of their neighbourhood environment, housing environment, social networks, and health. Furthermore, the survey also included questions relating to socio-demographic/economic variables (Wilson et al., 2007).

The second telephone survey, which this thesis investigates, was conducted in 2003, using participants from the same sample as the first survey (Wilson et al., 2007). However,

"882 households were identified as eligible for the follow-up. Of the 281 ineligible households, i) 136 had moved out of the area/no such person at address; ii) 125 had not-in-service numbers; iii) in 20 cases, the household informant was unable to speak English/respondent was neither physically nor mentally well enough to complete the interview; and, iv) for 73 households, it was not possible to determine eligibility" (Wilson et al., 2007:155). Therefore, the response rate for the second survey was 76%, 671 participants out of 882 participants (Wilson et al., 2007).

After the survey data from the second survey had been obtained, the data was then added into a Statistical Program for Social Sciences (SPSS) file. The data has been divided into neighbourhood environmental quality variables and housing environmental quality variables, both of which were subsequently divided into physical and social variables (See: Appendix 1), in order to differentiate between how the participants' health is influenced by the physical versus the social variables. The physical housing environmental quality variables include the participants' satisfaction/dissatisfaction with: the dwelling's interior layout, amount of sunlight, indoor air quality, size of yard, cost of heating, cost of mortgage/rent, and their ability to keep the outside of their dwelling

maintained. The social housing environmental quality variables include participants' satisfaction/dissatisfaction with: the amount of indoor noise, the amount of outdoor noise, safety and security, location, their dwelling overall, housing prices in the neighbourhood, pride for their home, that their home is a reflection of themselves, that their housing choices have financial limitations, and whether the quality of their home or their neighbourhood is more important to them. As for the neighbourhood environmental quality variables, the physical variables include the participants' perceived commonness/uncommonness of: open public spaces, bicycle paths and street lighting; along with their satisfaction/dissatisfaction with: the density of dwellings, the amount of improvement needed for parks, use of public parks, public transit, and traffic problems. Finally, the social variables include participants' perceived commonness/uncommonness of: litter, noise from people, noise from traffic, noise from factories, homelessness, graffiti, vandalism, attacks, alarms sounding, and use of drugs/alcohol; along with their satisfaction/dissatisfaction with: if the neighbourhood will be a better/worse place to live in the next five years, if the neighbourhood is in a poorer/more affluent part of the city, and the presence of activities/facilities for youth.

These variables are important to the research, as previous studies examining the quality of environment and health indicate that how

residents perceive these features of their local environment may be an important determinant of their health (Ellaway et al. 2001). Each variable was measured using a Likert scale; typically used in surveys/questionnaires, with the respondent being asked, for example, whether they "'Strongly agree', 'Agree', 'Disagree', or 'Strongly Disagree' with some statement" (William, 2006). In this research, the questions utilized two different Likert scales. The first: 'Very satisfied', 'Somewhat satisfied', 'Somewhat dissatisfied', and 'Very dissatisfied', along with a 'Don't know' option and those who refused to answer the question. However, these variables were subsequently recoded into binary variables, with 'Very Satisfied' and 'Somewhat satisfied' becoming 'Satisfied' and 'Somewhat dissatisfied', 'Very dissatisfied', 'Don't know', and those who refused to answer the question becoming 'Dissatisfied'. Initially, the 'Don't know' responses and those who refused to answer the question were removed from the new binary variables, as they did not indicate satisfaction or dissatisfaction. However, removing these responses significantly decreased the amount of available responses to use for testing. Therefore, they were recoded into 'dissatisfied' in order to remain with the response data, as recoding them as being 'satisfied' could not be justified, as given the type of questions asked in the survey, a 'Don't know'/refusal implies dissatisfaction. For example, one survey question asked participants about their satisfaction/dissatisfaction with the safety

and security of their dwelling. Answering 'Don't know' does not indicate satisfaction because if these participants were satisfied, they would have indicated 'Very satisfied' or 'Somewhat satisfied' instead of expressing their uncertainty. Therefore, it is instead classified as dissatisfaction. The second Likert scale used was: 'Very common', 'Fairly common', 'Not very common', 'Not at all common', 'Don't know', and those who refused to answer the question. As these variables were also recoded into binaries, 'Very Common' and 'Fairly common' became 'Common', while 'Not very common', 'Not at all common', 'Don't know', and those who refused to answer the question became 'Uncommon'. Again, given the nature of the questions asked, 'Don't know'/refusal implies that they are uncommon. For example, another survey question asked participants about the commonness/uncommonness of graffiti in their neighbourhood. Answering 'Don't know' implies that they have not noticed enough graffiti in their neighbourhood to respond that it is 'Very common' or 'Fairly common', so it is instead classified as uncommon.

The socio-demographic/economic variables used in this research are also important, as according to Wen et al. (2006), a range of socio-demographic/economic factors also influence self-perceived neighbourhood environment and health, including: age, gender, income, tenure, education, and employment. Since the socio-demographic/economic variables were also important to the future

analysis of the data, they were also appropriately recoded in order to more accurately accomplish the analysis portion of the research (See: Table 1).

It was anticipated that logistic regression would be a subsequent step of the analysis, as logistic regression can be used to predict each health outcome on the basis of the socio-demographic/economic variables and the environmental quality variables; to determine the percent of variance in each health outcome explained by the socio-demographic/economic and environmental quality variables; and to rank the relative importance of the socio-demographic/economic and environmental quality variables (Garson, 2009). Therefore, an initial task was to recode many of the variables being included in the analysis. As the environmental quality variables are the dependent variables, they needed to be recoded to become binary, or dichotomous (Connor, 2002); whereas the health outcomes (independent variables), along with the socio-demographic and socioeconomic variables, were not required to be recoded into binaries.

The following analysis will first examine the relationship between socio-demographic/economic, environmental quality, and health outcomes (using cross-tabulations and Chi-squares), in order to reveal any significance between the variables and to test whether the distribution of scores differs consistently from what would be anticipated by chance. As there were many unexplainable insignificant relationships between variables, these variables were put into a scale to determine if they were

more statistically significant when combined together, the next step was reducing the number of environmental quality variables that were insignificant to the analysis of the data (by creating indices, determining Alpha levels, and performing reliability tests). Finally, predictions on the significance levels between the variables and the health outcomes were conducted (logistic regressions). Logistic regression estimates the odds of a certain event occurring, with binomial logistic regression only supporting a single dependent variable (Garson, 2009). Therefore, this thesis aims to predict variation in an independent variable (health outcome), by entering in the dependent variables (socio-demographic/economic and environmental). For the logistic regression models, the reference categories have been chosen to predict the likelihood of those with the poorest level(s) of health, including the oldest age group, the lowest income, etc. (See: Table 1).

Table 1: Coding Description of the Socio-Demographic/Economic Variables and Reference Categories for the Logistic Regressions

Variable	Coding	Reference Category
Age	0= 18-44	65+
	1= 45-64	
	2= 65+	
Gender	1= Male	Female
	2= Female	
Income	1= <$30 000	<$30 000
	2= $30 000 - $49 999	

	3= $50 000 - $79 999	
	4= $80 000+	
Tenure	1= Own	Rent
	2= Rent	
Education	0= < High School	< High School
	1= High School	
	2= > High School	
Employment	1= Unemployed	Unemployed
	2= Employed	

This chapter discusses how the data used for this thesis was collected (through surveying participants) and how these variables were divided into Neighbourhood Environmental Quality variables (physical and social) and Housing Environmental Quality variables (physical and social), in order to reveal any differences/similarities between the participants' perceived influence of their neighbourhood characteristics versus their housing characteristics on their health. The steps of the analysis (cross-tabulations, ANOVAs, and regression models) are discussed and the results presented in the proceeding chapter.

Chapter Four: Results

The purpose of this chapter is to reveal the outcome(s) of each of the methods discussed in the previous chapter. Specific values will be presented, followed by a discussion of the results in the proceeding chapter.

In order to measure the association between each environmental quality variable and each health outcome and socio-demographic/economic variables, cross-tabulations have been performed, focusing on their Chi-Square, or significance level. A significance level of 0.05 has been used. Therefore, any Chi-Square outcome of 0.05 or lower is considered significant, whereas any Chi-Square outcome above 0.05 is considered insignificant. Three groupings of cross-tabulations have been executed, in order to represent and distinguish between the significance levels of the three main categories of variables examined in this thesis (environmental quality variables, socio-demographic/economic variables, and health outcomes):

1) Each environmental quality variable versus each health outcome,

2) Each environmental quality variable versus each socio-demographic/socioeconomic variable, and

3) Each socio-demographic/economic variable versus each health outcome (See: Appendix 2).

Upon examination of the cross-tabulation/Chi-Square results between the environmental quality variables and the five health outcomes, a range of housing and neighbourhood environmental quality characteristics have shown significance. Significant *housing* environmental quality characteristics include: how noise carries between rooms inside a participant's dwelling, how noise carries from outside their dwelling, the safety and security of their dwelling, overall satisfaction with their dwelling, pride of their dwelling, indoor air quality of their dwelling, heating costs of their dwelling, their ability to maintain the outside of their dwelling, and their mortgage/rent expenses. In addition, significant *neighbourhood* environmental quality characteristics include: the presence/lack of bicycle paths, the density of dwellings, problems with traffic, participants' use of public parks, activities/facilities available to children and youth, whether or not participants describe their neighbourhood as being poor, noise from people, homelessness, graffiti, attacks based on ethnicity, the noise of alarms sounding, drug and/or alcohol abuse in the neighbourhood, vandalism, concerns about walking alone at night, neighbours entering one another's homes without permission, and muggings. However, a number of variables included in the cross-tabulations do not reveal a level of significance with any of the five health outcomes. Not statistically significant *housing* environmental quality characteristics include: participants' satisfaction with the interior

layout of their dwelling, the amount of sunlight that reaches inside their dwelling, their yard size, and there being a limited choice of dwellings for them due to financial issues. Moreover, not statistically significant *neighbourhood* environmental quality characteristics include: the amount of open public spaces, the amount of street lighting, whether or not the parks need to be improved, the presence/lack of public transit, litter, noise from traffic, and noise from factories.

Upon examination of the cross-tabulation/Chi-Square results between the environmental quality variables and the six socio-demographic/socioeconomic variables, a slightly broader range of housing and neighbourhood environmental quality characteristics have shown significance. Significant *housing* environmental quality characteristics include: participants' satisfaction with how noise carries between rooms inside their dwelling, how noise carries from outside their dwelling, the safety and security of their dwelling, overall satisfaction with their dwelling, pride of their dwelling, indoor air quality of their dwelling, heating costs of their dwelling, their ability to maintain the outside of their dwelling, and their mortgage/rent expenses. In addition, significant *neighbourhood* environmental quality characteristics include: the presence/lack of bicycle paths, the amount of open public spaces, the density of dwellings, problems with traffic, participants' use of public parks, activities available to children and youth, whether or not

participants describe their neighbourhood as being poor, noise from people, noise from traffic, homelessness, litter, graffiti, attacks based on ethnicity, the noise of alarms sounding, drug and/or alcohol abuse in the neighbourhood, vandalism, concerns about walking alone at night, neighbours entering one another's homes without permission, and muggings.

Unlike the cross-tabulations between the environmental quality variables and the five health outcomes, each of the *housing* environmental quality variables reveal significance with at least one of the six socio-demographic/socioeconomic variables. However, there are still several neighbourhood environmental quality characteristics that do not reveal significance. Not statistically significant *neighbourhood* environmental quality characteristics include: the amount of street lighting, whether or not the parks need to be improved, and noise from factories.

Finally, upon examination of the Chi-Square results between the six socio-demographic/economic variables and the five health outcomes, each socio-demographic/economic reveals significance with at least one of the health outcomes. For emotional distress, the significant variables include: income level and tenure status. When examining participants' BMI level, significant variables include: age, gender, tenure status, and education level. For satisfaction with health, the significant variables include: age and tenure status. As for self-reported health status, significant variables

include: age, income level, tenure status, and education level. Finally, for chronic conditions, the significant socio-demographic/socioeconomic variables include: the participants' age, gender, income level, employment status, and education level.

Reducing the Number of Environmental Quality Variables:

Once completing the cross-tabulations, it was decided that there was an excess of data to sort through and analyze and a lot of conflicting and insignificant relations among items that might be closely interrelated. One way forward, on the basis of conceptual input, is to create scales/indices. For this project, there were numerous individual variables and once the cross-tabulations were performed, the cells became quite small, as the project is only examining four neighbourhoods and not every participant has responded to every question on the questionnaire. Ultimately, the cross-tabulations were an important step in determining that the data set needed to be categorized into indices in order to test the Alpha levels for different variables.

To begin, in order to organize the variables into indices, the environmental quality variables were divided into four categories:

1) Neighbourhood Social Environmental Quality,

2) Neighbourhood Physical Environmental Quality,

3) Housing Social Environmental Quality, and

4) Housing Physical Environmental Quality

These four categories were chosen in order to examine how the physical variables differ from the social variables, in terms of housing quality and neighbourhood quality, as literature suggests that physical characteristics and social characteristics impact health in different ways (Wilson et al., 2008). Once the environmental quality variables had been categorized, reliability tests were performed on each grouping. The reliability tests act as a way of establishing which items from the initial questionnaire are related to one another and the internal consistency of each index. It is important to be concerned with reliability because it measures the extent to which random measurement error may be influencing the indices' scores and that it is an initial way to determine its validity: the degree to which the scale measures what it is intending to measure (Wells and Wollack, 2003; Pallant, 2007). Therefore, testing for reliability allows variables weakening the strength of the index to be discovered and removed before moving forward with the analysis (MSC, 2010) (See: Appendix 3).

In order to examine the statistical coherence of the indices, reliability tests were performed to determine the Cronbach's Alpha levels of the potential groupings of variables. The Alpha level indicates the internal consistency among the variables being categorized into the indices (Garson, 2010). According to Garson (2009), a cut-off of .60 is common

in exploratory research; however, the alpha should be at least .70 to keep an item in an acceptable scale.

> "Cronbach's alpha increases as the number of items in the scale increases…[if] the added items are not bad items compared to the existing set. Increasing the number of items can be a way to push alpha to an acceptable level" (Garson, 2009).

