EXPLORING THE ASSOCIATION BETWEEN PHYSICAL ACTIVITY, HEART DISEASE, AND ASPECTS OF THE ENVIRONMENT INCLUDING INTERPERSONAL AND COMMUNITY FACTORS

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Exploring the Association between Physical Activity, Heart Disease, and Aspects of the Environment Including Interpersonal and Community Factors

by

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Abstract

Purpose: To explore the association between regular physical activity, heart disease and aspects of the environment, including interpersonal and community factors.

Methods: The 2011 Survey of Residents of St. John's, a representative telephone survey, provided data on English-speaking adults, 19 years and older, from St. John's, Newfoundland. From this, we created a novel interpersonal index based on sense of belonging and on satisfaction with family and friends and community level factors. We then used logistic regression to examine the association.

Results: After controlling for age and sex, individuals who reported being physically active on a daily basis were more likely to have higher scores on the interpersonal index, were more likely to have a positive impression of outdoor spaces as a place to be active and were more likely to report feeling safe and secure in their environment than individuals who reported not being physically active. In addition, individuals with heart disease were more likely to rate their impression of active outdoor spaces (i.e. spaces where they were active) negatively than those without heart disease.

Interpretation: The socio-ecological model of health provides researchers with a framework to study communities. This framework shows that St. John's residents rely on interpersonal and community support for daily physical activity. Strategies to encourage residents to be active should be based on this concept.

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List of Abbreviations

PA……..……Physical activity

PHAC……..……Public Health Agency of Canada

CVD……Cardiovascular Disease

MACS……Mayor's Advisory Committee for Seniors

AFC……Age Friendly Community

WHO……..The World Health Organization

SES……Socio-economic Status

NL……Newfoundland and Labrador

CDC……...Centre for Disease Control and Prevention

OR ……Odds Ratio

CI……Confidence Interval

CIHI……Canadian Institute for Health Information

CCHS ……..Canadian Community Health Survey

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Chapter 1
Introduction

1.1 Problem Statement

It is well known that regular physical activity (PA) can drastically improve overall health (Shiroma and Lee, 2010). The Public Health Agency of Canada (PHAC) (2004) confirms that PA can help to prevent a number of chronic conditions, including cardiovascular disease, diabetes, cancer, hypertension, obesity, depression, osteoporosis and premature death. Additionally, regular PA has been shown to reduce morbidity and mortality in individuals who suffer from a number of chronic conditions, including heart disease. Unfortunately, about 51% of Canadians are physically inactive, making this the most salient of all modifiable risk factors for chronic conditions (Warburton and Brebin, 2006). In fact, physical inactivity is considered to be the fourth leading risk factor for death on a global scale (WHO, 2011), making it an important risk factor worldwide. While PA is clearly important to prevent disease and promote health, many Canadians are not meeting Health Canada's guidelines for PA and are therefore not reaping the health benefits (Warburton and Brebin, 2006)

As early as the 1940s and 1950s, epidemiological studies revealed that sedentary lifestyles were associated with an escalated risk for developing heart disease (Morris, Heady, Raffle, Roberts, & Parks, 1953). Cardiovascular disease (CVD), including heart disease, is currently the primary cause of death in Canada

despite its largely preventable nature due to its modifiable risk factors such as regular physical activity (Petter, Kemp, Mazoff, Ferrier, & Blanchard, 2009).

While these studies indicate that PA is beneficial in reducing risk for developing heart disease, PA has other benefits as well. In recent decades, a number of well-controlled experimental studies have illustrated that PA intervention leads to both physiological and psychological change (Bellow, Epstein, & Parikh-Patel, 2011). Furthermore, since the 1990s, there has been general consensus that there are links between PA participation and healthy aging (Chodzko-Zaiko, 1993). The benefits of PA include the prevention of cardiovascular disease, the improvement of psychological health and the support of healthy aging. If Canadians were to participate in PA, the ensuing benefits could considerably reduce the billions of dollars spent on diseases attributable to physical inactivity (Duncan, Spence, and Memmery, 2005).

A *social-ecological model of health behaviour* (discussed in the next chapter) makes it clear that PA can be influenced by many factors, including both barriers to and facilitators of activity. Interpersonal and community level factors related to PA are well established as having the potential to be strong predictors of health outcomes. For example, some research has indicated that the lack of safe outdoor facilities and spaces can be a potential barrier for positive health outcomes (Baert, Gorus, Mets, Geerts, & Bautmans, 2011). However, the specific relationships between many environmental factors (including interpersonal and community factors), physical activity and heart disease remain unclear and may vary between communities.

1.2 Research Questions and Objectives

The goal of this study is to examine factors from within the socio-ecological model of health behaviour related to the interpersonal and community factors of one's environment and their potential association with physical activity and heart disease (Sallis and Owen, 2002). Our research will examine these environmental factors as they relate to both physical activity and self-reported heart disease in the population of St. John's, Newfoundland.

1.2.1 Research Hypotheses

The research hypotheses tested throughout this project are listed below. An interpersonal index which will be explained in due course has been developed to test the hypotheses, and a number of relevant community factors were selected. The level of confidence used was alpha of 0.05 significance.

1) Heart disease and physical activity are associated.

2) Physical activity and the interpersonal index are associated.

3) Physical activity and the community factors are associated.

4) Heart disease and the interpersonal index are associated.

5) Heart disease and the community factors are associated.

6) Physical activity is associated with both the interpersonal index and the community factors while controlling for other co-variants (age and sex).

7) Heart disease is associated with both the interpersonal index and the community factors while controlling for other co-variants (age and sex).

1.3 Rationale

Recent shifts in cultural norms have led to the increased prevalence of heart disease in North America. Canada is among the countries known for high rates of heart disease, and Newfoundland and Labrador continue to have the highest rates of heart disease in Canada (Heart and Stroke Foundation, 2011). Physical activity is an important protector from heart disease. Because of the decline in regular physical activity in everyday living, something particularly evident in the loss of manual labour jobs such as farming and fisheries within the province of Newfoundland and Labrador, heart disease rates are high. It is imperative to understand factors that motivate individuals to participate in regular physical activity if we are to promote healthier lifestyles in this population. This study is the first of its kind to look at environmental factors associated with heart

disease and PA in this specific population. It is also the first to develop an interpersonal index for these factors.

Chapter 2
Background and Literature Review

2.1 Introduction

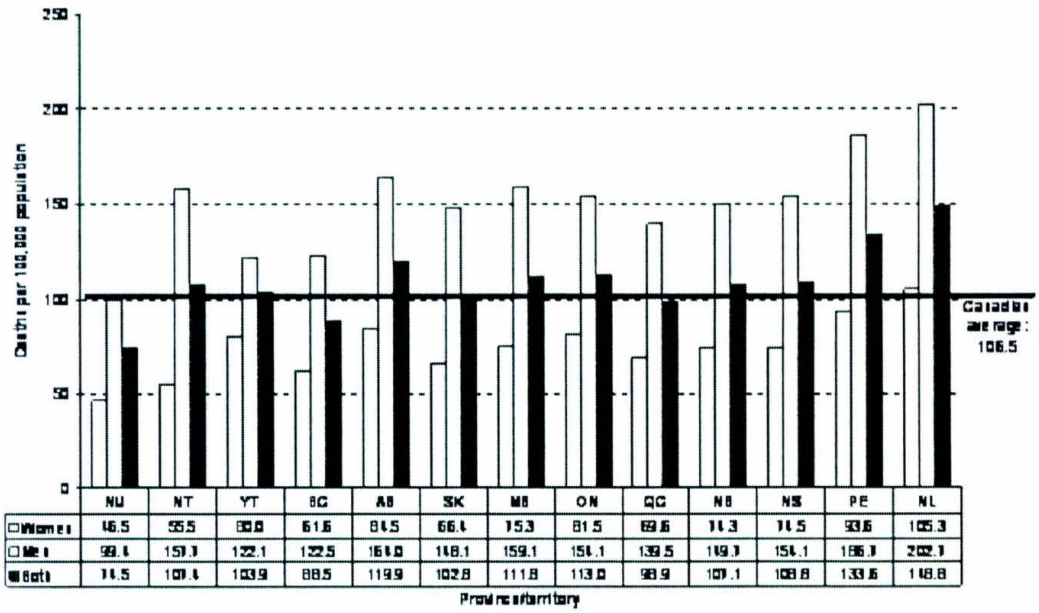
Worldwide, an estimated 17 million people die each year of cardiovascular disease, particularly heart attacks and strokes (WHO, 2011). Heart disease is responsible for 30% of all deaths in Canada, making it the leading cause of death (Petter *et al.*, 2009). The leading cause of hospitalization in Canada is heart disease and stroke, accounting for 16.9% of total hospitalizations (Heart & Stroke, 2011). Every seven minutes, a Canadian dies of heart disease (Heart & Stroke, 2011).