On the other hand, items can be dropped from the scale in cases where if deleted, the alpha would become higher (Garson, 2009). The Alpha level for these indices was set at approximately 0.6. Therefore, any Alpha level around 0.6 or higher indicates that the variables within the indices are consistent enough

to be combined together into one variable. After the initial reliability tests, it was determined that some of the individual environmental quality variables for the Neighbourhood Social Environmental Quality category and the Housing Social Environmental Quality category were reducing the indices' Alpha levels. Therefore, those variables were removed from the indices to improve the indices internal consistency and accuracy. Furthermore, for the Neighbourhood Physical Environmental Quality category and the Housing Physical Environmental category, the Alpha levels were too low to create indices with the necessary internal consistency. As a result, it was decided that only two individual variables from each of these two categories would remain in the analysis, as each influenced the Alpha level to be higher as individual variables then when they were included among the indices.

The Neighbourhood Social Environmental Quality index initially included the binary variables representing the following questions (See: Table 2).

Table 2: Description of Neighbourhood Social Variables

Variable Name (Neighbourhood Social Variables)	**Survey Question/Description**
Activities/Facilities (activiti2)	What about activities and facilities for children and young people in your neighbourhood?
Poor Neighbourhood (poorneig2)	Do you think most people in Hamilton would describe this neighbourhood as a poorer part of the city or a better-off part of the city?
Litter (litter2)	Garbage and litter lying about - is this in your neighbourhood?
Noise from Traffic (trnoise2)	Noise from traffic in your neighbourhood?
Noise from People (pplnoise2)	Noise from people, such as partying and people shouting in your neighbourhood?
Noise from Factories (facnoise2)	Noise from factories, businesses, construction and aircraft in your neighbourhood?
Homelessness (homeless2)	Homeless people on the streets in your neighbourhood?
Graffiti (graffiti2)	Graffiti on walls and buildings in your neighbourhood?
Attacks (attacks2)	Insults or attacks related to someone's race, colour or ethnicity in your neighbourhood?
Burglar/Car Alarms (alarms2)	The sound of home burglar or car alarms going off in your neighbourhood?
Drugs and Alcohol Abuse(drugsalco2)	Drug or alcohol abuse in your neighbourhood?

Vandalism (vandalsm2)	Vandalism and homes or cars being broken into in your neighbourhood?
Walking Alone (wlkalone2)	Concerns from people in this neighbourhood about walking alone at night?
Neighbours Entering Home (nghbrent2)	Neighbours entering your property without permission?
Muggings (muggings2)	Muggings and other attacks on people in your neighbourhood?

However, although the Alpha level was suitable at .751, by removing the Activities/Facilities for youth variable from the final index, the Alpha level increased to .786.

Furthermore, the Housing Social Environmental Quality index initially included the binary variables representing the following questions (See: Table 3):

Table 3: Description of Housing Social Variables

Variable (Housing Social Variables)	**Survey Question/Description**
Indoor Noise (noiseins2)	What about how noises carry between rooms inside your dwelling?
Outdoor Noise (noiseout2)	What about how noises carry from outside your dwelling?
Safety and Security(safecur2)	What about the safety and security of your dwelling?
Overall Satisfaction (overall2)	Overall, how satisfied are you with your present dwelling as a place to live?
House Prices (housepri2)	In a year from now, do you expect house prices or rent in

	your neighbourhood will go up, stay about the same, or go down?
Neighbourhood Move (moveneig2)	If you had to move, would you prefer to move to a better home in THIS neighbourhood, or to a similar home but in a BETTER neighbourhood?
Location of Home (homeloca2)	Is your home in a good location for you?
Home Reflection (homerefle2)	Is your home a good reflection of who you are?
Home Pride (proudhom2)	Are you are proud to show your home to visitors?
Home and Neighbourhood (neighdm2)	Does it matter what your neighbourhood is like as long as you have a nice home?
Limited Choice (choiceli2)	Do you have limited choices on where to live because of financial issues?
Good Neighbourhood and/or Good Home (gnghome2)	Is being in a good neighbourhood is just as important as having a good home?
Will neighbourhood Change (wilchang2)	On the whole, do you think that over the next five years this neighbourhood will get better or worse as a place to live?

The initial Alpha level for this index was too low, at .437. Therefore, by removing the variables: House Prices, Neighbourhood Move, Home and Neighbourhood, and Limited Choice the Alpha level increased to .618.

However, as mentioned, the Housing Physical Environmental Quality index and the Neighbourhood Physical Housing Environmental Quality index produced low Alpha levels at .489 and .185, respectively. Moreover, by removing any of the variables from the indices, the Alpha level would decrease further. Therefore, for the Housing Physical Environmental Quality category and for the Neighbourhood Physical Environmental Quality category, only two variables from each category were kept and were not combined together in an index. Instead, these variables were treated as individual variables in the latter stages of the analysis, as each influenced the Alpha level to be higher as individual variables then when they were included among the indices and are representative of the physical variables for housing and for neighbourhood (See: Table 4).

Table 4: Description of the Four Independent Variables

Variable Code (Housing and Neighbourhood Physical Variables)	**Survey Question/Description**
Interior Layout (layout2)	Are you very satisfied/dissatisfied with the interior layout of your dwelling?
Outdoor Maintenance (maintout2)	What about your ability to keep the outside of your home well maintained?
Density of Dwellings (density2)	Do you think the density of dwellings in your neighbourhood needs a great deal of improvement?
Traffic Problems (trafficp2)	What about problems with traffic in your neighbourhood?

Testing of the Means

One-way analysis of variance (ANOVA) tests were then performed on the two remaining indices, Neighbourhood Social Environmental Quality and Housing Social Neighbourhood Environmental Quality, in order to test if the means of the variables included in the indices are equal. For each test, the indices were used as the dependent variable and each of the socio-demographic/economic variables were entered as the independent variable (See: Tables 5 to 28).

Table 5: Descriptives: Neighbourhood Social Environmental Quality Index and Income

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min.	Max.
<$30,000	79	5.2960	2.86711	.32247	4.6541	5.9380	1.00	15.00
$30,000-$49,999	78	5.1734	3.57971	.40530	4.3663	5.9804	.00	14.00
$50,000-$79,999	105	3.7327	2.34855	.22914	3.2783	4.1871	1.00	12.00
$80,000+	121	3.5150	2.54798	.23147	3.0567	3.9733	1.00	12.00
Total	383	4.2795	2.90620	.14844	3.9877	4.5714	.00	15.00

Table 6: ANOVA: Neighbourhood Social Environmental Quality Index and Income

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	246.245	3	82.082	10.430	.000
Within Groups	2982.517	379	7.869		
Total	3228.761	382			

For this Analysis of Variance, when testing if the mean score of the Neighbourhood Social Environmental Quality Index differs by income, the F-statistic is 10.43, with an associated p-value of 0. Since the p-value is less than 0.05, income is statistically significant. Therefore, it indicates that annual income is important.

Table 7: Descriptives: Neighbourhood Social Environmental Quality Index and Education

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min.	Max.
< High school	67	5.7969	3.14209	.38511	5.0279	6.5659	1.00	15.00
High school	89	4.8140	2.94995	.31191	4.1941	5.4338	1.00	12.00
> High school	227	3.6156	2.61072	.17318	3.2743	3.9568	.00	14.00
Total	383	4.2741	2.91046	.14866	3.9818	4.5664	.00	15.00

Table 8: ANOVA: Neighbourhood Social Environmental Quality Index and Education

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	278.996	2	139.498	17.913	.000
Within Groups	2959.238	380	7.787		
Total	3238.234	382			

When testing if the mean score of the Neighbourhood Social Environmental Quality Index differs by education, the F-statistic is 17.913, with an associated p-value of 0. Since the p-value is less than 0.05, education is statistically significant. Therefore, education is important.

Table 9: Descriptives: Neighbourhood Social Environmental Quality Index and Age

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min.	Max.
18-44	220	4.3452	2.92623	.19729	3.9563	4.7340	1.00	15.00
45-74	154	4.2559	2.93194	.23591	3.7899	4.7220	.00	14.00
75+	11	2.5909	1.65992	.49073	1.5038	3.6781	1.00	7.00
Total	386	4.2574	2.90880	.14808	3.9663	4.5486	.00	15.00

Table 10: ANOVA: Neighbourhood Social Environmental Quality Index and Age

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	33.469	2	16.734	1.983	.139
Within Groups	3223.071	382	8.437		
Total	3256.540	384			

When testing if the mean score of the Neighbourhood Social Environmental Quality Index differs by age, the F-statistic is 1.983, with an associated p-value of 0.139. Since the p-value is higher than 0.05, age is not statistically significant. Therefore, it shows that age is not an important variable for consideration in this regard.

Table 11: Descriptives: Neighbourhood Social Environmental Quality Index and Gender

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min.	Max.
Male	181	4.3391	2.95405	.21958	3.9058	4.7724	1.00	14.00
Female	205	4.1853	2.87354	.20074	3.7895	4.5811	.00	15.00
Total	386	4.2574	2.90880	.14808	3.9663	4.5486	.00	15.00

Table 12: ANOVA: Neighbourhood Social Environmental Quality Index and Gender

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.274	1	2.274	.268	.605
Within Groups	3254.266	383	8.497		
Total	3256.540	384			

When testing if the mean score of the Neighbourhood Social Environmental Quality Index differs by gender, the F-statistic is .268, with an associated p-value of 0.605. Since the p-value is higher than 0.05, gender is not statistically significant. Therefore, it indicates that gender is not important in this analysis which leads to questions of why not, taken up in the discussion.

Table 13: Descriptives: Neighbourhood Social Environmental Quality Index and Employment

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min.	Max.
Not Employed	111	4.5916	3.16279	.30051	3.9960	5.1871	1.00	13.00
Employed	274	4.1407	2.79279	.16886	3.8083	4.4731	.00	15.00
Total	384	4.2706	2.90726	.14830	3.9791	4.5622	.00	15.00

Table 14: ANOVA: Neighbourhood Social Environmental Quality Index and Employment

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	16.027	1	16.027	1.899	.169
Within Groups	3223.891	382	8.440		
Total	3239.918	383			

When testing if the mean score of the Neighbourhood Social Environmental Quality Index differs by employment, the F-statistic is 1.899, with an associated p-value of 0.169. Since the p-value is higher than 0.05, employment is not statistically significant. Therefore, it shows that employment is not an important variable for consideration in this analysis, which again leads to questions of why not, taken up in the discussion.

Table 15: Descriptives: Neighbourhood Social Environmental Quality Index and Tenure

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min.	Max.
Own	339	3.9493	2.65441	.14426	3.6655	4.2331	.00	14.00
Rent	47	6.5111	3.63610	.53147	5.4412	7.5810	1.00	15.00
Total	385	4.2605	2.90958	.14822	3.9691	4.5519	.00	15.00

Table 16: ANOVA: Neighbourhood Social Environmental Quality Index and Tenure

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	269.874	1	269.874	34.639	.000
Within Groups	2984.011	383	7.791		
Total	3253.886	384			

When testing if the mean score of the Neighbourhood Social Environmental Quality Index differs by tenure, the F-statistic is 34.639, with an associated p-value of 0. Since the p-value is less than 0.05, tenure is statistically significant. Therefore, tenure is important.

Table 17: Descriptives: Housing Social Environmental Quality Index and Income

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min.	Max.
<$30,000	54	2.3846	1.85859	.25272	1.8777	2.8915	.00	7.00
$30,000-$49,999	45	2.5233	1.68760	.25234	2.0146	3.0319	.00	8.00
$50,000-$79,999	63	2.5082	1.24623	.15646	2.1955	2.8209	.00	6.00
$80,000+	82	2.1835	1.41767	.15639	1.8724	2.4947	.00	9.00
Total	244	2.3745	1.53444	.09815	2.1811	2.5678	.00	9.00

Table 18: ANOVA: Housing Social Environmental Quality Index and Income

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.125	3	1.708	.722	.540
Within Groups	568.031	240	2.367		
Total	573.156	243			

For this Analysis of Variance, when testing if the mean score of the Housing Social Environmental Quality Index differs by income, the F-statistic is .722, with an associated p-value of 0.540. Since the p-value is higher than 0.05, income is not statistically significant. Therefore, it indicates that annual income is not an important variable for consideration, in this regard.

Table 19: Descriptives: Housing Social Environmental Quality Index and Education

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min.	Max.
< High school	36	2.5507	1.87204	.31251	1.9162	3.1852	.00	7.00
High school	56	2.1204	1.37117	.18296	1.7537	2.4870	.00	5.00
> High school	152	2.4130	1.48863	.12059	2.1747	2.6512	.00	9.00
Total	244	2.3660	1.52534	.09756	2.1738	2.5581	.00	9.00

Table 20: ANOVA: Housing Social Environmental Quality Index and Education

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.949	2	2.475	1.062	.347
Within Groups	561.427	241	2.330		
Total	566.376	243			

When testing if the mean score of the Housing Social Environmental Quality Index differs by education, the F-statistic is 1.062,

with an associated p-value of 0.347. Since the p-value is higher than 0.05, education is not statistically significant. Therefore, it shows that education is not an important variable for consideration.

Table 21: Descriptives: Housing Social Environmental Quality Index and Age

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min.	Max.
18-44	138	2.5736	1.53617	.13086	2.3148	2.8323	.00	9.00
45-74	98	2.1693	1.50650	.15195	1.8677	2.4709	.00	7.00
75+	9	1.6666	1.36599	.44645	.6448	2.6885	.00	4.00
Total	245	2.3771	1.53172	.09776	2.1845	2.5697	.00	9.00

Table 22: ANOVA: Housing Social Environmental Quality Index and Age

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	14.290	2	7.145	3.092	.047
Within Groups	559.272	242	2.311		
Total	573.562	244			

When testing if the mean score of the Housing Social Environmental Quality Index differs by age, the F-statistic is 3.092, with an associated p-value of 0.047. Since the p-value is less than 0.05, age is statistically significant. Therefore, age is important.

Table 23: Descriptives: Housing Social Environmental Quality Index and Gender

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min.	Max.
Male	102	2.4694	1.61280	.15974	2.1525	2.7863	.00	9.00
Female	144	2.3116	1.47365	.12300	2.0684	2.5547	.00	8.00
Total	245	2.3771	1.53172	.09776	2.1845	2.5697	.00	9.00

Table 24: ANOVA: Housing Social Environmental Quality Index and Gender

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.484	1	1.484	.630	.428
Within Groups	572.077	243	2.354		
Total	573.562	244			

When testing if the mean score of the Housing Social Environmental Quality Index differs by gender, the F-statistic is .630, with an associated p-value of 0.428. Since the p-value is higher than 0.05, gender is not statistically significant. Therefore, it shows again that gender is not an important variable for consideration.

Table 25: Descriptives: Housing Social Environmental Quality Index and Employment

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min.	Max.
Not Employed	51	2.4796	1.68399	.23588	2.0058	2.9534	.00	8.00
Employed	195	2.3503	1.49277	.10704	2.1392	2.5614	.00	9.00
Total	245	2.3771	1.53172	.09776	2.1845	2.5697	.00	9.00

Table 26: ANOVA: Housing Social Environmental Quality Index and Employment

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.675	1	.675	.286	.593
Within Groups	572.887	243	2.358		
Total	573.562	244			

When testing if the mean score of the Housing Social Environmental Quality Index differs by employment, the F-statistic is .286, with an associated p-value of 0.593. Since the p-value is higher than 0.05, employment is not statistically significant. Therefore, it indicates again that employment is not an important variable for consideration.

Table 27: Descriptives: Housing Social Environmental Quality Index and Tenure

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min.	Max.
Own	203	2.3333	1.45951	.10248	2.1313	2.5354	.00	9.00
Rent	42	2.6000	1.86372	.28894	2.0163	3.1837	.00	7.00
Total	244	2.3787	1.53479	.09817	2.1854	2.5721	.00	9.00

Table 28: ANOVA: Housing Social Environmental Quality Index and Tenure

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.455	1	2.455	1.040	.309
Within Groups	570.958	242	2.359		
Total	573.413	243			

When testing if the mean score of the Housing Social Environmental Quality Index differs by tenure, the F-statistic is 1.040, with an associated p-value of 0.309. Since the p-value is higher than 0.05, tenure is not statistically significant. Therefore, it shows that tenure is not an important variable for consideration.

For the Neighbourhood Social Environmental Quality index, the income level, education level, and tenure status variables indicate significance. This demonstrates that the means of those variables within the index vary significantly and are important variables for consideration when testing the mean score of that scale. However, age, gender, and employment do not show significance, indicating that the means of those variables do not vary significantly and are unimportant variables for consideration when testing the mean score of the scale. Furthermore, for the Housing Social Environmental Quality index, only the age variable indicates significance, at 0.047. This demonstrates that the means of that variable within the index vary significantly and that it is an important

variable for consideration when comparing the means of that scale. However, the means of the other socio-demographic/economic variables, gender, income level, education level, employment status and tenure status do not vary significantly, indicating that they are unimportant variables for consideration when comparing the means of that scale.

Analyzing Relationships Between Variables and Determining their Statistical Significance

The next step in the analysis process was to perform logistic regression. Logistic regression is used when the dependent variable is dichotomous

> "... i.e. it takes only two values, which usually represent the occurrence or non-occurrence of some outcome event, usually coded as 0 or 1, and the independent variables are continuous, categorical, or both" (Garson, 2009).

For this research, logistic regression was run to determine the association(s) between the chosen variables and the five health outcomes: emotional distress (GHQ), Body Mass Index, self-reported health status, health satisfaction, and chronic conditions. Three separate sets of regression models are executed in order to: 1) Reveal any relationship(s) between each health outcome and the socio-demographic/economic variables; 2) Reveal any relationship(s) between each health outcome and the environmental quality variables; and finally, 3) To determine how/if these relationships change once each health outcome is examined versus

all of the socio-demographic/economic and environmental quality variables combined together.

To begin, logistic regression was run for the five health outcomes versus: the six socio-demographic variables, tenure, and the neighbourhoods, in order to identify the extent to which the socio-demographic/economic variables are associated with each health outcome, without any impact from the environmental quality variables or the indices (See: Tables 29, 32, 35, 38, and 41).

Next, logistic regression was run for the five health outcomes versus: the four independent environmental quality variables, the two indices, and the neighbourhoods, in order to identify the extent to which the individual physical environmental quality variables and the indices are associated with each health outcome, without any influence from the socio-demographic/economic variables (See: Tables 30, 33, 36, 39, and 42). Finally, logistic regression was run for the five health outcomes versus: the six socio-demographic variables (age, gender, employment, income, education, and tenure), the two indices that were created (Social Housing Environmental Quality and Social Neighbourhood Environmental Quality), and the four independent environmental quality variables (density of dwellings in each neighbourhood, traffic problems, housing layout, and outside maintenance of dwelling), and each of the four neighbourhoods being studied (See: Tables 31, 34, 37, 40, and 43), in

order to reveal any differences in the associations between the variables once they are combined together into the same regression model.

After each of the logistic regressions was completed, the rho values for each of the fifteen regressions were computed. McFadden's rho-squared, a coefficient of determination, indicates how much an improvement the full model is over the model with no terms in it. According to Hensher and Johnson (1981), rho values between 0.20 and 0.40 should be regarded as very adequate. In order to perform this step using SPSS, the Initial -2 Log Likelihood and the final -2 Log Likelihood, both of which can be found within each regression test's output data, need to be recorded. The initial (-2 Log Likelihood) is found under 'iteration history' output, found in Block 0 and the final (-2 Log Likelihood) is found under 'Model Summary' output –found in Block 1 of the regression tests' output data). The formula used is: 1 - (Final –2 Log Likelihood/Initial –2 Log Likelihood/Final). None of the rho calculations reached the 0.20 to 0.40 level, indicating weaker model performance. The rho values range from 0.03 to 0.131, with the self-assessed health status and chronic conditions models being the strongest (versus just the socio-demographic/economic variables and versus all the socio-demographic/economic and environmental quality variables together), with rho values ranging from 0.103 to 0.131.

Emotional Distress (GHQ) Regressions

Table 29: GHQ Versus Just the Socio-Demographic/Economic Variables

Observed	**Predicted**		
GHQ Categorized as happy/unhappy	Happy (below 3.99)	Unhappy (above 4)	Percentage Correct
Happy (below 3.99)	431	150	74.1
Unhappy (above 4)	28	38	57.8
Overall Percentage			72.5

Variable	**B**	**Sig.**	**Exp(B)**	**95% Confidence Intervals**	
				Lower	**Upper**
Aged 65+		.048			
Aged 18-44	1.182	.025	3.262	1.160	9.179
Aged 45-64	.719	.179	2.052	.719	5.851
Home Ownership vs. Renting	-.295	.425	.744	.360	1.538
Annual Income of <$30 000		.008			
Annual Income of $30 000 – $49 999	.089	.795	1.093	.558	2.142
Annual Income of $50 000 – $79 999	-.821	.046	.440	.196	.986
Annual Income of $80 000+	-1.349	.009	.260	.094	.715
Employed vs. Unemployed	-.008	.980	.992	.536	1.838
< High School		.726			
High School	.311	.423	1.365	.637	2.926
> High School	.205	.598	1.227	.573	2.627

Male vs. Female	-.339	.231	.713	.409	1.241
Southwest Mountain		.624			
Chedoke-Kirkendall	.237	.565	1.267	.566	2.839
Downtown	.553	.204	1.739	.741	4.081
Northeast Industrial	.385	.335	1.470	.672	3.215

Rho: 0.07154345

Table 29 is examining the relationship between GHQ scores and the socio-demographic/economic variables being studied. The results indicate that there is a significant association between emotional distress and age and/or income.

The values in the Exp(B) column are the odds ratio for each of the independent variables (Pallant, 2007). Pallant's (2007) work states that the odds ratio represents, "The change in odds of being in one of the categories of outcome when the values of the predictor increases by one unit" (176).

Upon examination of the Exp(B) column, it indicates that participants, aged 18-44 years old, are 3.3 times more likely to report emotional distress than the reference category, those aged 65+. Furthermore, participants with an annual income of $50 000 to $79 999 are 44 percent as likely to report emotional distress as those with an annual income of the reference category, <$30 000, and those with an annual income of $80 000+ are 26 percent as likely to report emotional distress as the reference category.

Table 30: GHQ Versus Just the Environmental Variables

Observed	Predicted		
GHQ Categorized as happy/unhappy	Happy (below 3.99)	Unhappy (above 4)	Percentage Correct
Happy (below 3.99)	486	107	81.9
Unhappy (above 4)	37	29	43.8
Overall Percentage			78.1

Variable	B	Sig.	Exp(B)	95% Confidence Intervals Lower	Upper
Problem with Traffic vs. No Problem	-.116	.685	.890	.507	1.563
Unsatisfied with Density of Dwellings vs. Satisfied	-.053	.856	.949	.536	1.680
Unsatisfied with Interior Layout vs. Satisfied	.351	.471	1.420	.547	3.688
Unsatisfied with Ability to Maintain Outside vs. Satisfied	-.206	.523	.814	.433	1.530
Home Ownership vs. Renting	-.322	.385	.725	.350	1.499
Housing Social Environmental Index	.105	.293	1.111	.913	1.351
Neighbourhood Social Environmental Index	.139	.004	1.150	1.045	1.265
Southwest		.987			

Mountain					
Chedoke-Kirkendall	.140	.732	1.150	.515	2.568
Downtown	.093	.839	1.098	.447	2.695
Northeast Industrial	.122	.769	1.130	.499	2.558

Rho: 0.057707952

Table 30 is examining the relationship between GHQ scores and the environmental variables being studied. The results indicate that there is a significant association between emotional distress and the Neighbourhood Social Environmental Quality index.

In addition, the Exp(B) value indicates that the participants with low scores on the Neighbourhood Social Environmental Quality Index (See: Table 4) are approximately 1.15 times more likely to report emotional distress than those with higher scores.

Table 31: GHQ Versus all of the Socio-Demographic/Economic and Environmental Variables

Observed	Predicted		
GHQ Categorized as happy/unhappy	Happy (below 3.99)	Unhappy (above 4)	Percentage Correct
Happy (below 3.99)	444	138	76.3
Unhappy (above 4)	29	37	56.2
Overall Percentage			74.2

Variable	B	Sig.	Exp(B)	95% Confidence Intervals	
				Lower	Upper
Aged 65+		.053			
Aged 18-44	1.143	.034	3.137	1.088	9.048
Aged 45-64	.619	.256	1.857	.639	5.398
Unemployed vs. Employed	-.052	.872	.950	.508	1.777
Annual Income of <$30 000		.019			
Annual Income of $30 000 – $49 999	.054	.879	1.056	.524	2.127
Annual Income of $50 000 – $79 999	-.736	.079	.479	.211	1.088
Annual Income of $80 000+	-1.330	.011	.265	.095	.736
Female vs. Male	-.325	.260	.722	.410	1.272
< High School		.584			
High School	.416	.299	1.516	.691	3.329
> High School	.269	.498	1.309	.601	2.853
Renting vs. Home Ownership	-.121	.756	.886	.412	1.903
Traffic Problems vs. No Problems	-.091	.760	.913	.510	1.635

Unsatisfied with Density of Dwellings vs. Satisfied	.039	.897	1.040	.576	1.876
Unsatisfied with Interior Layout vs. Satisfied	.423	.412	1.527	.555	4.197
Unsatisfied with Ability to Maintain Outside vs. Satisfied	-.182	.584	.833	.433	1.602
Housing Social Environmental Index	.091	.361	1.095	.901	1.332
Neighbourhood Social Environmental Index	.146	.004	1.157	1.049	1.276
Southwest Mountain		.879			
Chedoke-Kirkendall	.223	.598	1.250	.545	2.863
Downtown	.103	.824	1.108	.448	2.740
Northeast Industrial	-.107	.808	.899	.380	2.126

Rho: 0.103226845

Table 31 is examining the relationship between GHQ scores and all of the socio-demographic/economic variables and environmental variables being studied. The results indicate that there is a significant association between emotional distress and age and/or income and/or the Neighbourhood Social Environmental Quality index.

The Exp(B) column indicates that participants, aged 18-44, are nearly 3 times more likely to report emotional distress than those aged

65+. Furthermore, those with an annual income of $80 000+ are approximately 27 percent as likely to report emotional distress as those with an annual income of <$30 000. Also, participants with low scores on the Neighbourhood Social Environmental Quality index are 1.157 times more likely to report emotional distress than those with higher scores.

Body Mass Index (BMI) Regressions

Table 32: BMI Versus Just the Socio-Demographic/Economic Variables

Observed	**Predicted**		
BMI Binary	Overweight	Not Overweight	Percentage Correct
Not Overweight	5	396	1.3
Overweight	2	217	99.0
Overall Percentage			35.8

Variable	**B**	**Sig.**	**Exp(B)**	**95% Confidence Intervals**	
				Lower	**Upper**
Aged 65+		.021			
Aged 18-44	.005	.988	1.005	.526	1.922
Aged 45-64	.513	.112	1.669	.887	3.143
Home Ownership vs. Renting	.576	.052	1.779	.996	3.179
Annual Income of <$30 000		.168			
Annual Income of $30 000 - $49 999	.352	.190	1.422	.840	2.408
Annual Income of $50 000 - $79 999	.085	.761	1.089	.629	1.884
Annual Income of $80 000+	-.252	.427	.777	.418	1.447
Employed vs. Unemployed	.305	.176	1.357	.872	2.111
< High School		.014			
High School	-.442	.087	.643	.387	1.066
> High School	-.747	.004	.474	.286	.784
Male vs. Female	.554	.002	1.740	1.220	2.480
Southwest Mountain		.466			
Chedoke-Kirkendall	-.189	.435	.828	.515	1.330

Downtown	.045	.876	1.046	.592	1.849
Northeast Industrial	.218	.374	1.244	.769	2.014

Rho: 0.061379448

Table 32 is examining the relationship between BMI levels and the socio-demographic/economic variables being studied. The results indicate that there is a significant association between BMI and age, and/or gender, and/or education.

The Exp(B) column shows that male participants are 1.74 times more likely to be overweight than female participants. Furthermore, participants with an education above the high school level are approximately 50 percent as likely to be overweight that those with an education below the high school level.