Mirolla (2004) estimates that 70% of premature deaths are preventable. Thousands of Canadians die each year from heart disease; many of these deaths are premature, and many are preventable. Individuals diagnosed with heart disease have a significantly higher risk of illness and premature death, but research indicates that the high rates of morbidity and mortality related to heart disease are partially due to a lack of physical activity (PA) (Bellow *et al.*, 2011; Heart and Stroke, 2009; Leung *et al.*, 2007). Thus, PA constitutes an important aspect of the successful prevention of premature death. In fact, lack of PA is well established as the leading predictor of mortality in heart disease patients (Bellow *et al.*, 2011; Myers *et al.*, 2002; Weiss *et al.*, 2004). According to Shiroma and Lee (2010), "regular physical activity or cardio respiratory fitness decreases the risk of coronary heart disease." A rigorous meta-analysis focusing on the

prevention of heart disease demonstrates that individuals who engage in regular PA significantly reduce their risk of disease (Berlin & Colditz, 1990). While many of the initial studies focus on white men, recent research has involved a more accurate cross-section of the population, including women and various ethnic/racial groups. Further research has confirmed that people who suffer from heart disease and engage in moderate to vigorous activity one to three times a week for at least 30 minutes have a decreased risk of mortality (Mars, Kempen, Mesters, Proot, & Van Eijk., 2008). One study shows a 33% reduction in mortality in those who exercise compared to their non-active counterparts (Mars *et al.*, 2008).

Canada has high rates of heart disease, and this rate is even higher in Atlantic Canada. In fact, the Heart and Stroke Foundation estimates that 37% of all deaths in Atlantic Canada are due to heart disease (2011). The second highest death rate in Atlantic Canada is found in eastern Newfoundland, which has heart disease rates that are significantly higher than the national average (Community Accounts, 2007; Public Health Agency Canada (PHAC), 2004). Heart disease kills more individuals than any other illness in the province of Newfoundland and Labrador (NL). Figure 1 illustrates the prevalence of heart disease deaths in NL (shown on the far right). The figure shows that the death rate per 100,000 people is significantly higher in Newfoundland than the rest of Canada (as demonstrated by the horizontal line).

Figure 1. Heart Disease Deaths by Canadian Province



Public Health Agency of Canada,1998, by permission (See Appendix C).

Compounding these high province-wide statistics, St. John's has a rapidly aging population with concomitantly increasing rates of heart disease. Individuals over 55 years of age represent more than 25% of the population within the city (Community Accounts, 2007). Given the preventable nature of heart disease, it seems logical that PA should be encouraged in this population. It is possible, however, that certain environmental factors will handicap efforts to introduce effective PA. Despite what is known about the associations between PA and heart disease, no research has looked specifically at environmental factors

associated with heart disease and PA in St. John's.

This chapter will analyze the literature on the economic burden caused by lack of PA and will explore various aspects of the environment as they relate to physical activity and heart disease. More specifically, it will consider interpersonal and community factors associated with PA and heart disease, such as marital status, family and friends, social support, neighbourhood safety, the impression of presence of facilities, and impression of outdoor spaces.

Regular physical activity performed by individuals with and without heart disease can act as both prevention and intervention; therefore, it is imperative that factors, which could help promote PA, be explored. This study is the first of its kind to look at environmental factors associated with heart disease and PA in this specific population. It is also the first to develop and interpersonal index for these factors.

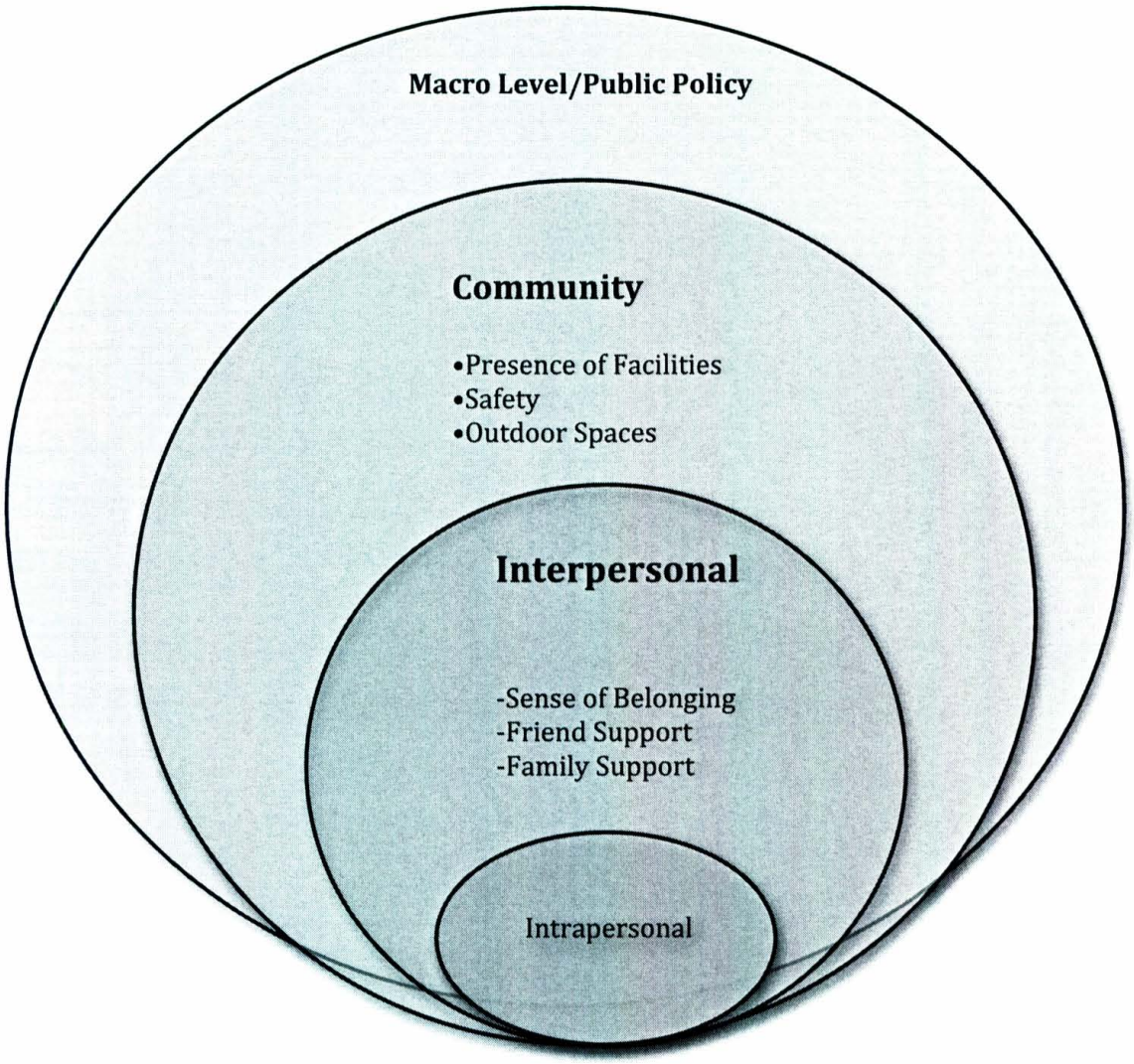
2.2 The Socio-Ecological Model of Health

The most common theoretical model used to examine environmental interactions is the socio-ecological model (McLeroy, Bibeau, Stecklet, & Glanz, 1988). Research suggests that this general model should be used to show the association of PA with heart disease (McLeroy *et al.*, 1988). The socio-ecological model of health helps to highlight the interpersonal and community factors associated with PA and heart disease; it is useful in the formulation of ways to increase quality of life and decrease disease rates. The socio-ecological model

suggests that PA is motivated by complex multilevel interactions between individuals and environmental factors. Behaviours and their complexity change according to the environment in which they take place. However, these behaviours can be predicted, and if we understand them, we can promote healthier lifestyles.