Table 33: BMI Versus Just the Environmental Variables

Observed	Predicted		
BMI Binary	Not Overweight	Overweight	Percentage Correct
Not Overweight	0	409	.0
Overweight	0	221	100.0
Overall Percentage			35.1

Variable	B	Sig.	Exp(B)	95% Confidence Intervals	
				Lower	Upper
Problem with Traffic vs. No Problem	-.052	.774	.949	.664	1.356
Unsatisfied with Density of Dwellings vs. Satisfied	-.176	.340	.838	.583	1.204
Unsatisfied with Interior Layout vs. Satisfied	-.177	.608	.838	.426	1.648
Unsatisfied with Ability to Maintain Outside vs. Satisfied	-.374	.092	.688	.445	1.063
Home Ownership vs. Renting	.618	.028	1.855	1.070	3.215
Housing Social Environmental Index	.000	.997	1.000	.867	1.154
Neighbourhood Social Environmental Index	.069	.053	1.072	.999	1.150
Southwest Mountain		.294			
Chedoke-Kirkendall	-.171	.467	.843	.532	1.336
Downtown	-.100	.738	.905	.505	1.623
Northeast Industrial	.284	.257	1.328	.813	2.171

Rho: 0.031385874

Table 33 is examining the relationship between BMI levels and the environmental variables being studied. The results indicate that there is only one significant association, between BMI and tenure (home ownership).

The Exp(B) value indicates that participants who own their home are approximately 1.9 times more likely to be overweight than the participants that rent their dwelling.

Table 34: BMI Versus All of the Socio-Demographic/Economic and Environmental Variables

Observed	Predicted		
BMI Binary	Not Overweight	Overweight	Percentage Correct
Not Overweight	10	391	2.6
Overweight	2	217	99.0
Overall Percentage			36.6

Variable	B	Sig.	Exp(B)	95% Confidence Intervals Lower	Upper
Aged 65+		.028			
Aged 18-44	-.054	.873	.947	.488	1.838
Aged 45-64	.450	.169	1.569	.825	2.983
Unemployed vs. Employed	.279	.221	1.322	.845	2.067
Annual Income of <$30 000		.300			
Annual Income of $30 000 - $49 999	.307	.262	1.359	.795	2.324
Annual Income of $50 000 - $79 999	.148	.603	1.159	.664	2.024
Annual Income of $80 000+	-.191	.551	.826	.441	1.547
Female vs. Male	.582	.001	1.789	1.250	2.559
< High School		.020			
High School	-.419	.110	.657	.393	1.099
> High School	-.728	.005	.483	.290	.805
Renting vs. Home Ownership	.743	.017	2.102	1.140	3.875
Traffic Problems vs. No Problems	-.082	.667	.921	.633	1.340
Unsatisfied with Density of Dwellings vs. Satisfied	-.176	.364	.838	.573	1.227
Unsatisfied with Interior Layout vs.					

Satisfied	-.048	.895	.953	.464	1.958
Unsatisfied with Ability to Maintain Outside vs. Satisfied	-.343	.144	.710	.448	1.124
Housing Social Environmental Index	-.003	.964	.997	.858	1.158
Neighbourhood Social Environmental Index	.064	.091	1.066	.990	1.147
Southwest Mountain		.769			
Chedoke-Kirkendall	-.182	.455	.833	.516	1.345
Downtown	-.216	.491	.806	.436	1.490
Northeast Industrial	.009	.972	1.009	.596	1.709

Rho: 0.072597273

Table 34 is examining the relationship between BMI levels and all of the socio-demographic/economic variables and environmental variables being studied. The results indicate that there is a significant association between BMI and age, gender, education, and/or tenure.

The Exp(B) column indicates that male participants are approximately 1.8 times more likely to be overweight than female participants. Furthermore, participants with an education above the high school level are nearly 50 percent as likely to be overweight than participants with an education below the high school level. In addition, participants that own their home are approximately 2 times more likely to be overweight than the participants that rent their dwelling.

Health Satisfaction Regressions

Table 35: Health Satisfaction Versus Just the Socio-Demographic Variables

Observed	**Predicted**		
Satisfaction with Health	V/Sat	V/dissat	Percentage Correct
V/Sat	302	242	55.5
V/Dissat	31	62	66.5
Overall Percentage			57.1

Variable	**B**	**Sig.**	**Exp(B)**	**95% Confidence Intervals**	
				Lower	**Upper**
Aged 65+		.001			
Aged 18-44	-.046	.916	.955	.407	2.242
Aged 45-64	.854	.038	2.349	1.048	5.265
Home Ownership vs. Renting	-.401	.243	.669	.341	1.313
Annual Income of <$30 000		.874			
Annual Income of $30 000 - $49 999	.166	.623	1.180	.609	2.286
Annual Income of $50 000 - $79 999	.271	.454	1.312	.645	2.669
Annual Income of $80 000+	.083	.844	1.087	.474	2.495
Employed vs. Unemployed	-.283	.308	.754	.438	1.298
< High School		.352			
High School	-.276	.389	.759	.405	1.421
> High School	-.463	.149	.630	.336	1.180
Male vs. Female	-.135	.570	.873	.547	1.393
Southwest Mountain		.522			
Chedoke-Kirkendall	-.092	.787	.912	.468	1.779

Downtown	.372	.320	1.451	.696	3.022
Northeast Industrial	.296	.373	1.345	.701	2.581

Rho: 0.055091508

Table 35 is examining the relationship between health satisfaction and the socio-demographic/economic variables being studied. The results indicate that there is a significant association between health satisfaction and age.

As for the Exp(B) column, it indicates that participants aged 45-64 are approximately 2.4 times more likely to be dissatisfied with their health than participants aged 65+.

Table 36: Health Satisfaction Versus Just the Environmental Variables

Observed	Predicted		
Satisfaction with Health	V/Sat	V/Dissat	Percentage Correct
V/Sat	374	200	65.2
V/Dissat	29	53	64.3
Overall Percentage			65.1

Variable	B	Sig.	Exp(B)	95% Confidence Intervals	
				Lower	Upper
Problems with Traffic vs. No Problem	.032	.899	1.032	.633	1.682
Unsatisfied with Density of Dwellings vs. Satisfied	.284	.269	1.328	.803	2.198
Unsatisfied with Interior Layout vs. Satisfied	-.293	.457	.746	.345	1.613
Unsatisfied with Ability to Maintain Outside vs. Satisfied	-.483	.080	.617	.359	1.060
Home Ownership vs. Renting	-.133	.689	.875	.456	1.680
Housing Social Environmental Index	.148	.094	1.160	.975	1.379
Neighbourhood Social Environmental Index	.096	.031	1.100	1.009	1.200
Southwest Mountain		.919			
Chedoke-Kirkendall	-.189	.576	.828	.427	1.605
Downtown	-.062	.875	.940	.435	2.031
Northeast Industrial	.039	.910	1.040	.528	2.049

Rho: 0.055379759

Table 36 is examining the relationship between health satisfaction and the environmental variables being studied. The results indicate that there is a significant association between health satisfaction and the Neighbourhood Social Environmental Quality index.

The Exp(B) column shows that the participants with low scores on the Neighbourhood Social Environmental Quality index are 1.1 times more likely to be dissatisfied with their health than those with higher scores.

Table 37: Health Satisfaction Versus All of the Socio-Demographic/Economic and Environmental Variables

Observed	Predicted		
Satisfaction with Health	V/Sat	V/Dissat	Percentage Correct
V/Sat	336	218	60.7
V/Dissat	37	57	60.2
Overall Percentage			60.6

Variable	B	Sig.	Exp(B)	95% Confidence Intervals	
				Lower	Upper
Aged 65+		.001			
Aged 18-44	-.166	.713	.847	.350	2.050
Aged 45-64	.752	.076	2.121	.925	4.862
Unemployed vs. Employed	-.325	.255	.723	.413	1.265
Annual Income of <$30 000		.670			
Annual Income of $30 000 - $49 999	.075	.832	1.078	.539	2.156
Annual Income of $50 000 - $79 999	.420	.257	1.523	.736	3.151
Annual Income of $80 000+	.192	.656	1.212	.521	2.821
Female vs. Male	-.135	.581	.874	.542	1.410
< High School		.428			
High School	-.184	.576	.832	.436	1.586
> High School	-.420	.201	.657	.345	1.250
Renting vs. Home Ownership	-.165	.651	.848	.416	1.730
Traffic Problems vs. No Problems	.052	.841	1.053	.635	1.747
Unsatisfied with Density of Dwellings vs.					

Satisfied	.262	.328	1.300	.768	2.199
Unsatisfied with Interior Layout vs. Satisfied	-.209	.623	.812	.353	1.865
Unsatisfied with Ability to Maintain Outside vs. Satisfied	-.452	.119	.636	.361	1.123
Housing Social Environmental Index	.177	.063	1.194	.991	1.438
Neighbourhood Social Environmental Index	.087	.058	1.091	.997	1.193
Southwest Mountain		.978			
Chedoke-Kirkendall	-.152	.661	.859	.435	1.695
Downtown	-.051	.902	.951	.426	2.119
Northeast Industrial	-.052	.888	.950	.462	1.953

Rho: 0.089653625

Table 37 is examining the relationship between participants' health satisfaction and all of the socio-demographic/economic variables and environmental variables being studied. The results indicate that there is a significant association between health satisfaction and age.

Self-Assessed Health Status Regressions

Table 38: Self-Assessed Health Status Versus Just the Socio-Demographic/Economic Variables

Observed	**Predicted**		
Self-Assessed Health Status	Exc/Vg/Gd	Fair/Poor	Percentage Correct
Exc/Vg/Gd	396	169	70.1
Fair/Poor	30	50	62.6
Overall Percentage			69.2

Variable	**B**	**Sig.**	**Exp(B)**	**95% Confidence Intervals**	
				Lower	**Upper**
Aged 65+		.001			
Aged 18-44	.063	.892	1.065	.429	2.646
Aged 45-64	1.054	.015	2.868	1.227	6.703
Home Ownership vs. Renting	-.189	.609	.828	.402	1.707
Annual Income of <$30 000		.224			
Annual Income of $30 000 - $49 999	-.538	.121	.584	.296	1.152
Annual Income of $50 000 - $79 999	-.758	.051	.469	.219	1.003
Annual Income of $80 000+	-.553	.214	.575	.241	1.376
Employed vs. Unemployed	-.285	.342	.752	.418	1.353
< High School		.301			
High School	-.355	.288	.701	.365	1.349
> High School	-.510	.129	.600	.311	1.160
Male vs. Female	.134	.604	1.144	.689	1.898
Southwest Mountain		.012			
Chedoke-Kirkendall	.491	.248	1.634	.711	3.759
Downtown	.827	.068	2.286	.942	5.549

Northeast Industrial	1.237	.002	3.447	1.599	7.427

Rho: 0.106368224

Table 38 is examining the relationship between self-assessed health status and the socio-demographic/economic variables being studied. The results indicate that there is a significant association between self-assessed health status and age and/or neighbourhood.

The Exp(B) column shows that participants aged 45-64 are nearly 2.9 times more likely to report poorer self-assessed health than those aged 65+. Furthermore, those living in the Northeast Industrial neighbourhood (See: Figure 1) are approximately 3.5 times more likely to report poorer self-assessed health than participants living in the Southwest Mountain neighbourhood.

Table 39: Self-Assessed Health Status Versus Just the Environmental Variables

Observed	Predicted		
Self-Assessed Health Status	Exc/Vg/Gd	Fair/Poor	Percentage Correct
Exc/Vg/Gd	374	200	65.2
Fair/Poor	29	53	64.3
Overall Percentage			65.1

Variable	B	Sig.	Exp(B)	95% Confidence Intervals Lower	Upper
Problems with Traffic vs. No Problems	-.378	.161	.685	.404	1.162
Unsatisfied with Density of Dwellings vs. Satisfied	.214	.436	1.238	.724	2.118
Unsatisfied with Interior Layout vs. Satisfied	-.611	.123	.543	.250	1.180
Unsatisfied with Ability to Maintain Outside vs. Satisfied	-.390	.189	.677	.379	1.211
Home Ownership vs. Renting	-.309	.373	.734	.372	1.450
Housing Social Environmental Index	-.026	.788	.975	.810	1.173
Neighbourhood Social Environmental Index	.051	.276	1.053	.960	1.154
Southwest Mountain		.005			
Chedoke-Kirkendall	.359	.394	1.431	.627	3.267
Downtown	.754	.103	2.127	.858	5.268
Northeast Industrial	1.313	.001	3.718	1.690	8.180

Rho: 0.078672173

Table 39 is examining the relationship between self-assessed health status and the environmental variables being studied. The results

indicate that there is a significant association between self-assessed health status and neighbourhood.

The Exp(B) column shows that participants living in the Northeast Industrial neighbourhood are over 3.7 times more likely to report poorer self-assessed health than those living in the Southwest Mountain neighbourhood.

Table 40: Self-Assessed Health Status Versus All of the Socio-Demographic/Economic and Environmental Variables

Observed	Predicted		
Self-Assessed Health Status	Exc/Vg/Gd	Fair/Poor	Percentage Correct
Exc/Vg/Gd	412	152	73.0
Fair/Poor	28	53	65.2
Overall Percentage			72.0

Variable	B	Sig.	Exp(B)	95% Confidence Intervals	
				Lower	Upper
Aged 65+		.001			
Aged 18-44	.045	.925	1.046	.410	2.664
Aged 45-64	.998	.024	2.712	1.139	6.456
Unemployed vs. Employed	-.385	.211	.680	.372	1.244
Annual Income of <$30 000		.173			
Annual Income of $30 000 - $49 999	-.705	.052	.494	.242	1.007
Annual Income of $50 000 - $79 999	-.724	.069	.485	.222	1.057
Annual Income of $80 000+	-.441	.329	.643	.265	1.560
Female vs. Male	.130	.622	1.139	.679	1.909
< High School		.274			
High School	-.339	.322	.713	.364	1.394
> High School	-.556	.110	.574	.291	1.133
Renting vs. Home Ownership	.038	.921	1.039	.487	2.218
Traffic Problems vs. No Problems	-.416	.141	.660	.380	1.147
Unsatisfied with Density of Dwellings vs. Satisfied	.122	.671	1.130	.643	1.985
Unsatisfied with Interior Layout vs.	-.818	.051	.441	.194	1.004

Satisfied					
Unsatisfied with Ability to Maintain Outside vs. Satisfied	-.254	.425	.776	.416	1.448
Housing Social Environmental Index	-.026	.796	.974	.799	1.188
Neighbourhood Social Environmental Index	.048	.328	1.049	.953	1.155
Southwest Mountain		.077			
Chedoke-Kirkendall	.412	.337	1.510	.650	3.508
Downtown	.602	.213	1.827	.707	4.716
Northeast Industrial	1.054	.012	2.868	1.267	6.495

Rho: 0.130722882

Table 40 is examining the relationship between self-assessed health status and all of the socio-demographic/economic variables and environmental variables being studied. The results indicate that there is a significant association between self-assessed health status and age and/or neighbourhood.