A socio-ecological framework provides an overview of both facilitators of and common barriers to PA and suggests connections between the barriers. It highlights the need for multifaceted approaches to environmental factors on four levels (McLeroy *et al.*, 1988): intrapersonal, interpersonal, community, and macro/public policy. Note that this particular research focuses on only two of these: the interpersonal and community levels. Some theorists believe that a valuable comprehensive framework for understanding change can be created if this multi-level approach is used to examine behaviour. They also argue that the socio-ecological model explains the extent to which each barrier level influences health (Giles-Corti and Donovan, 2002; Sallis, Johnson, Clafas, Caparsosa, & Nichols, 1997). Practical examples of interventions to promote behaviour change can be created using this model. Professionals can use it to develop strategies, with a view to promoting healthier lifestyles, and encouraging the development of related policies and community programs.

Figure 2. Socio-Ecological Model of Health



SAGE, 1988, Adapted by permission (Refer to Appendix D)

Figure 2 shows graphically the four levels of the socio-ecological framework. The first level factors are intrapersonal and situated within the individual. On the second level, interpersonal factors involve the primary social relationships that surround an individual (friends, family, coworkers, etc.). The model shows that having the support of friends and family and feeling a sense of belonging in one's community will enhance one's participation in PA, while a lack of support or sense of belonging will reduce participation in PA (Queensland Health, 2007). The third level includes community relationships; for example, characteristics of neighbourhoods, including facilities and safety. Both the lack of facilities and the absence of safety have been reported as barriers to PA (Queensland Health, 2007). Community partnerships and policy level interventions such as providing parks and increasing safety may help overcome these barriers. The final level of the framework involves macro/public policy factors, including local and federal PA policies (Queensland Health, 2007).

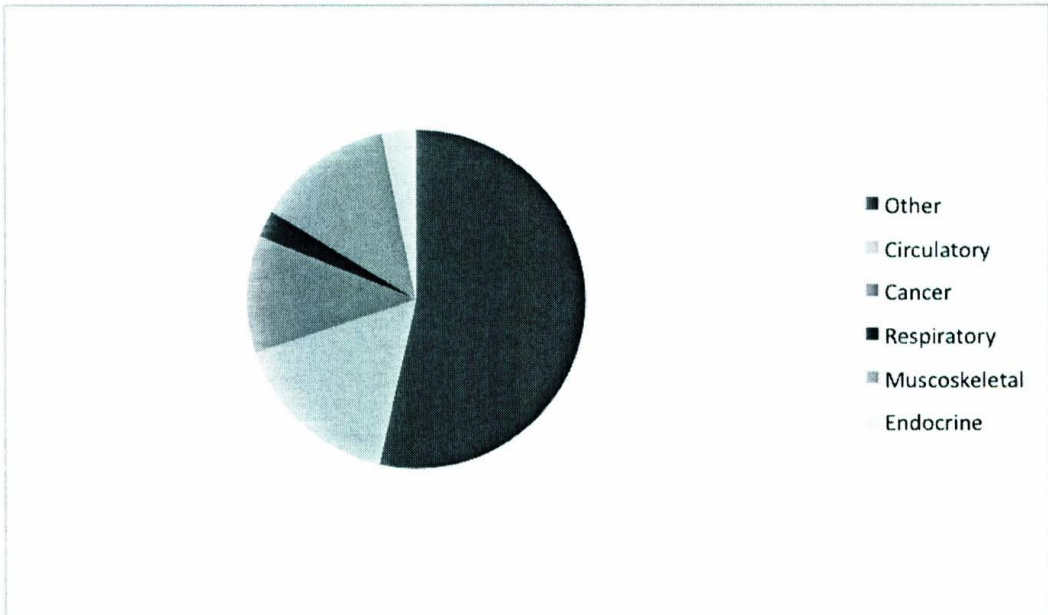
The abundance of factors operating at numerous levels indicates the need for a multifactor approach to the promotion of healthy lifestyles. In this sense, the socio-ecological model is useful, (McLeroy *et al.*, 1988). Researchers using the socio-ecological framework can visualize the factors involved in the acquisition of a healthy lifestyle (McLeroy *et al.*, 1988).

2.3 The Economic Burden

While Canada has made enormous strides in health care, we must continue

to improve the health of Canadians and work to reduce health care costs. Better medical technology has allowed Canadians to live longer lives and has reduced the incidence of many illnesses, such as tuberculosis, that were prevalent a century ago (Mirolla, 2004). Although the health of Canadians has improved as a whole, there has been a steady increase in the incidence of chronic diseases, one of which is heart disease (Mirolla, 2004). Such diseases incapacitate thousands of Canadians every year and cost innumerable tax dollars. Figure 3 illustrates the sizable burden placed on Canada's economy by these diseases; note the disproportionate size of circulatory illnesses.

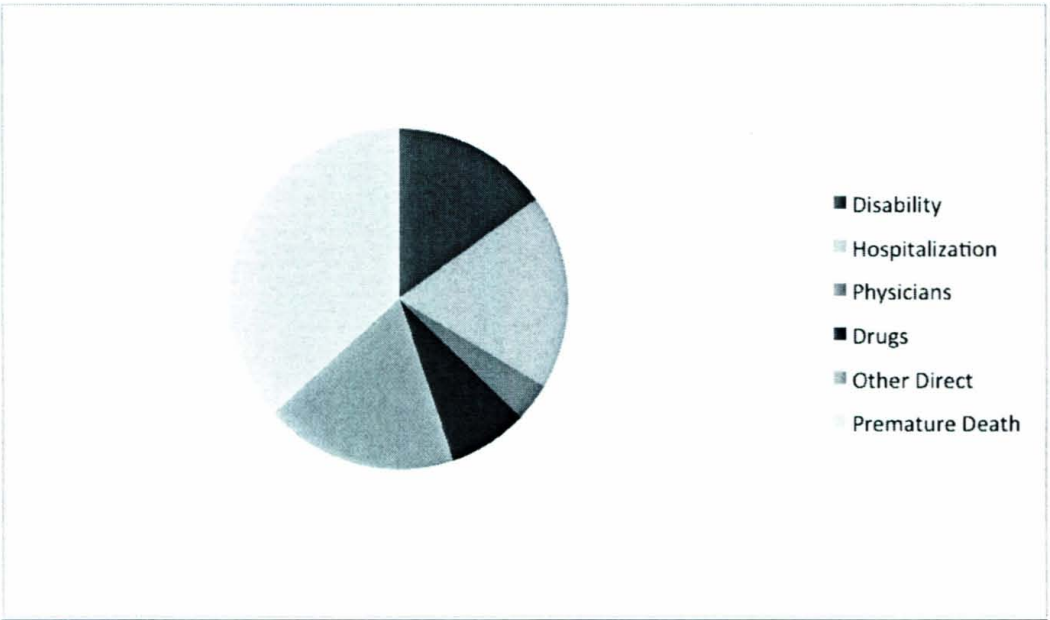
Figure 3. Indirect and Direct Costs of Chronic Illness in Canada in 1998



Public Health Agency of Canada, 1998, adapted by permission (Appendix E)

In fact, the Heart and Stroke Foundation (2011) estimates that heart disease and stroke cost the Canadian economy, on average, more than $22.2 billion each year. This money is spent on physician services and hospital costs (Heart & Stroke, 2011). Indirect costs related to heart disease include loss of productivity and lost wages, creating a huge economic burden on the government and tax payers, as shown in Figure 4.