The Exp(B) column indicates that participants aged 45-64 are over 2.7 times more likely to report poorer self-assessed health than those aged 65+. Furthermore, participants living in the Northeast Industrial neighbourhood are approximately 2.7 times more likely to report poorer self-assessed health than those living in the Southwest Mountain neighbourhood.

Chronic Condition(s) Regressions

Table 41: Chronic Condition(s) Versus Just the Socio-Demographic/ Variables

Observed	**Predicted**		
Chronic Conditions Binary	None	1+	Percentage Correct
None	0	287	.0
1+	0	361	100.0
Overall Percentage			55.8

Variable	**B**	**Sig.**	**Exp(B)**	**95% Confidence Intervals**	
				Lower	**Upper**
Aged 65+		.000			
Aged 18-44	-1.499	.000	.223	.113	.440
Aged 45-64	-.476	.175	.621	.312	1.235
Home Ownership vs. Renting	-.058	.836	.944	.545	1.634
Annual Income of <$30 000		.107			
Annual Income of $30 000 - $49 999	.347	.199	1.415	.833	2.404
Annual Income of $50 000 - $79 999	.272	.322	1.312	.766	2.247
Annual Income of $80 000+	-.198	.512	.820	.454	1.482
Employed vs. Unemployed	-.373	.089	.689	.448	1.058
< High School		.027			
High School	-.719	.009	.487	.284	.834
> High School	-.601	.024	.548	.325	.925
Male vs. Female	-.203	.249	.816	.577	1.153

Southwest Mountain		.215			
Chedoke-Kirkendall	-.334	.150	.716	.454	1.128
Downtown	-.535	.062	.585	.333	1.028
Northeast Industrial	-.108	.663	.897	.551	1.461

Rho: 0.111412482

Table 41 is examining the relationship between chronic conditions and the socio-demographic/economic variables being studied. The results indicate that there is a significant association between chronic conditions and age and/or education.

The Exp(B) column indicates that participants aged 18-44 are approximately 22 percent as likely to have one or more chronic conditions than those aged 65+. Furthermore, participants with an education at the high school level are nearly 49 percent as likely to have one or more chronic conditions as those with an education below the high school level, while those with an education above the high school level are approximately 55 percent as likely to have one or more chronic conditions.

Table 42: Chronic Condition(s) Versus Just the Environmental Variables

Observed	Predicted		
Chronic Conditions Binary	None	1+	Percentage Correct
None	0	289	.0
1+	0	361	100.0
Overall Percentage			55.6

Variable	B	Sig.	Exp(B)	95% Confidence Intervals	
				Lower	Upper
Problems with Traffic vs. No Problems	-.057	.740	.945	.677	1.319
Unsatisfied with Density of Dwellings vs. Satisfied	-.066	.705	.936	.666	1.316
Unsatisfied with Interior Layout vs. Satisfied	-.055	.866	.947	.500	1.794
Unsatisfied with Ability to Maintain Outside vs. Satisfied	-.499	.021	.607	.398	.926
Home Ownership vs. Renting	-.143	.573	.867	.527	1.425
Housing Social Environmental Index	-.108	.126	.898	.782	1.031
Neighbourhood Social Environmental Index	.070	.043	1.072	1.002	1.148
Southwest Mountain		.091			
Chedoke-Kirkendall	-.247	.249	.781	.513	1.189
Downtown	-.658	.019	.518	.299	.897
Northeast Industrial	-.100	.679	.905	.565	1.451

Rho: 0.020295583

Table 42 is examining the relationship between chronic conditions and the environmental variables being studied. The results indicate that there is a significant association between chronic conditions and outside maintenance and/or neighbourhood. The results also indicate that there is a significant association between chronic conditions and the Neighbourhood Social Environmental Quality index.

The Exp(B) column shows that participants who are satisfied with the outside maintenance of their dwelling are approximately 60 percent as likely to report having at least one chronic condition than those who are unsatisfied. Furthermore, participants living in the Downtown neighbourhood are approximately 50 percent as likely to have one or more chronic conditions as those living in the Southwest Mountain neighbourhood. In addition, participants with low scores on the Neighbourhood Social Environmental Quality index are 1.072 times more likely to have one or more chronic condition than those with higher scores.

Table 43: Chronic Condition(s) Versus All of the Socio-Demographic/Economic and Environmental Variables

Observed	**Predicted**		
Chronic Conditions Binary	None	1+	Percentage Correct
None	0	287	.0
1+	0	361	100.0
Overall Percentage			55.8

Variable	**B**	**Sig.**	**Exp(B)**	**95% Confidence Intervals**	
				Lower	**Upper**
Aged 65+		.000			
Aged 18-44	-1.582	.000	.206	.103	.411
Aged 45-64	-.544	.127	.581	.289	1.168
Unemployed vs. Employed	-.427	.057	.653	.421	1.013
Annual Income of <$30 000		.149			
Annual Income of $30 000 - $49 999	.313	.257	1.368	.796	2.349
Annual Income of $50 000 - $79 999	.320	.254	1.378	.795	2.388
Annual Income of $80 000+	-.153	.619	.858	.470	1.567
Female vs. Male	-.182	.309	.834	.587	1.184
< High School		.026			
High School	-.743	.008	.476	.275	.822
> High School	-.587	.031	.556	.326	.948
Renting vs. Home Ownership	.103	.724	1.109	.626	1.964
Traffic Problems vs. No Problems	-.101	.588	.904	.626	1.305
Unsatisfied with Density of Dwellings vs. Satisfied	-.320	.094	.726	.499	1.056
Unsatisfied with Interior Layout vs. Satisfied	-.057	.873	.945	.471	1.897

Unsatisfied with Ability to Maintain Outside vs. Satisfied	-.327	.167	.721	.454	1.146
Housing Social Environmental Index	-.094	.216	.910	.784	1.057
Neighbourhood Social Environmental Index	.083	.028	1.087	1.009	1.170
Southwest Mountain		.085			
Chedoke-Kirkendall	-.317	.178	.728	.459	1.155
Downtown	-.789	.011	.454	.247	.836
Northeast Industrial	-.333	.224	.717	.419	1.225

Rho: 0.127069377

Table 43 is examining the relationship between chronic conditions and all of the socio-demographic/economic variables and environmental variables being studied. The results indicate that there is a significant association between chronic conditions and age, education, and/or zone, and/or with the Neighbourhood Social Environmental Quality index.

The Exp(B) column indicates that participants aged 18-44 are nearly 20 percent as likely to have one or more chronic conditions than those aged 65+. In addition, those with an education at the high school level are approximately 48 percent as likely to report one or more chronic conditions as those with an education below the high school level. Furthermore, participants living in the Downtown neighbourhood are approximately 45 percent as likely to report one or more chronic condition as those living in the Southwest Mountain neighbourhood and those participants with low scores on the Neighbourhood Social Environmental Quality index are 1.087 times more likely to report having one or more chronic condition than those with higher scores.

Conclusion

With the three-step approach to the analysis of the data: cross-tabulations, testing of the means (ANOVAS), and the logistic regressions, a thorough examination of the data has been conducted. For the first grouping of cross-tabulations, when examining the environmental quality variables and health outcomes, significant housing variable associations appeared between health and noise, safety and security, overall satisfaction, pride of dwelling, indoor air quality, heating costs, mortgage/rent expenses, and outside maintenance; while significant neighbourhood variable associations exist between health and bicycle paths, density of dwellings, traffic problems, use of public parks, activities/facilities for youth, the neighbourhood being described as poor, noise from people, homelessness, graffiti, attacks, alarms sounding, drug/alcohol abuse, vandalism, concerns about walking alone, neighbours entering homes without permission, and muggings. The second grouping of cross-tabulations, examining the relationships between the environmental quality variables and the socio-demographic/economic variables, indicated the exact same significant relationships as the first grouping, along with the additional neighbourhood quality variables: access to public space, noise from traffic, and litter. The third grouping of cross-tabulations, looking at the relationships between the socio-demographic/economic variables and the health outcomes, showed

emotional distress is significantly associated with income and tenure; BMI with age, gender, tenure, and education; health satisfaction with age and tenure; self-reported health status with age, income, tenure, and education; and chronic conditions with age, gender, income, employment, and education. After the cross-tabulations were performed and the indices were created, the subsequent analysis of variance tests indicated that for the Neighbourhood Social Environmental Quality ANOVAs, important variables for consideration were revealed to be income, education, and tenure. However, age, gender, and employment were revealed to be unimportant. Furthermore, for the Housing Social Environmental Quality ANOVAs, only age was revealed to be an important variable for consideration; whereas income, education, gender, employment, and tenure were not. Next, for the logistic regression, age is the only variable that indicates significance across all of the five health outcomes. Education indicates significance only with the BMI and chronic conditions regression models; income only with the emotional distress regression models; and tenure and gender only with the BMI regression models (each of these aforementioned significant findings exclude the regression models that include only the environmental quality variables); whereas employment does not indicate significance in any of the regression models. For the regression models examining the relationship between the health outcomes and just the environmental quality variables, only the

Neighbourhood Social Environmental Quality index, tenure, zone, and outside maintenance indicate any significance in any of these models. Moreover, outside maintenance is the only physical environmental quality variable to show any significance and only with the chronic conditions health outcome. The goodness-of-fit tests (rho values) indicate that the regression models are the strongest for the self-assessed health outcome regressions and the chronic conditions regressions. However, the BMI regressions and the health satisfaction regressions have the lowest rho values of the regression tests, indicating that these models are the weakest. Furthermore, each model examining the health outcome versus all of the socio-demographic/economic variables and environmental quality variables combined were the strongest, whereas each model examining the health outcome versus just the environmental quality variables were the weakest. The following chapter, Chapter 5: Summary and Discussion, will further describe and interpret the results uncovered in this section.

Chapter Five: Summary and Discussion

The results of this research project have illustrated some of the ways in which neighbourhood environmental quality and neighbourhood housing quality can influence residents' health, specifically focusing on the City of Hamilton. The purpose of this chapter is to discuss the results of the study and the information that has been revealed through the analysis of the data. It will then go on to interpret the findings and relate them to the literature.

Analysis of the Relations Between Variables

The initial analysis explored the relationship between the environmental quality variables and the health outcomes, the environmental quality variables and the socio-demographic/economic variables, and then the socio-demographic/economic variables and the health outcomes. The significant cross-tabulation/Chi-Square results between the environmental quality variables and the five health outcomes grouping were very similar to the Chi-Square results between the environmental quality variables and the socio-demographic/economic variables grouping. The significant *housing* environmental quality characteristics for both groupings of cross-tabulations include: how noise carries between rooms inside a participant's dwelling, how noise carries from outside their dwelling, the safety and security of their dwelling, overall satisfaction with their dwelling, pride of their dwelling, indoor air

quality of their dwelling, heating costs of their dwelling, their ability to maintain the outside of their dwelling, and their mortgage/rent expenses. The significant *neighbourhood* environmental quality characteristics for both cross-tabulation groupings include: the presence/lack of bicycle paths, the density of dwellings, problems with traffic, participants' use of public parks, activities available to children and youth, whether or not participants describe their neighbourhood as being poor, noise from people, homelessness, graffiti, attacks based on ethnicity, the noise of alarms sounding, drug and/or alcohol abuse in the neighbourhood, vandalism, concerns about walking alone at night, neighbours entering one another's homes without permission, and muggings. The only dissimilar relationships between these two cross-tabulation groupings were the additional significant variables found in the environmental quality variables versus the socio-demographic/economic variables Chi-Square results: the amount of open public spaces, noise from traffic, and litter. As each of these additional significant results are categorized as *neighbourhood* environmental quality variables, this supports the literature that suggests that a "... [a person's] neighbourhood has a multidimensional impact on health" (Wilson et al., 2008:375) and that measures of socio-demographic/economic status are important determinants of health (Wilson et al., 2008). Moreover, neighbourhood

perceptions have been linked to personal characteristics, including socio-demographic/economic variables (Keller-Olaman et al. 2005).

Upon examination of the Chi-Square results between the six socio-demographic/socioeconomic variables and the five health outcomes, one or more socio-demographic/socioeconomic revealed significance with at least one of the health outcomes, with some patterns emerging. Firstly, age being significant with all of the health outcomes, except emotional distress. This supports literature that there is a significant association between age and health (Wilson et al, 2008; Wilson et al., 2003). However, other studies have linked age with emotional distress, whereas these Chi-Square results did not (Wilson et al., 2008). In addition, another pattern is the significant relationship between tenure and all of the health outcomes, except chronic conditions. This supports the literature that finds there are limited opportunities for renters to improve the characteristics of their dwelling that may be negatively impacting their health and since renting is typically more temporary than home ownership, this may explain why tenure was not significantly associated with chronic conditions (Keller-Olaman, 2005)

Analysis of Testing of the Means Scores

One-way analysis of variance (ANOVA) tests were then performed on the two indices, Neighbourhood Social Environmental Quality and Housing Social Neighbourhood Environmental Quality, in order to test if

the means of the variables included in the indices are equal. For the Neighbourhood Social Environmental Quality index, income level, education level, and tenure status indicated significance. This supports the literature that suggests that socio-demographic/economic characteristics, particularly age and income, can influence peoples' perceptions of their neighbourhood and that neighbourhood environments can act as a social determinant of health (van Ham and Feijten, 2008; Wilson et al., 2008). However, age, gender, and employment did not show significance, whereas literature suggests that employment status can also influence neighbourhood perceptions (van Ham and Feijten, 2008).

For the Housing Social Environmental Quality index, only age indicated significance; while the means of the other socio-demographic/economic variables, gender, income level, education level, employment status and tenure status did not vary significantly. This supports the literature that finds housing perceptions to be associated with age, but does not support the same literature that also finds income and employment to influence peoples' housing perceptions (van Ham and Feijten, 2008).