Figure 4. Distribution of Costs from Cardiovascular Diseases in Canada



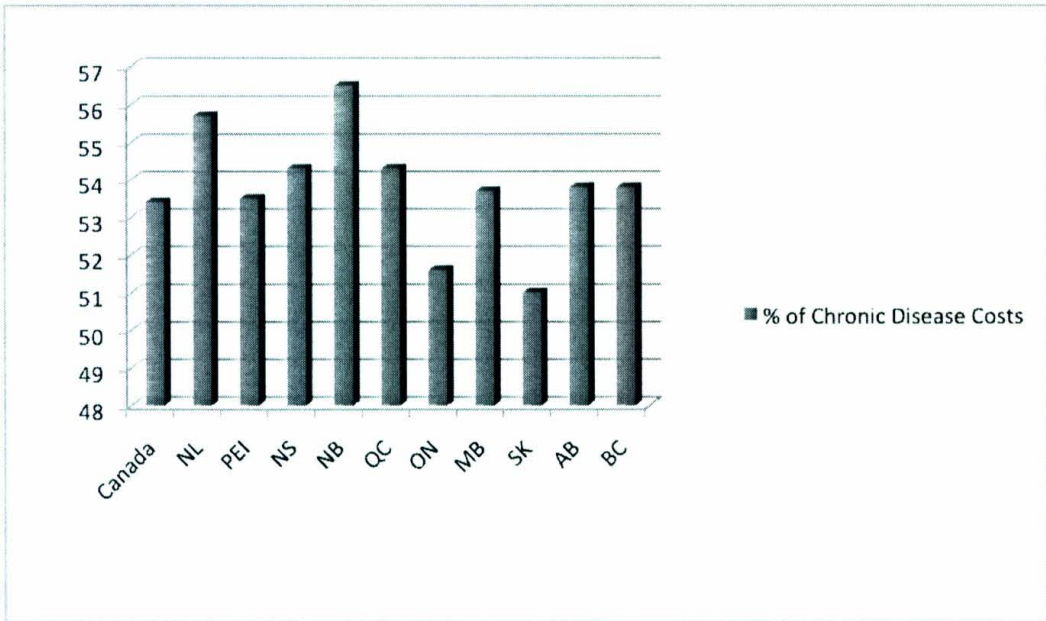
Public Health Agency of Canada, 1998, adapted by permission (Appendix F)

Yet the sizable strain that heart disease puts on health care costs may be unnecessary, as there are solutions. For example, heart disease can be a partially preventable disease. Leading a healthy lifestyle is the first step. This

means not using tobacco, taking part in PA, maintaining a healthy weight, and eating a healthy, balanced diet (Shiroma and Lee, 2010). According to the Heart and Stroke Foundation (2011), nearly half (49.5%) of Canadians aged 12 and over report being physically inactive. Individuals who are active reduce their risk of heart disease by 35-55% (Heart & Stroke, 2011). While Canada's health guide suggests that to reap the benefits of PA, people should engage in at least 30 minutes a day of moderate to vigorous activity (Health Canada, 2011), even smaller doses of PA can assist in the prevention of chronic disease and reduce the risk of subsequent episodes.

According to data collected in 1999, Canadians who are physically inactive develop chronic diseases (not just heart disease, but also diabetes, and a host of other ailments) costing the health care system 2.1 billion dollars or 21% of its total budget (Canadian Diabetes Association, 2008). Figure 5 illustrates the percentage of health care costs from chronic disease for each province. As the figure shows, in NL the cost of chronic disease places a major economic burden (55.5%) on the health care system. Although we are concerned here with heart disease in Newfoundland and Labrador, in the larger picture, since PA can decreases the risk of developing chronic diseases, Canadians could substantially reduce this cost by becoming more physically active (Bamana *et al.*, 2008; Humpel *et al.*, 2004; Huston, Evenson, Bors, & Gizlice, 2003; Spangler-Murphy, Krummel, Morrison, & Gordon, 2011). However, if we want Newfoundlanders—and other Canadians—to become more active, we need to understand the factors that influence PA.

Figure 5. Percent of Chronic Disease Costs to Total Economic Burden of Illness by Canadian Province



Public Health Agency of Canada, 1998, adapted by permission (Appendix G)

2.3 Physical Activity and Heart Disease

The World Health Organization (WHO) (2011) defines PA as "any bodily movement produced by skeletal muscles that requires energy expenditure" including all movements that are part of everyday life such as work and recreation, as well as exercise and sporting activities. Increased PA and regular exercise have long been associated with improved morbidity and mortality rates

(Bennett *et al.*, 2007; Sallis, Hovell, & Hofstetter, 1992). Some epidemiological studies demonstrate that individuals who work in sedentary jobs are more likely to develop heart disease, than those who work in more active jobs (Andrade, 2007). In addition, engaging in PA has been shown to improve mental health, control body weight, and improve individuals' ability to engage in daily required tasks (Centres for Disease and Control (CDC), 1999). In short, engaging in PA has significant health benefits (Booth *et al.*, 2000; Duncan *et al.*, 2005; Li *et al.*, 2005), not just for heart health but for overall wellbeing.

One report estimates that 57% of Canadians are insufficiently active and therefore are not reaping the optimal health benefits of PA (Canadian Fitness and Lifestyle Research Institute, 2001). But within Canada there are differences in activity levels: in fact, activity levels change depending on where you live in Canada. PHAC (2004) suggests that people in British Columbia tend to be very active and have lower rates of heart disease. In contrast, Newfoundlanders have lower rates of activity and higher rates of heart disease.

2.4 Interpersonal and Community Factors

Since the late 1990s, interest has grown in exploring the role of environmental factors in health outcomes. Research on the environment has uncovered key correlations with PA and heart disease, some of which can be described using the interpersonal and community levels from the social-ecological model of health, for example, impression of presence of facilities, safety, impression of outdoor spaces, and social participation (Humpel *et al.*,

2004). However, the effect of the community remains understudied (Humpel *et al.*, 2004).

Although a clear and universal theory remains to be formulated, various theoretical variables show that there are barriers to and benefits of PA (Daly *et al.*, 2002). Some literature illustrates an association between the environment and physical activity and heart disease in some communities, but the barriers are not clearly understood. It is known that many individuals do not engage in the required levels of PA, especially those at risk for chronic disease or suffering from heart disease; moreover, studies show that interpersonal factors (poor relations with family and friends) and community factors (lack of facilities and lack of outdoor spaces) throw up barriers to participation (Daly *et al*, 2002; Humpel *et al.*, 2004). However, each community is different, with distinct variables that can create barriers to PA. The objective of this study is to explore the association between physical activity, heart disease, and aspects of the environment (including e.g. interpersonal and community factors) in St. John's.

2.4.1 Interpersonal Factors

This study created an interpersonal index from variables that appear in a number of individuals. Each of these variables was derived using a modified version of the socio-ecological model of health (Refer to Figure 2). They include satisfaction with friends and family and sense of belonging to their community.