Subsequently, after the Chi-Square values and analysis of variance tests were produced, three different logistical regression models were run on each of the five health outcomes. The significant variables revealed by

the regression models have some similarities and differences from those revealed by the cross-tabulations.

Analysis of the Relationships Between Variables and their Statistical Significance

Emotional Distress

When examining the association among the variables being studied and emotional distress (GHQ), common variables, with significance, among two of the three regression models run (emotional distress versus just the socio-demographic/economic variables and emotional distress versus all of the socio-demographic/economic and environmental variables combined) are shown to be age (18 to 44) and income (<$30 000 or $80 000+ annually). This indicates that young adults to those early middle-aged are more likely to experience emotional distress than the other age groups included in the category. Furthermore, the results also indicate that those with an annual income of <$30 000 or $80 000+ are more likely to report emotional distress than those earning $30 000 to $49 999 or $50 000 to $79 999, annually. These results match the findings of another Hamilton study that also finds age and income to be significantly related to emotional distress (Wilson et al., 2008). Similarly to what the literature suggests, the significance of age may be explained by the elderly population experiencing more well being, optimism, and peacefulness than those in the younger age categories (Wen et al., 2006). Furthermore, according to Wen et al. (2006), a lower income "...may be reflected in

perceptions of stress and feelings of anger…powerlessness…[and] frustration" (2577). For the other regression model, health outcomes versus just the environmental variables being studied, only the Neighbourhood Social Environmental Quality index indicates significance. Therefore, lower Neighbourhood Social Environmental Quality index scores can be linked to emotional distress, as the index includes variables (noise, litter, etc.) that can be positively linked with perceived neighbourhood problems and subsequently, feelings of emotional distress (Wen et al., 2006). This finding also matches another Hamilton study, as neighbourhood characteristics were also linked to emotional distress (Wilson et al., 2008). Since other studies have associated the physical environmental quality variables (layout of dwelling, outside maintenance, traffic problems, and density of dwellings) with emotional distress (Wen et al., 2006; Ross et al., 2007), it was anticipated that these variables would also indicate a significant relationship with emotional distress in this research; however, none were shown to be significant.

BMI levels

In terms of how the variables influence participants' BMI levels, a common variable, with significance, among two of the three regression models run (BMI versus just the socio-demographic/economic variables and BMI versus all of the socio-demographic/economic and environmental

variables combined) is age (65+). According to Ross et al. (2007), there is a relationship between older age and increased BMI. However, Wen et al. (2006) argue that the elderly population tends to have a lower body weight/mass than those in the younger age categories. Furthermore, gender showed significance in both regression models, indicating that females are more likely than males to be overweight. As literature suggests, this may be the result of the higher likelihood that women will stay at home to raise their children and maintain their household, leaving fewer opportunities for exercise and less time for physical activity than men may have (Poortinga et al., 2007). Along with gender, achieving an education level above or below the high school level also indicates a significant relationship, as a lower education level can result in lower-paying job opportunities, which in turn results in a poorer diet, as unhealthier food options are typically more affordable (Ross et al., 2007). Another Hamilton study has similar findings that age, gender, and education (those with an education above the high school level) are significantly associated with BMI (Wilson et al., 2008). However, the other study found a younger age range (25-44) to be significantly related to BMI than this research (65+) (Wilson et al., 2008). For the other regression model, BMI versus just the environmental variables, tenure (home ownership) is the only significant variable. In addition, tenure is also significant in the regression model that examines the relationship

between BMI and all of the socio-demographic/economic and environmental variables combined. This indicates that those who own their home are more likely to be overweight than those who rent their dwelling. This finding is different from the literature, as research suggests that those who can afford to own their own home have better access to improved healthcare services, etc. (Wen et al., 2006).

It has been well documented that Canadian rates of obesity have been increasing largely due to socio-demographic/economic factors, environmental factors, and peoples' health-behaviours (Ross et al., 2007). Therefore, it was surprising that many of the specific factors outlined by Ross et al.'s (2007) report, including: income and employment (socio-demographic/economic) and density of dwellings and traffic problems (environmental), did not show significance in the analysis of this data. Researchers have found associations between a lower annual income and a higher BMI (Ross et al., 2007), including other research that investigates the same Hamilton neighbourhoods and also indicates that income ($50 000 to $79 000 annually) is significantly associated with BMI. Moreover, Lee and Moudon (2008) report that traffic problems are the biggest barrier to physical activity in neighbourhoods and that physical inactivity contributes to a higher BMI. In addition, it was anticipated that the Neighbourhood Social Environmental Quality index would indicate significance, as many of the variables included in it (activities/facilities,

attacks, homelessness, etc.) have been associated with levels of physical activity (Ross et al., 2007). Therefore, these findings of insignificant relationships between variables are also different from what the literature suggests.

Health Satisfaction

When investigating the association between the variables and health satisfaction, a common variable with significance, among two of the three regression models run (health satisfaction versus just the socio-demographic/economic variables and health satisfaction versus all of the socio-demographic/economic and environmental variables combined), is age (65+), indicating that the elderly are more likely to report lower health satisfaction than the other age categories. This supports the research that finds that health usually declines with progression into the senior stage(s) of life (Wen et al., 2006). However, this finding does not support a study by Xiao and Barber (2007) that finds that the older participants in their study were more likely to be satisfied with their health than the younger participants. For the other regression model, health satisfaction versus just the environmental variables, only the Neighbourhood Social Environmental Index indicates a significant association. Therefore, lower Neighbourhood Social Environmental Quality index scores can be linked to poorer health satisfaction, as again, the index includes variables that can be associated with self-perceived neighbourhood problems, resulting in

lower satisfaction with health (Wen et al., 2006). There were few significant health satisfaction relationships revealed with this data and unlike what some literature suggests, this research did not uncover a significant association between health satisfaction and income or education (Xiao and Barber, 2007). According to Xiao and Barber (2007), having a higher annual income and/or a higher education level can be linked to greater health satisfaction. However, these findings were not revealed through the data analysis of this thesis.

Self-Assessed Health Status

When examining the association among the variables being studied and self-assessed health status, a common variable with significance, among two of the three regression models run (self-assessed health status versus just the socio-demographic/economic variables and self-assessed health status versus all of the socio-demographic/economic and environmental variables combined) is shown to be age (45-64 and 65+). This indicates that participants in these age categories are more likely to report a poorer self-assessed health status than those in the youngest age category. This is similar to what the literature suggests, as it has been found that advancement in age, commonly in the middle-age and elderly stages of life, specifically among residents aged fifty-five years and older of life, can be linked to poorer health, including self-assessed/perceived health status (Wen et al., 2006). A common, significant variable among

all three types of regression models run is living in the Northeast Industrial neighbourhood. This suggests that those living in poorer, more industrialized neighbourhoods are more likely to report a poorer self-assessed health status than those living in less polluted, industrialized, and more affluent neighbourhoods. Furthermore, there is a significant relationship for participants living in the Southwest Mountain neighbourhood, between self-assessed health status versus just the socio-demographic/economic variables and self-assessed health status versus just the environmental variables. This suggests that those living in high income, low diversity neighbourhoods also can experience poorer self-reported health status than those living in low income, more diverse neighbourhoods. As with these findings, a previous study conducted on these four Hamilton neighbourhoods also finds age (45-64) and neighbourhood (Northeast Industrial) to be significantly associated with self-assessed health status (Wilson et al., 2008). However, that same study by Wilson et al. (2008) also finds income (<$30 000) to be significantly associated with self-assessed health status, whereas with this research, income was not significantly associated with self-reported health. According to Poortinga et al. (2007), poor access to amenities, low neighbourhood quality, and neighbourhood disorder contribute to lower self-reported health status, even when taking into consideration individual socio-economic characteristics (income). Therefore, it was also

anticipated that the Neighbourhood Social Environmental Quality index scores would be significantly associated with self-reported health status, as the index includes many variables that other researchers have determined to be important factors contributing to peoples' self-reported health (noise, litter, vandalism, attacks, alarms, etc.) (Poortinga et al., 2007). Furthermore, studies have also found employment to be linked to self-reported health, as those who are unemployed or retired are more likely to report poorer health (Poortinga et al., 2007). Although other literature suggests that relationships exist between Neighbourhood Social Environmental Quality variables and self-reported health status, and employment with self-reported health status, these findings were not revealed through the research for this thesis.

Chronic Conditions

In terms of how the variables influence participants' chronic conditions, a common variable with significance, among two of the three regression models run (chronic conditions versus just the socio-demographic/economic variables and chronic conditions versus all of the socio-demographic/economic and environmental variables combined) is shown to be age (18-44 and 65+). This suggests that those younger to early middle-aged and the elderly experience at least one chronic condition. This frequency of chronic condition(s) in the youngest age category examined is less anticipated, as research suggests that the odds of

the elderly experiencing one or more chronic conditions are higher than the other age categories (Wilson et al., 2007). In addition, the results imply that those with an education below the high school level or at the high school level are more likely to have at least one chronic condition than those with an education above the high school level (when examining chronic conditions versus all the socio-demographic/economic and environmental quality variables combined). This supports the literature that has found an association between a higher education level and a higher income, which can result in improved health and fewer chronic conditions (Wen et al., 2006). Furthermore, living in the Downtown neighbourhood shows significance when examining the relationship between chronic conditions versus just the environmental variables. The fact that the Downtown neighbourhood is classified as being a lower income neighbourhood contributes to its higher level of people with one or more chronic conditions. Surprisingly, although other research examining the same Hamilton neighbourhoods finds a significant relationship between chronic conditions and income (below $50 000 annually) (Wilson et al., 2008), none of the income levels indicate significance with having one or more chronic conditions. This contradicts the concept that those living in lower income neighbourhoods (the Downtown) experience an increased level of chronic conditions and that those living in higher income neighbourhoods (Southwest Mountain) experience a decreased

level of chronic conditions, as those with a higher income level typically have better access to healthcare services, can afford more nutritious food, etc. (Wen et al., 2006).

Summary of Significant Associations with the Health Outcomes

Each regression model revealed varying levels of significant associations between the five health outcomes and the socio-demographic/economic variables, the environmental quality variables, and all of the variables combined. As mentioned in this chapter, some of the findings are unanticipated and could become an avenue for further research. It should also be noted that age is the only variable to indicate significance in the regressions across all five of the health outcomes, suggesting that age is an important factor mediating neighbourhood environmental quality and health. Furthermore, out of the four physical environmental quality variables examined with the regression models, only the outside maintenance variable indicated significance (with chronic conditions). However, other studies have determined that the physical neighbourhood variables, density of dwellings and traffic problems, may also influence at least two of the health outcomes examined (emotional distress and BMI), as higher rates of traffic problems have been associated with increased stress levels and are a barrier to outdoor physical activity, contributing to higher BMI rates (Ross et al., 2007). Furthermore, a higher density of dwellings is associated with lower BMI rates, as a greater

density of dwellings can result in more opportunities for physical activity (destination(s) close enough to walk/cycle to, more street lighting, etc.) and reduced emotional distress (physical activity boosts self-image, increased feelings of safety/security, etc.) (Ross et al., 2007).

The final chapter, Chapter 6: Conclusions, will summarize the findings, outline the limitations of this research, and discuss its contributions.

Chapter Six: Conclusions

The purpose of this chapter is to summarize the findings of this research and to discuss its limitations and contributions.

Summary

The data obtained from the survey, asking participants living in one of the four Hamilton neighbourhoods being studied, was thoroughly analyzed in order to determine: are there any linkages between perceived neighbourhood environmental characteristics, perceived housing characteristics, socio-demographic characteristics, and the participants' health status? The hypothesis that self-reported health, measured in a variety of ways, *will* vary by neighbourhood, mediated by the socio-demographic/economic factors, proved to be correct in various regression models run on the data: self-reported emotional distress (GHQ) is mediated by age and income; self-reported BMI is mediated by age, education, gender, and tenure; self-reported health satisfaction is mediated by age; self-reported self-assessed health status is mediated by age; and self-reported chronic conditions are mediated by age and education. In addition to the socio-demographic/economic variables, one of the two indices that were created (Neighbourhood Social Environmental Quality) was significantly associated with emotional distress, health satisfaction, and chronic conditions; as well as neighbourhood for self-assessed health status and chronic conditions. In addition, there were also other

unexpected results that were revealed by running the regression models, such as income only being significant with emotional distress, as literature suggests that there is also a significant relationship between income and BMI, self-assessed health status, and chronic conditions (Wilson et al., 2008). In addition, it was unexpected that education would only be significant with the BMI and chronic conditions health outcomes, as the literature also points to significant associations between education and emotional distress (Wilson et al., 2008). Furthermore, it was surprising that gender and tenure were only significant with BMI, as gender has also been significantly linked to emotional distress, with women reportedly being more likely to report emotional distress than men (Wilson et al., 2003); and tenure has also been significantly linked with self-assessed health status, with those who do not own their home reporting poorer health than those who do (Feldman et al., 2008). Moreover, employment did not show significance with any of the health outcomes, whereas literature has pointed to a significant association between employment and chronic conditions (Wilson et al., 2003). It was surprising that the Housing Social Environmental Quality index did not indicate significance with any of the health outcomes, as literature suggests that the social characteristics of housing (noise, safety and security) are significantly associated with emotional distress, self-reported health status, and chronic conditions (Jacobs et al., 2009; Petticrew et al., 2009). In addition, it was surprising

that outside maintenance would be the only physical environmental quality variable to indicate any significance, as the significance of physical characteristics dominated the findings of another Hamilton study examining these neighbourhoods, with, for example, a significant relationship being uncovered between a neighbourhood's physical characteristics and emotional distress (Wilson et al., 2008; Wilson et al., 2003). Furthermore, Wen et al. (2006) report that physical environmental characteristics, including housing conditions, have shown to be more important to perceptions of health than social characteristics.

Limitations

There were some limitations to this study. For example, many of the people who had participated in the original survey (n=1200), did not participate in the second survey (n=671) (Wilson et al., 2004; Wilson et al. 2007). As mentioned earlier, out of the 882 households that were identified as eligible for the follow-up, 281 were identified as ineligible households, (participant(s) had moved out of the area/no such person at address; participant(s) did not have not-in-service numbers, participant(s) was/were unable to speak English/participant(s) was/were neither physically nor mentally well enough to complete the interview, and it was not possible to determine eligibility for some participants) (Wilson et al., 2007). Therefore, the data set for the second survey was smaller than the initial survey.