The presence of a social support system is one variable that has been

shown to influence an individual's PA (Hupcey, 2002). Social support can be defined in a number of ways, but for the purpose of this study, it is "any activity on the part of one individual which aids another individual in reaching desired goals" (Treiber *et al.*, 1991). In recent decades, the meaning of social support has changed drastically. What was once confined to direct personal contact now includes more indirect forms, such as letters, emails, phone calls, and the social media etc. The important aspect of social support is that individuals sustain satisfactory social contact with friends and family members. Having adequate social support can translate into the personal belief that one is valued and belongs to a personal network of communication, whether with other individuals, groups or the larger community." Vaux (1992) states that social support involves three distinct areas: supportive behaviours, subjective appraisal and support, and supportive networks. Procidano and Heller (1983) summarize the role of social support as "the extent to which an individual believes his/her needs of support, information, and feedbacks are fulfilled

Social support from friends and family can greatly influence health outcomes (Eyler, 2003) and affects well-being. Mars and colleagues divide social support into the following four domains: (1) social contacts and social activities, (2) work and informal support, (3) cultural activities and public events, and (4) politics and media (Mars *et al.*, 2008). Leyden (2003) points to the growing literature proposes that having social support or networks, and feeling a sense of belonging to a community can have a positive influence on an individual's health. For example, social networks can enable and encourage

participation in PA, by providing the support and encouragement of friends. People who have adequate social support systems and are actively engaging in social participation activities have a tendency to live healthier lives (Leyden, 2003). An adequate social support system includes family, friends, peers and the community.

Another study uses an evidence-based consensus process to review a list of "activity-friendly" indicators (Brennan *et al.*, 2006). It takes a social-ecological approach to describe individual, interpersonal, community, and policy level indicators, identifying 10 indicators that promote "activity-friendly" environments; social environment is one of these indicators (Brennan *et al.*, 2006).

Like Brennan *et al.* (2006), Baert *et al.* (2011) adapt the socio-ecological framework to define the interpersonal level as "processes and primary groups including family, friends and peers that support individuals." This is especially important because the friends and family who make up a this type of social support system can greatly influence participation in PA.

The literature also suggests that a relationship exists between the interpersonal factors of having active neighbours, a significant other, personal and social interactions within one's community, and participation in recreational activities in one's community. As noted in Li *et al.*'s *Multilevel Influences on Physical Activity*, these can be considered elements of social capital. Social capital is a resource found in relationships between people in a neighbourhood, upon which individuals can draw to maintain certain actions (Li *et al.*, 2005).

Social capital in the form of social support is an important interpersonal factor that can have an impact on health outcomes.

Other interpersonal factors that can have an impact on health include a sense of belonging to the community, social participation in programs, family support and support in public schools. Eyler (2003) examines a female population and determines that those who feel a sense of belonging in their community are more than twice as likely to participate in PA as their counterparts. Unlike many other studies, using a qualitative approach, Eyler finds a common theme among the 301 female respondents and determines that they are more likely to engage in PA if they are in groups (Eyler, 2003). In this case, a sense of belonging and being a member of a group influences PA.

Another qualitative study focused on the social support required to motivate people to modify their cardiac risk factors, found that having social support can help to improve lifestyle. The participants in the study described lifestyle changes they made in an effort to keep healthy, and the social support they needed to make these modifications (Boutin-Foster, 2005). The author discusses the lack of understanding in patients with heart disease and how it causes a barrier to lifestyle change. Boutin-Foster used a semi-structured interview method to examine the instrumental support perceived by those with heart disease (Boutin-Foster, 2005). The study determined that although change is difficult, having a social support network can promote risk factor modification and improve lifestyle outcomes (Boutin-Foster, 2005).

Cleland *et al.* (2010) focus on women's perception of interpersonal factors, using a narrow sample from socially disadvantaged areas and looking at a number of variables including family support. The authors conclude that family support is a significant aspect of PA for leisure-time physical activity both for those who are active for 1-149 min/week and those who are active for more than 150 min/week (Cleland *et al.*, 2010). They examine both family and friend/colleague support by asking the following question: "During the past year, how often did members of your family (and friend/colleagues) do physical activity with you and/or encourage you to do physical activity?" After conducting a fully adjusted multivariate analysis, they conclude that those with family support have 10-11% greater odds of being physically active. Those with friend/colleague support have a 6-15% higher likelihood of being physically active (Cleland *et al.*, 2010).

Many studies identify social support as a key factor to promoting healthy lifestyles. In their study of older adults with chronic conditions, Mars *et al.* (2008) find that individuals feel social support and participation (i.e. PA) are positive aspects of their recovery process. In a similar vein, Clarke (1996) says that seniors who belong to organizations and programs are most likely to engage in PA.

Yuan *et al.* (2011) consider how individuals in Taiwan are influenced by social support from family both before and after they contract chronic conditions. The authors use a questionnaire containing six items related to family support. They conclude that increased social networking between family members leads

to healthier lifestyles and note that many individuals are encouraged by their spouses to engage in regular PA (Yuan *et al.*, 2011). While their research is important, it fails to establish a causal relationship between family support, participation in PA, and chronic conditions.

In a study focusing on both family and friends as a means of social support, Eyler and colleagues take an interventional approach and demonstrate that support can successfully initiate PA (Eyler *et al.*, 1999). This study looks at the US Women's Determinants Study conducted by a telephone survey. It finds a correlation between social support and sedentary lifestyles (Eyler *et al.*, 1999). Interestingly, the authors suggest that once PA is initiated, social support may not be needed for its maintenance (Eyler *et al.*, 1999).

Not all studies provide conclusive evidence of the importance of social support on health outcomes. Parry and Watt-Watson (2010) look at the psychological and physical aspects of the social support of peers for individuals suffering from heart disease. The results are unclear, but the evidence suggests that peer support may increase patients' self-efficacy and ultimately improve their PA (Parry and Watt-Watson, 2010). The results of the study cannot be generalized, however, because of differences in methodological approaches.

Darlow and Xu (2011) examine the influence of perceived social support on exercise and the effects of friends and spouses on individuals' PA. This study focuses on a university setting and uses an online survey. The authors say social support appears to have limited impact on exercise behaviours (Darlow and Xu, 2011). While, Giles-Corti and Donovan (2002) find that social and

physical environments have significantly less impact on PA than individuals' personal beliefs and motivations, most studies, as previously noted, provide adequate evidence to conclude that social support has an important influence on whether people engage in health lifestyles.

In a study that closely examines international social support in relation to PA, self-reported data were collected from participants and assessed according to various social environmental factors (Stahl *et al.*, 2001). The researchers (Stahl *et al.*, 2001) determine that social influences are key aspects of the social environment that influence PA participation. Treiber *et al.* (1991) consider social support as it relates to two groups. First, they look at 13 public schools and use a 16-item scale to measure individual activity levels and a 12-item scale to measure social support (Treiber *et al.*, 1991). The results show physical activity in females to be significantly associated with social support in almost all categories, but fewer than half the categories show significant results for males (Treiber *et al.*, 1991). The results suggest that leisure time activities are not related to family support, but may be related to friend support. Treiber *et al.* (1991) also look at the parents of the participating children. This study is the first of its kind to demonstrate differences in gender, race, and specific types of PA and their relation to social support.

2.4.2 Community Factors

This study defines community factors as variables that exist or occur on a community level following the socio-ecological model of health. Community factor variables include outdoor spaces, safety, and the presence of recreational facilities. Although there is a great deal of literature dealing with this area, few studies have examined the association of physical activity and heart disease.