In addition, only English-speaking participants were included in the survey; therefore, excluding the non-English speaking population.

Another limitation can be found with the goodness-of-fit (McFadden's Rho) calculations for the regression models. None of the Rho values reached the ideal 0.2 to 0.4 level, indicating that these models have a weaker fit.

Furthermore, although it can be considered a limitation or a contribution, the social variables were, to a large extent, more significant and/or dominant than the physical variables, in terms of the health outcomes. "It may be the case that social and physical characteristics have differential levels of importance for health in different neighbourhoods" (Wilson et al., 2003:197). However, this resulted in the findings being mostly related to the social characteristics, as only four of the physical environmental quality variables (housing and neighbourhood) remained in the final step of the analysis, the logistic regressions, and is contrary to what literature about other Hamilton studies indicates, that perceptions of the physical environment are found to impact health more than the perceived social problems of a neighbourhood (Wilson et al., 2004; Wen at al., 2006). On the other hand, this unanticipated finding contributes to knowledge about the difference in impact of physical and social neighbourhood environmental characteristics on health.

Contributions

Despite these limitations, and as mentioned earlier, it is anticipated that the findings from this project will increase knowledge about how perceived social and physical aspects of neighbourhoods may influence individual and population health status (Wilson et al. 2003). According to researchers, there still remains much to be assessed about the influence of the social and physical neighbourhood characteristics on health (Luginaah et al., 2001; Yen and Syme, 1999). Since the early 1990s, there has been a renewed awareness of "...the effects on health in different types of neighbourhoods, localities and regions" (Luginaah et al., 2001:135). Therefore, it was important to examine the survey's data in order to contribute to knowledge relating to neighbourhoods and health. To further deepen our understanding of the relationship between neighbourhood environmental quality and health, a future step could be to further investigate the unanticipated/surprising results uncovered in this thesis (income only being significant with emotional distress, education only being significant with the BMI and chronic conditions, gender and tenure were only significant with BMI, employment and the Housing Social Environmental Quality index not indicating significance with any of the health outcomes, and outside maintenance being the only physical environmental quality variable that indicated any significance).

Furthermore, the knowledge acquired through the analysis of the survey's data may help "...ensure that health planning and service provision are tailored to unique neighbourhood population health needs" (Odoi et al., 2005:1), as the results of the analysis will provide useful information to inform health planning and policy decisions in ways which are better suited to the socio-economically and socio-demographically distinct neighbourhoods (Odoi et al., 2005; Luginaah et al., 2001). In terms of policy, this could mean changes to housing and neighbourhood development practices (density of dwellings, access to goods/services, etc.) and/or improvements in safety and security (educating residents on how to protect their home and themselves, more police officers patrolling neighbourhoods by foot/bicycle, etc.).

Bibliography

Abelson, J., Forest, P-G., Eyles, J., Casebeer, A. and G. Mackean (2004) 'Will it make a difference if I show up and share?' A citizens perspective on improving public involvement processes for health system decision-making. *Journal of Health Services Research and Policy*, 9, pp. 205-212.

Arah, O.A. (2009) On the relationship between individual and population health. *Medical Care and Philosophy*, 12, pp. 235-244.

Barger, D. and C.J. Donoho (2008) The relative contributions of race/ethnicity, socioeconomic status, health, and social relationships to life satisfaction in the United States. *Quality of Life Research*, 18, pp. 179-189.

Brower, S. (1996) Good neighborhoods: a study of in-town and suburban residential environments. Westport, CT: Praeger Publishers.

Brown, B.B., Yamada, I., Smith, K.R., Zick, D.C., Kowaleski-Jones, L. and J.X. Fan (2009) Mixed land use and walkability: Variations in land use measures and relationships with BMI, overweight, and obesity. *Health and Place*, 15, pp. 1130-1141.

Cohen, S. and D. Janicki-Deverts (2009) Can We Improve Our Physical Health by Altering Our Social Networks? *Perspectives on Psychological Science*, 4(4), pp. 375-378.

Connor, E.F. (2002) Logistic Regression. http://userwww.sfsu.edu/~efc/classes/biol710/logistic/logisticreg.htm [Accessed: September 13, 2009].

Diez Roux, A.V. (2001) Investigating Neighbourhood and Area Effects on Health. *American Journal of Public Health*, 91(11), pp. 1783-1789.

Ellaway, A., Morris, G., Curtice, J., Robertson, C., Allardice, G. and R. Robertson (2009) Associations between health and different types of environmental incivility: A Scotland-wide study. *Public Health*, 123, pp. 708-713.

Ellaway, A., Macintyre, S. and A. Kearns (2001) Perceptions of Place and Health in Socially Contrasting Neighbourhoods. *Urban Studies*, 38(12), pp. 2299-2316.

Etches, V., Frank, J., Di Ruggiero, E., and D. Manuel (2006) Measuring Population Health: A Review of Indicators. *Annual Review of Public Health*, 27, pp. 29-55.

Evans, G.W. (2003) The built environment and mental health. *Journal of Urban Health*, 80, pp. 536-555.

Eyles, J., Keller-Olaman, S. and K. Wilson (2005) Environmental disadvantages, and housing, and neighbourhood quality in Hamilton, Ontario, Canada. *Environment and Behavior*, 37, pp. 376-383.

Feldman, P., Warr, D., Tacticos, T. and M. Kelaher (2009) People, places and policies – trying to account for health inequalities in impoverished neighbourhoods. *Australian and New Zealand Journal of Public Health*, 33(1), pp. 17-24.

Garson, David. (2009) Logistic Regression. http://faculty.chass.ncsu.edu/garson/PA765/logistic.htm. [Accessed: July 2, 2009].

Hensher, D. and L. W. Johnson (1981) Applied Discrete Choice Modeling. Croom Helm, London.

Jacobs, D.E., Wilson, J., Dixon, S.L., Smith, J., and A. Evens (2009) The relationship of housing and population health: a 30-year retrospective analysis. *Environmental Health Perspectives*, 597(8).

Jia, H., Moriarty, D.G. and N. Kanarek (2009) County-Level Social Environment Determinants of Health-Related Quality of Life Among US Adults: A Multilevel Analysis. *Journal of Community Health*, 34, pp. 430-439.

Keller-Olaman, S., Eyles, J., Elliott, S., Wilson, K., Dostrovsky, N. and M. Jerrett (2005) Individual and neighbourhood characteristics associated with environmental exposure: exploring relationships at home and work in a Canadian city. *Environment and Behavior*, 37, pp. 441-464.

Law, M., Wilson, K. Eyles, J., Elliott, S., Jerrett, M., Moffat, T. and I. Luginaah (2005) Meeting health need, accessing health care: the role of neighbourhood. *Health and Place*, 11, pp. 367-377.

Lee, C. and A.V. Moudon (2008) Neighbourhood design and physical activity. *Building Research and Information*, 36(5), pp. 395-411.

Luginaah, I., Jerrett, M., Elliott, S., Eyles, J., Parizeau, K., Birch, S., Abernathy, T., Veenstra, G., Hutchison, B., and C. Giovis (2001) Health profiles of Hamilton: Spatial characterisation of neighbourhoods for health investigations. *GeoJournal*, 53, pp. 135-147.

Macintyre, S., Ellaway, A. and S. Cummins (2002) Place effects on health: how do we conceptualise, operationalise and measure them? *Social Science and Medicine*, 55, pp. 125-139.

Matheson, F.I., Moineddin, R., and R.H. Glazier. (2007) The weight of place: A multilevel analysis of gender, neighborhood material deprivation, and body mass index among Canadian adults. *Social Science and Medicine*, 66, pp. 675-690.

Microsoft Corporation (2010) Testing for Reliability. http://msdn.microsoft.com/en-us/library/aa292188(VS.71).aspx [Accessed: April 1, 2010].

Miles, R. and Y. Song (2009) "Good" Neighbourhoods in Portland, Oregon: Focus on Both Social and Physical Environments. *Journal of Urban Affairs*, 31(4), pp. 491-509.

Miles, R. and D.E. Jacobs (2008) Future Directions in Housing and Public Health: Findings From Europe With Broader Implications for Planners. *Journal of the American Planning Association*, 74(1), pp. 77-89.

Molinari, C., Ahern, M. and M. Hendryx (1998) The relationship of community quality to the health of women and men. *Soc Sci Med,* 47, pp. 1113-1120.

National Institutes of Health (2009) Calculate Your Body Mass Index. http://www.nhlbisupport.com/bmi/ [Accessed: April 10, 2010].

Odoi, A., Wray, R., Emo, M., Birch, S., Hutchison, B., Eyles, J. and T. Abernathy (2005) Inequalities in neighbourhood sociographic characteristics: potential evidence-base for neighbourhood health planning. *International Journal of Health Geographics*, 4(20).

Pallant, J. (2007) *SPSS Survival Manual: A step-by-step guide to data analysis using SPSS for Windows* (Version 15). Sydney, Australia: Allen and Unwin, pp. 176.

Petticrew, M., Kearns, A., Mason, P. and C. Hoy (2009) The SHARP study: a quantitative and qualitative evaluation of the short- term outcomes of housing and neighbourhood renewal. *BMC Public Health*, 9, pp. 415.

Pevalin, D.J., Taylor, M.P. and J. Todd (2008) The Dynamics of Unhealthy Housing in the UK: A Panel Data Analysis. *Housing Studies*, 23(5), pp. 679-695.

Pickett, K.E. and M. Pearl (2001) Multilevel analyses of neighbourhood socioeconomic context and health outcome: a critic review. *Journal of Epidemiology and Community Health*, 55, pp. 111-122.

Poortinga, W., Dunstan, F. and D. Fone (2007) Perceptions of the neighbourhood environment and self rated health: a multilevel analysis of the Caerphilly Health and Social Needs Study. *BMC Public Health*, 7:285.

Roman, C.G., Knight, C.R., Chalfin, A. and S.J. Popkin (2009) The Relation of the Perceived Environment to Fear, Physical Activity, and Health in Public Housing Developments: Evidence from Chicago. *Journal of Public Health Policy*, 30, S286-S308.

Ross, N.A., Tremblay, S., Khan, S., Crouse, D., Tremblay, M., and J. Berthelot (2007) Body Mass Index in Urban Canada: Neighborhood and Metropolitan Area Effects. *Research and Practice*, 97(3), pp. 500-508.

Stafford, M. and M. Marmot (2003) Neighbourhood deprivation and health: does it affect us all equally? *International Journal of Epidemiology*, 32, pp. 357-366.

van Ham, M. and P, Feijten (2006) Who wants to leave the neighbourhood? The effect of being different from the neighbourhood population on wishes to move. *Environment and Planning A*, 40, pp. 1151-1170.

Veenstra, G., Luginaah, I., Wakefield, S., Birch, S., Eyles, J. and S. Elliott (2005) Who you know, where you live: social capital, neighbourhood and health. *Social Science and Medicine*, 60, pp. 799-818.

Veitch, J.A. (2008) Investigating and Influencing How Buildings Affect Health: Interdisciplinary Endeavours. *Canadian Psychology*, 49(4), pp. 281-288.

Wells, C.S. and J.A. Wollack (2003) An Instructor's Guide to Understanding Test Reliability. *University of Wisconsin*, pp. 1-7.

Wen, M., Hawkley, L.C., and J.T. Cacioppo (2006) Objective and perceived neighborhood environment, individual SES and psychosocial factors, and self-rated health: An analysis of older adults in Cook County, Illinois. *Social Science and Medicine*, 63, pp. 2575-2590.

William, M.K. (2006) Research Methods: Knowledge Base. http://www.socialresearchmethods.net/kb/seallik.php. [Accessed: September 18, 2009].

Williams, D.R., Costa, M.V., Odunlami, A.O. and S.A. Mohammed (2008) Moving Upstream: How Interventions That Address the Social Determinants of Health Can Improve Health and Reduce Disparities. *Journal of Public Health Management Practice*, S8-S17.

Wilson, K., Eyles, J., Elliott, S., and S. Keller-Olaman (2008) Health in Hamilton neighbourhoods: Exploring the determinants of health at the local level. *Health and Place*, 15, pp. 374-382.

Wilson, K., Elliott, S.J., Eyles, J. and S.J. Keller-Olaman (2007) Factors Affecting Change Over Time in Self-reported Health. *Canadian Journal of Public Health*, 98 (2), pp. 154-158.

Wilson, K., Elliott, S., Law, M., Eyles, J., Jerrett, M., and S. Keller-Olaman (2003) Linking Perceptions of neighbourhood to health in Hamilton, Canada. *Journal of Epidemiology and Community Health*, 58, pp. 192-198.

Xiao, H. and P.J Barber (2008) The Effect of Perceived Health Status on Patient Satisfaction. *Value in Health*, 11 (4), pp. 719-725.

Yen, S. and S.L. Syme (1999) The Social Environment and Health: A Discussion of the Epidemiological Literature. *Annual Review of Public Health*, 20, pp. 287-308.

Appendices

Appendix 1: Description of the Variables

Name and Code of Variables (*Physical Housing* Variables)	**Survey Question/Description**
Interior Layout (layout2) Satisfied=0; Dissatisfied=1	Are you very satisfied/dissatisfied with the interior layout of your dwelling?
Amount of Sunlight (sunlight2) Satisfied= 0; Dissatisfied =1	What about an adequate amount of sunlight in your dwelling?
Indoor Air Quality (airinsid2) Satisfied = 0; Dissatisfied =1	What about indoor air quality?
Yard Size (yardsize2) Satisfied = 0; Dissatisfied =1	What about the size of your yard?
Cost of Heating (heatcost2) Satisfied = 0; Dissatisfied =1	What about the cost of heating your dwelling?
Cost of Mortgage or Rent (mortcost2) Satisfied = 0; Dissatisfied =1	What about mortgage or rent costs?
Outdoor Maintenance (maintout2) Satisfied = 0;	What about your ability to keep the outside of your home well maintained?