2.4.2.1 Safety and the Physical Environment

Perceptions of the physical environment and the correlation of those perceptions to self-reported walking are studied by Foster, Hillsdon, & Thorogood (2004). They examine participants' perceptions of their physical environment (Foster *et al.*, 2004) in both daytime and night-time; they look at open spaces and the presence of shops. Overall, the results indicate positive perceptions of the physical environment for both genders. Each variable tested showed a significant relationship to walking for both men and women. In other words, positive perceptions of their physical environment influence their walking activity. However, when women feel unsafe walking in their neighbourhood, they are less likely to walk than their male counterparts. In other words, for women at least, perceptions of safety have an impact on healthy lifestyles.

An early study on perceptions of PA and the physical environment looks at several aspects of the physical environment, including safety (Sallis *et al.*, 1989). The researchers find no significant association between perceived safety and PA.

A later study conducted by Sallis *et al.* (1997) also concludes that safety is not a significant factor in PA participation. Takano *et al.* (2002) demonstrate the importance of perceived safety to seniors in a community, but this appears to have no bearing on their PA outcome. These earlier studies have been challenged by current research which shows that the physical environment and perception of personal safety are major determinants in whether or not people engage in PA.

In research comparing self-reported perceptions of safety in one's community with pedometer-determined PA, results indicate that a perceived lack of safety can act as a barrier to activity for some people (Foster *et al.*, 2004). Low-income groups and racial and ethnic minorities are most likely to limit PA for safety reasons. In addition, those in urban areas are most likely to indicate safety as less of a concern (Foster *et al.*, 2004).

A study by King *et al.* (2000) looking at women over the age of 40 finds safety to be a major determinant of engagement in PA. This is supported by research that finds evidence of gender differences in the perception of safety as it relates to PA participation (Foster *et al.*, 2004). For example, Bennett *et al.* (2007) use both pedometers and questionnaire data to obtain a working data set. They find that 80% of participants feel safe throughout the day, while only 37% feel safe at night. More women report feeling unsafe at night.

Ball, Bauman, Leslie, & Owen (2001) have similar results but suggest a significant association in both sexes; when individuals of either gender perceive their community to be safe, they are more likely to take part in PA (Ball *et al.*,

2001). In 1999, the Centers for Disease Control and Prevention conducted a survey of 12,767 individuals; using a Likert scale, they asked for respondents' perception of community safety. They conclude that unsafe neighbourhoods are significantly associated with reduced physical activity (CDC, 1999).

Much of the literature on safety and PA is cross-sectional, and the majority takes a quantitative approach. There is little understanding of the results. Some studies suggest that community safety may have a direct impact on willingness to participate in PA; others do not. Conclusions vary, according to the community setting (Foster *et al.*, 2004; Bennett *et al.*, 2007; Ball *et al.*, 2001).

2.4.2.2 The Presence of Physical Facilities

Presence of facilities is a community factor that may be associated with PA and heart disease. An early account by Sallis *et al.* (1989) shows the influence of one's environment on PA; it indicates that the presence of facilities and engagement in PA are positively linked (Sallis *et al.*, 1989). Interestingly, in a later study, the same researchers find no significant association between the presence of facilities and activity levels (Sallis *et al.*, 1992).

Booth *et al.* (2000) find that individuals with access to recreation facilities are more likely to be physically active. They add that this relationship is also true for older adults. A study carried out in a university setting examines individuals' awareness of facilities around campus and compares this to their PA behaviours (Leslie *et al.*, 1999). The population studied included university members 15-74 years of age, both males and females. Respondents who rated their campus

facilities more highly were more likely to be active than their unaware counterparts. However, both sexes reveal significant associations between adequacy of facilities and level of PA. Another study yields similar results but looks at 5,000 women. The authors report that women in this study were more active when they perceived facilities to be more present in their community (Sternfeld, Ainsworth, & Queensberry, 1999).

Bamana *et al.* (2008) use a questionnaire to determine whether physical environments that include the presence of facilities contribute to an individual's PA habits. The authors ask individuals if the area where they live provides opportunities to be physically active. Using a 3-point Likert scale, they find that the two variables are statistically related (Bamana *et al.*, 2008).

A similar study looks at several features of the environment and finds that having access to places in which to be active is associated with PA (Huston *et al.*, 2003). The authors suggest providing more activity areas and trails to increase individuals' PA (Huston *et al.*, 2003). They find neighbourhoods to be positively associated with recommended levels of PA when facilities are available and note that this is true even after adjusting for SES and community characteristics. They argue that the presence of facilities and safety are key components of individuals' leisure activities and these two factors are consistently related to activity levels (Huston *et al.*, 2003). The odds ratio (OR) for participation in PA for those who perceive they have high access to facilities is 2.28; in other words, they are 2.28 times more likely to engage in PA.

Stahl *et al.* (2001) ask for responses to "my area offers many opportunities

to be active" to address the effect of the presence of facilities on PA. Using a 5-point Likert scale, they determine that individuals with more opportunities to be active will be more active. MacDougall, Cooke, Owen, Wilson, & Baumen (1997) observe the presence of recreation facilities within a community and obtain similar results. Interestingly, they conclude that lower ratings of the perceived convenience of facilities is significantly associated with lower PA in men only. Women's perception of decreased presence of facilities is not related to their participation in activities (MacDougall *et al.*, 1997). But in another study examining the relationship between facilities nearby and the inadequacy of facilities in a survey 14,674 males and females, the authors find that nearby facilities are a predictor of activity in females only (Shaw, Bonen & McCabe, 1991).

As the above survey of the literature makes clear, the research on into the presence of facilities and the impact on physical activity has conflicting results. Moreover, there is limited understanding of the results. Further research is required in this area.

2.4.2.3 Outdoor Spaces

Many studies view outdoor spaces as a means of providing a supportive environment that, in turn, can promote a healthy community (Ball *et al.*, 2001; Takano *et al.*, 2002; Troped *et al.*, 2001). This study defines outdoor spaces in two ways. For the purpose of this research *active outdoor spaces* will include open spaces and green spaces, such as parks trails and fields. *Other outdoor*

spaces will be defined as such things like sidewalks, shelters, and rest areas.

One study uses a five-year cohort and focuses on seniors living in urban areas (Takano *et al.*, 2002). In this study, 7,382 individuals participated in a mail-out survey that included nine items related to individuals' perceived physical environment. The researchers find that green space is strongly associated with increased longevity in seniors (Takano *et al.*, 2002). This increased longevity is determined by examining the death registry. Other determinants of morbidity and mortality are considered as well. For example, walkable spaces near the place of residence are strongly associated with positive perspectives on an individual's community (Takano *et al.*, 2002). This agrees with the findings of Booth *et al.* (2000), who demonstrate that increased outdoor spaces that are usable and accessible for seniors lead to increased activity levels.

A cross-sectional study of residents of England compares Census data to a generalized land use database (Mitchell and Popham, 2007). The authors determine that a higher proportion of green space is associated with better health after various confounders are taken into consideration (Mitchell and Popham, 2007). Similarly, Fan, Das, & Chan (2011) look at the impact of neighbourhood green space and argue that it has an indirect effect on reducing stress and increasing social support. In turn, many individuals reap the health benefits of green spaces in their neighbourhood.

Another study asks persons living in Queensland, Australia, to rate their perceptions of the physical characteristics of their environment. Over 60% of respondents say the presence of paths and outdoor trails is an essential aspect

of their PA (Duncan, Mummery, Steele, Cristina, & Schofield, 2008).

De Vries, Verheij, & Groenewegen (2003) set out to determine if people living in greener areas are healthier than those who live in less green areas. The authors look at several characteristics of environmental green space and health (De Vries *et al.*, 2003) using data collected from the Netherlands Institute for Health Survey Research. They conclude there is increased PA when there is an increased presence of outdoor spaces (De Vries et al, 2003). However, there is little empirical evidence of a relationship between green spaces and health. Another study (Maas, Vergeij, Groenewegan, & De Vries, 2006) describes the limited epidemiological studies that focus on outdoor spaces for activity. They look closely at the percentage of green area within individuals' environment and compare it to their perceived health (Maas *et al.*, 2006). Interestingly, the authors find the relationship between green space and health to be most consistent in older adults (Maas *et al.*, 2006). However, in saying this financially secure older adults may be more inclined to live in areas with more green space available; therefore, this could be a potential confounder.