Dissatisfied = 1	

Name and Code of Variables (*Social Housing* Variables)	**Survey Question/Description**
Indoor Noise (noiseins2) Satisfied = 0; Dissatisfied =1	What about how noises carry between rooms inside your dwelling?
Outdoor Noise (noiseout2) Satisfied = 0; Dissatisfied =1	What about how noises carry from outside your dwelling?
Safety and Security (safecur2) Satisfied = 0; Dissatisfied =1	What about the safety and security of your dwelling?
Overall Satisfaction (overall2) Satisfied = 0; Dissatisfied =1	Overall, how satisfied are you with your present dwelling as a place to live?
Housing Prices (housepri2) Satisfied = 0; Dissatisfied =1	In a year from now, do you expect house prices or rent in your neighbourhood will go up, stay about the same, or go down?
Neighbourhood Move (moveneig2) Satisfied = 0; Dissatisfied =1	If you had to move, would you prefer to move to a better home in THIS neighbourhood, or to a similar home but in a BETTER neighbourhood?
Location of Home	Is your home in a good location for

(homeloca2) Satisfied = 0; Dissatisfied =1	you?
Home Reflection (homerefle2) Satisfied = 0; Dissatisfied =1	Is your home a good reflection of who you are?
Home pride (proudhom2) Satisfied = 0; Dissatisfied =1	Are you are proud to show your home to visitors?
Home and Neighbourhood (neighdm2) Satisfied = 0; Dissatisfied =1	Does it matter what your neighbourhood is like as long as you have a nice home?
Limited Choice (choiceli2) Satisfied = 0; Dissatisfied =1	Do you have limited choices on where to live because of financial issues?
Good Neighbourhood and/or Good Home (gnghome2) Satisfied = 0; Dissatisfied =1	Is being in a good neighbourhood is just as important as having a good home?

Name and Code of Variables (*Physical Neighbourhood* Variables)	**Survey Question/Description**
Open Public Spaces (pubspace2) 0 = Common; 1 = Uncommon	Plenty of open public spaces in your neighbourhood?
Bicycle Paths (bikepath2) 0 = Common; 1 = Uncommon	Bicycle paths in your neighbourhood?
Street Lighting (lighting2) 0 = Common; 1 = Uncommon	Adequate street lighting in your neighbourhood?
Density of Dwellings (density2) Satisfied = 0; Dissatisfied = 1	Do you think the density of dwellings in your neighbourhood needs a great deal of improvement?
Parks Need Improvement (parksimp2) Satisfied = 0; Dissatisfied = 1	Do you think local parks and recreation facilities in your neighbourhood need a great deal of improvement?
Public Transit (ptransit2) Satisfied = 0; Dissatisfied = 1	What about public transit in your neighbourhood?
Traffic Problems (trafficp2) Satisfied = 0; Dissatisfied = 1	What about problems with traffic in your neighbourhood?
Use of Public Parks (useparks2) Satisfied = 0; Dissatisfied = 1	Do you use public parks in your neighbourhood?
Name and Code of	Survey

Variables (Social Neighbourhood Variables)	Question/Description
Will Neighbourhood Change (wilchang2) Satisfied = 0; Dissatisfied = 1	On the whole, do you think that over the next five years this neighbourhood will get better or worse as a place to live?
Activities/Facilities (activiti2) Satisfied = 0; Dissatisfied = 1	What about activities and facilities for children and young people in your neighbourhood?
Poor Neighbourhood (poorneig2) Satisfied = 0; Dissatisfied = 1	Do you think most people in Hamilton would describe this neighbourhood as a poorer part of the city or a better-off part of the city?
Litter (litter2) 0 = Common; 1 = Uncommon	Garbage and litter lying about - is this in your neighbourhood?
Noise from Traffic (trnoise2) 0 = Common; 1 = Uncommon	Noise from traffic in your neighbourhood?
Noise from People (pplnoise2) 0 = Common; 1 = Uncommon	Noise from people, such as partying and people shouting in your neighbourhood?
Noise from Factories (facnoise2) 0 = Common; 1 = Uncommon	Noise from factories, businesses, construction and aircraft in your neighbourhood?
Homelessness (homeless2) 0 = Common; 1 = Uncommon	Homeless people on the streets in your neighbourhood?
Graffiti (graffiti2)	Graffiti on walls and

0 = Common; 1 = Uncommon	buildings in your neighbourhood?
Attacks (attacks2) 0 = Common; 1 = Uncommon	Insults or attacks related to someone's race, colour or ethnicity in your neighbourhood?
Burglar/Car Alarms (alarms2) 0 = Common; 1 = Uncommon	The sound of home burglar or car alarms going off in your neighbourhood?
Drugs and/or Alcohol Abuse (drugsalco2) 0 = Common; 1 = Uncommon	Drug or alcohol abuse in your neighbourhood?
Vandalism (vandalsm2) 0 = Common; 1 = Uncommon	Vandalism and homes or cars being broken into in your neighbourhood?

Appendix 2: Cross-Tabulations

Environmental Quality Variables with the Socio-Demographic/Economic Variables:

Environmental Quality Variable	Age	Income	Employ.	Educ.	Gender	Tenure
Layout	0.474	0.076	0.062	0.346	0.928	0.017
Sunlight	0.442	0.814	0.035	0.591	0.643	0.662
Inside noise	0.12	0	0.435	0.59	0.291	0.255
Outside Noise	0.339	0.008	0.246	0.635	0.983	0.012
Safety/Security	0.272	0.212	0.717	0.997	0.08	0.04
Inside Air	0.297	0.019	0.396	0.591	0.701	0
Yard Size	0.014	0.183	0.831	0.018	0.034	0.283
Heating Costs	0.794	0.396	0.834	0.736	0.009	0.027
Mortgage/Rent Costs	0.36	0.003	0.049	0.001	0.956	0.059
Outside Maintenance	0.294	0.006	0.892	0.204	0.481	0.06
Overall	0.254	0.04	0.522	0.244	0.716	0
House Prices	0.175	0.892	0.166	0.17	0.083	0.003
Use of Parks	0	0	0	0	0.026	0.039
Street Lighting	0.458	0.272	0.397	0.189	0.244	0.504
Public Space	0.965	0.179	0.068	0.01	0.886	0.891
Bike Paths	0.001	0	0	0.001	0.12	0.43
Home Pride	0.011	0.023	0.764	0.014	0.434	0.048
Home Location	0.141	0.312	0.418	0.299	0.63	0.235
Move Neighbourhood	0.001	0	0.001	0	0.621	0.22
Home Reflection	0.185	0.68	0.013	0.156	0.201	0.184
Limited Choice	0.079	0	0.401	0.004	0.051	0.001
Home and Neighbourhood	0.519	0.123	0.127	0.005	0.363	0.874
Neighbourhood Change	0.402	0.679	0.538	0.08	0.675	0.242
Density	0.783	0.012	0.22	0.019	0.667	0.037
Improve Parks	0.282	0.865	0.776	0.934	0.267	0.269
Activities	0.142	0.067	0.408	0.721	0.743	0.002
Public Transit	0.274	0.714	0.709	0.69	0.45	0.542
Traffic Problems	0.558	0.002	0.204	0.002	0.201	0.028

Poor Neighbourhood	0.002	0	0.944	0	0.897	0
Litter	0.062	0.004	0.95	0	0.239	0.001
Traffic Noise	0.087	0	0.465	0.116	0.154	0.019
People noise	0.02	0.003	0.6	0	0.902	0.002
Factory Noise	0.761	0.936	0.94	0.666	0.152	0.611
Homelessness	0.656	0	0.515	0.002	0.002	0
Graffiti	0.319	0.92	0.007	0.704	0.818	0.023
Attacks	0.586	0.004	0.32	0.094	0.44	0.011
Alarms	0.21	0.308	0.131	0.474	0.897	0.002
Drugs/Alcohol	0.069	0.017	0.68	0.001	0.313	0
Vandalism	0.28	0.113	0.579	0.03	0.949	0.237
Walking Alone	0.292	0	0.043	0	0.077	0
Neighbours Entering Home	0.199	0.134	0.005	0.572	0.05	0.008
Muggings	0.674	0.012	0.401	0.032	0.45	0.531

Environmental Quality Variables with the Health Outcomes:

Environmental Quality Variable	Emotional Distress	BMI	Health Satis.	Self-Assessed Health Status	Chronic Conditions
Layout	0.376	0.753	0.001	0.073	0.203
Sunlight	0.363	0.532	0.773	0.095	0.456
Inside noise	0	0.677	0.05	0.304	0.061
Outside Noise	0.13	0.702	0.007	0.09	0.218
Safety/Security	0.062	0.169	0	0.07	0.008
Inside Air	0.043	0.193	0.009	0.111	0.006
Yard Size	0.366	0.819	0.983	0.961	0.427
Heating Costs	0.017	0.552	0.173	0.228	0.149
Mortgage/Rent Costs	0.841	0.037	0.582	0.803	0.396
Outside Maintenance	0.008	0.063	0.002	0.006	0.001
Overall	0.009	0.058	0.001	0.012	0.1
House Prices	0.061	0.241	0.064	0.404	0.077
Use of Parks	0.053	0.303	0.007	0	0
Street Lighting	0.076	0.157	0.908	0.578	0.934
Public Space	0.053	0.85	0.83	0.514	0.93
Bike Paths	0.318	0.093	0.206	0.005	0.014

Home Pride	0.345	0.015	0.001	0.042	0.125
Home Location	0.39	0.396	0.48	0.368	0.631
Move Neighbourhood	0.403	0.039	0.794	0.437	0.07
Home Reflection	0.452	0.333	0.207	0.18	0.029
Limited Choice	0.004	0.131	0.052	0.014	0.074
Home and Neighbourhood	0.139	0.925	0.679	0.205	0.194
Neighbourhood Change	0.315	0.08	0.078	0.132	0.259
Density	0.407	0.258	0.048	0.072	0.038
Improve Parks	0.803	0.994	0.408	0.682	0.094
Activities	0.137	0.092	0	0	0.011
Public Transit	0.108	0.682	0.17	0.977	0.688
Traffic Problems	0.131	0.752	0.09	0.001	0.098
Poor Neighbourhood	0.032	0.004	0.01	0.005	0.001
Litter	0.101	0.338	0.133	0.211	0.066
Traffic Noise	0.065	0.991	0.649	0.494	0.172
People noise	0	0.041	0.001	0	0.151
Factory Noise	0.112	0.064	0.155	0.123	0.094
Homelessness	0	0.207	0.014	0.012	0.274
Graffiti	0.005	0.137	0.487	0.19	0.485
Attacks	0	0.046	0.056	0.899	0.299
Alarms	0.013	0.262	0	0.005	0.007
Drugs/Alcohol	0.005	0.002	0	0	0.027
Vandalism	0.044	0.779	0.025	0.009	0.372
Walking Alone	0	0.001	0.003	0.002	0.027
Neighbours Entering Home	0.001	0.893	0	0.029	0.02
Muggings	0	0.425	0.001	0	0.03

Health Outcomes with the Socio-Demographic/Economic Variables:

Health Outcome	Age	Income	Employ.	Educ.	Gender	Tenure
Emotional Distress	0.111	0.002	0.762	0.433	0.129	0.017
BMI	0.003	0.097	0.388	0.005	0	0.043
Health Satisfaction	0.001	0.304	0.302	0.16	0.569	0.031
Self-Assessed Health Status	0	0.001	0.144	0	0.78	0.025
Chronic Conditions	0	0	0	0	0.024	0.815

Appendix 3: Reliability Tests

Neighbourhood Social Environmental Quality

Cronbach's Alpha	N of Items
.751	16

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Neighbourhood Better in the Next 5 Years? Binary	3.86	7.367	.322	.742
Facilities for Children and Youth Binary	3.40	9.073	-.345	.791
Neighbourhood Poorer or Better Off than Rest of Hamilton Binary	3.96	7.091	.478	.725
Litter Binary	4.02	7.123	.513	.722
Noise from Traffic Binary	3.70	7.567	.236	.752
Noise from People Binary	4.00	6.953	.570	.715
Factory Noise Binary	3.99	7.869	.159	.758
Homelessness Binary	4.18	7.767	.411	.736
Graffiti Binary	4.10	7.672	.320	.741
Attacks Binary	4.20	8.173	.186	.750
Alarms Binary	4.03	7.354	.412	.732
Drugs and Alcohol Binary	4.03	6.889	.631	.710
Vandalism Binary	3.99	7.059	.516	.721
Walking Alone	3.99	7.060	.510	.722

Binary				
Neighbours Entering Your Home Without Permission Binary	4.19	7.914	.335	.742
Muggings Binary	4.21	8.024	.320	.744

Neighbourhood Physical Environmental Quality

Cronbach's Alpha	N of Items
.185	8

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Use of Parks Binary	7.94	2.402	.114	.139
Public Space Binary	7.89	2.483	.043	.181
Bike Path Binary	7.65	2.301	.150	.113
Lighting Binary	8.19	2.788	-.087	.212
Density of Dwellings Binary	7.31	2.647	.063	.174
Parks Improvement? Binary	7.34	2.682	-.006	.197
What about public transit in your neighbourhood?	3.95	1.166	.107	.182
Traffic Binary	7.35	2.474	.183	.122

Housing Social Environmental Quality

Cronbach's Alpha	N of Items
.437	12

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Noise Inside Binary	2.28	2.040	.256	.389
Noise Outside Binary	2.21	1.983	.212	.397
Safety and Security Binary	2.28	2.021	.290	.380
Overall Satisfaction of Dwelling Binary	2.32	2.005	.435	.358
House Prices in One Year From Now Binary	2.00	2.212	-.071	.518
Better Home in THIS Neighbourhood Versus Similar Home in a BETTER Neighbourhood Binary	2.38	2.346	.000	.440
Your Home is in a Good Location Binary	2.33	2.162	.224	.407
Home a Good Reflection of Who You Are? Binary	2.23	1.948	.276	.376
Proud of Home Binary	2.23	1.900	.325	.359

Neighbourhood Less Important than Having a Nice Home Binary	1.64	2.057	.076	.451
Limited Choices on where to Live because of Financial Issues? Binary	1.95	2.061	.028	.480
Good Neighbourhood as Important as Good Home Binary	2.31	2.132	.195	.408

Housing Physical Environmental Quality

Cronbach's Alpha	N of Items
.518	7

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Housing Layout Binary	1.08	1.387	.247	.483
Sunlight Binary	1.04	1.300	.279	.468
Inside Air Binary	1.05	1.339	.251	.480
Yard Size Binary	1.02	1.311	.236	.486
Heating Cost Binary	.78	1.130	.263	.484
Mortgage Cost Binary	1.07	1.330	.310	.460
Outside Maintenance Binary	1.04	1.350	.219	.493