In addition, elements of the built environment appear to be associated with recreational walking. Such elements as sidewalk plantings, the aesthetics of parks and properties are all elements that are consistently found to be positively associated with walking for recreation or exercise in ones community. Moreover, ones access to beaches or large attractive public open space also appears to encourage recreational walking (Heart and Stroke, 2007). On the other hand, individuals who perceive traffic to be heavy are more likely to be discouraged

from walking (Heart and Stroke, 2007). This is consistent with Sallis et al. (2012) who states that living in a community with a high density and a vast amount of nonresidential land uses such as parks, play areas, and recreational facilities is associated with higher rates of overall physical activity.

Other studies find the aesthetic quality of one's outdoor environment to be a significant predictor of participation in PA (Ball *et al.*, 2001; Carnegie *et al.*, 2002). These studies show that open public space is a determinant for taking part in exercise, along with neighbourhood/environmental aesthetics, and a highly walkable community (Ball *et al.*, 2001; Carnegie *et al.*, 2002; Humpel *et al.*, 2004). However, Humpel *et al.* (2004) find this relationship only in men.

Finally, in a review study, Owen, Humpel, Leslie, Bauman, Sallis (2004) discusses the importance of open spaces, but notes that few studies have been conducted into this issue. For their part, Owen *et al.* (2004) state that existing literature yields significant results, but these results vary by community.

2.6 Summary of Current Research

The mixed findings on the interpersonal and community factors associated with PA and heart disease depend on the community studied and the type of research conducted. While some research supports the notion that interpersonal and community factors play a role in health outcomes such as PA and heart disease, other research suggests that these factors have little influence on an individual's health. Because individuals living in a particular environment can be

influenced by their surroundings, making adjustments that may improve their health and well-being could affect an entire community, and, in fact, making changes on a community level has been shown to be the most effective means of changing PA attitudes and behaviours.

The evidence also suggests that greater focus needs to be placed on older adults. Considering the demographic shifts globally, and specifically in St. John's, it is imperative to consider PA levels of the senior population. In St. John's the mean age of those suffering from heart disease is 70 (Community Profiles, 2011). However, few studies exist on both physical activity and heart disease for individuals over the age of 60 (WHO, 2012). Although some factors that lead to heart disease can be considered modifiable, it remains the leading cause of mortality in NL (Heart and Stroke Foundation, 2011). Participation in PA is important for the prevention of heart disease, and improving the longevity of those who suffer from it, and reducing health care costs.

PA must become habitual (Leung et al, 2007; Reid *et al.*, 2006) but research shows that PA patterns are often difficult to initiate. It is therefore essential to comprehend what influences individuals to engage in PA. The physical environment is one such factor.

No data exist on St. John's residents and the environmental associations between physical activity and heart disease. St. John's differs from many Canadian cities and research performed elsewhere cannot be generalized to this population. Much of the data on neighbourhood safety come from the USA, with a few studies from Australia and the UK (Duncan *et al.*, 2005).

Admittedly, some studies focus on the interrelationship between the built and social environments and PA, but these are limited, especially in relation to heart disease and older populations, and nothing specific to the population of St. John's. More research is required, as it could lead to greater awareness of the impact of these factors among the general population and has the potential to influence policy.

Chapter 3
Methods

3.1. Introduction

The study that forms the basis of this dissertation looks in detail at the associations of interpersonal and community factors in St. John's with physical activity and heart disease. The study uses the socio-ecological model to explain perceptions of the environment as they relate to PA and heart disease on a multilevel scale (Sallis *et al.*, 2002). It draws on data from the *Survey of Residents of St. John's* to determine the associations of PA and heart disease with the outlined environmental factors. This chapter describes the study's design, participants, instrument, procedure, and methods of data analysis.

3.2. Research Design

This research uses a quantitative approach that is based on the idea that social phenomena can be quantified, measured and expressed numerically (Creswell, 2003).The research design uses a survey method. The data for this research was collected from the *Survey of Residents of St. John's* in December 2011 (Appendix A), a telephone survey of participants' perceptions of the St. John's environment. This design used a cross-sectional survey to observe the St. John's population at one specific point in time, the first two weeks of December 2011. From this design, numeric terms were analyzed using statistical techniques to determine if there was an association between the interpersonal and

community factors and physical activity and heart disease.

3.3. Participants

The data set used included 130 completed telephone interviews. The sample size includes a margin of error of 10% and a confidence of 90%. Using this calculation a minimum number of 96 completed surveys was required. Additionally, to analyze the variable of heart disease the sample size calculation for participants with heart disease was conducted using the following:

Sample size= Five times the number of variables.

Because we have five variables that will be included in the logistic regression variables, five times five will make for 25 people with heart disease (Norman and Streiner, 1994).

Participants were selected using a computer generated random sampling. The total sample size included 130 surveys completed by residents of St. John's. The numbers used for the telephone survey were acquired from Canada Select and included all telephone numbers listed in their database. Business numbers, and numbers that were out of service where not included within the sample. Using the "city field" function in Microsoft Excel allowed researchers to select the St. John's numbers. The "select duplicate" function allowed the removal of numbers used in a previous study. From here, the remaining numbers were copied into an excel sheet for use and randomized a further time. The final

numbers included a computer-generated random list of 1,500 unique telephone numbers.

Inclusion criteria were established prior to conducting research. Participants had to be 19 years of age or older, English speaking, in good enough health to participate, and current residents of St. John's.

Respondents who took part in the telephone survey were given the following information: (1) background information on the survey; (2) information on what was needed from the participants; (3) the rationale for the study; (d) the privacy and confidentiality conditions of the study; (4) a prompt that it was their choice to volunteer their time to the survey; (5) a prompt that it was their choice to refuse to answer questions or withdraw from the survey at any time throughout the survey process. Individuals willing to participate were asked to give oral constant. Those who consented proceeded through the survey questions.

3.4. Instrument

As noted above, the instrument used for this phase of the research was a telephone survey. This survey was developed over a course of meetings with the Mayor's Advisory Committee for Seniors (MACS) and the Age Friendly Communities (AFC) committee (Ryan, Young, MacDonald, Clarke, & Gadag, 2012). As this field of research often affects older adults, both the Mayor's Advisory Committee for Seniors (MACS) and the Age Friendly Communities (AFC) committee were involved in the process. This research project was carried out with this mandate in mind. This unique link between our research and St. John's City Council has allowed best practice research and the fulfillment of the set forth goal of developing a comprehensive survey. With respect to the second committee, the research followed recommendations of the World Health Organization (WHO). The WHO considered Age Friendly Communities (AFC) around the world and developed eight features of this concept. An AFC committee was developed and they joined with the city to conduct research. After a series of consultations, we were able to select environmental factors that relate directly to the health of residents of St. John's and incorporate them into the survey.

The starting place for the development of the survey was the World Health Organization (WHO) which had looked at 33 cities in all WHO regions. From this research, the WHO developed a guide to engage cities in becoming more age

friendly. For a city to be age friendly, it must adapt its services to be accessible to and inclusive of people with varying needs and capacities and ages. An age-friendly city encourages active aging by optimizing opportunities for health, participation and security in order to enhance quality of life as people age (WHO, 2007).

The AFC committee and MACS united to develop a survey to obtain residents' ratings of eight environmental factors directly related to the health of St. John's residents. A section of the survey was dedicated to socio-demographic characteristics, including country of origin, immigration status, education status, retirement status, home ownership, current and future satisfaction with income and investments, and general health status. The AFC committee reviewed what other researchers were doing and found that the only similar survey was in Ireland (Louth Age-friendly County, 2009).

Pilot testing was conducted on the survey over the summer of 2011. During this time, ambiguities were identified and questions were revised. The wording was important; participants are less likely to respond to offensive or intrusive questions. The pilot testing process allowed for clarification of any questions which could have caused confusion or conveyed different things to different people.

The final survey took approximately 10-15 minutes to complete. It was considered clear and logical. The more sensitive questions concerning age and current satisfaction with income and investments were asked at the start of the survey. However, in an effort to avoid an overload of potentially sensitive

questions at the start of the survey, residents were asked for their postal code at the end. The survey used a funneling approach, whereby questions were arranged from general to specific. For example, general health questions were asked before more specific health questions on chronic conditions.

3.5. Survey administration

Volunteers were essential to the success of the data collection. Ten trained volunteers helped administer the telephone surveys. The list of phone numbers was randomly divided into ten packages, and one package was given to each volunteer. A checklist was attached to each number, including if an interview was completed or not, and if a time was given to call back at the convenience of the participant. Each volunteer was asked to contact the researcher when ten surveys were completed so that we could keep track of sex and age. Volunteers were trained over the summer of 2011 (see Figure 7). They were shown how to follow the written instructions on the survey, how to code responses, and how to respond to anticipated questions. If a participant asked an unanticipated question, volunteers were instructed to contact the principal investigator with the contact information of the respondent. Volunteers were given a checklist of telephone numbers to keep track of the completed surveys so that no information was lost. Before they started, the volunteers did a complete run-though of the survey to ensure they were completely prepared.

Figure 6: Volunteer Training Approach

The survey was administered over the first two weeks of December, 2011. Two weeks before starting the data collection, a publicity blitz was conducted using newspaper ads, radio announcements and television appearances. There had been reports of fraudulent telephone surveys in St. John's; therefore, we made an effort to ensure residents understood this was a valid survey. Each participant was given contact information (phone number and email address) for the principal investigator in case he/she had questions or concerns about participating in the study (Appendix B).

3.6. Data analysis

Once data were collected, the analysis began. The two health outcomes examined were physical activity and heart disease. Both health comes were dichotomous variables. These variables of interest, physical activity and heart disease, were obtained from the *Survey of Residents of St. John's* (see Appendix A). The variables were divided into two groups: interpersonal and community factors. Based on the social-ecological model of health behaviour, the interpersonal factors included sense of belonging with one's community, family support, and friend support. The community level factors were safety, presence of facilities, and outdoor spaces.

To test our hypotheses, we ran cross tabulations on individuals' responses to physical activity and heart disease. In addition, we compared participants who reported being physically active to those who were not. Another cross tabulation was performed for those with and without heart disease. These cross tabulation analyses were computed based on frequencies from the dataset.

In order to establish a confidence interval of 10% and a confidence level of 95%, we determined that a minimum sample size of 96 respondents was necessary, based on the assumption that the St. John's population was 100,000. Based on this minimal number, we completed 130 surveys. P values of less than 0.05 were considered statistically significant, and all tests were two-sided. Statistical analyses were conducted using SPSS (Version 19.0).

Chi-square and Fisher exact tests were used to compare characteristics

between individuals who were physically active and those who were not physically active, as well as individuals with and without heart disease. Chi-square analysis was used when the values of each cell were greater than five (according to the SPSS output); if the values of a cell were below five, the fisher exact value was chosen, and we used logistic regression analysis to estimate the relationship between PA, heart disease and the environmental factors. To select potential confounders, we performed univariate analyses of the relationships, first between PA and the outlined factors and then between heart disease and the outlined factors. Based on existing literature, we used a cut-off p-value of 0.20 (Hannan, Arani, Johnson, Kemp, & Lukacik, 1992; Sulheim, Holme, Ekeland, & Bahr, 2006). Factors that were less than or equal to 0.20 were included in the logistic regression analysis. Because interpersonal and community factors were being tested, these variables were forced into the model.

Logistic regression was used to examine the association between heart disease and aspects of the environment based on the cross-sectional survey. This is useful for predicting the probability of a response and to illustrate the association of physical activity and heart disease with both interpersonal and community factors. Chi-square analyses and Fisher exact tests were used to compare characteristics between groups. From the values of the univariate analysis risk factors with significant relationships were assessed using a cutoff value of $p<0.20$ which is consistent with the literature and included into the logistic regression models for physical activity and heart disease (Hannan *et al.*, 1992; Sulheium *et al.*, 2006). We used these analyses to estimate the

relationship between participants who were physically active compared to those who were not physically active and those with heart disease compared to those without heart disease.

3.6.1. Computed Variables

An interpersonal index was developed to combine variables measuring similar factors. The grouping of these variable's was according to there association to the interpersonal level of the socio-ecological model of health. For this reason, the sense of belonging to one's community, satisfaction with family and satisfaction with friends were combined using a ranking scale than divided by the number of variables included in the index with the help of Dr. Alvin Simms (A. Simms, personal communication, April 11, 2012). The equation used was as follows for the original continuous variable:

Interpersonal Index= (Sense of Belonging +Satisfaction with Friends + Satisfaction with Family)/3

The results of the novel interpersonal index were continuous; however, we created a categorical value using high and low scores as a reference point. The two categories of variables were low and high interpersonal responses. Respondents with low interpersonal index scores and high interpersonal index scores were divided into two groups using a cutoff value of 2.00 which was the mean value of the scores. Therefore, a categorical variable was created in which a low interpersonal index score included values less than 2.00 and a high interpersonal index score included values greater than or equal to 2.00.

The community factors were chosen based on the socio-ecological model of health behaviour and the literature review. Because of conceptual differences in these variables, it was necessary to enter them separately. Each of the community variables were categorical.

Chapter 4
Results

4.1 Introduction

This chapter will highlight the results of our research following the research hypotheses established in Chapter 1. We begin by describing the participants' demographics, looking specifically at self-reported heart disease and physical activity. We then describe the univariate analysis we performed to determine which variables to use in our logistic regression equation. The chapter concludes with the logistic regression analysis.

4.2 Description of Sample

Study demographics and characteristics from the respondents appear in Table 1. The sample consisted of participants who ranged from 19 to 89 years of age with a mean age of 57.24 years. There were more females (84) than males (46) in the study. The majority of participants had a University or College education (60.47%). Most participants reported being retired (41.73%). About half (50.77%) of participants reported that their current income and investments adequately meet their needs, and 51.61% reported that their future income and investments would adequately satisfy their needs. Within the sample, 63.8% of residents reported being physically active and 22.3% reported having heart disease.

Table 1

Survey of Residents of St. John's Participant Demographics

Characteristic	Number (%)
Sex (n=130)	
Male	46(35.38)
Female	84(64.61)
Education (n=129)	
Grade 8 or lower	7(5.42)
High School	44(34.11)
University/College	78(60.47)
Retirement Status (n=127)	
Completely	53(41.73)
Partially	13(10.23)
Not at all	61(48.03)
Rating of Current Satisfaction with Income and Investments (n=130)	
Totally Inadequately	2(1.54)
Not Very well	30(23.07)
Adequately	66(50.77)
Very Well	32(24.62)
Rating of Future Satisfaction with Income and Investments (n=124)	
Totally Inadequately	9(7.26)
Not Very well	26 (20.97)
Adequately	64 (51.61)
Very well	25 (20.16)
Heart Disease (n=130)	29(22.3)
Physically Active (Yes)(n=130)	83(63.8)

4.3 Hypothesis 1: Heart Disease and Physical Activity

Table 2 presents individuals with and without heart disease and shows whether they were physically active. Individuals who reported having heart disease were less likely to report being physically active than whose without heart

disease. Therefore, individuals without self-reported heart disease were significantly more likely to report keeping physically active on a daily basis than individuals without self-reported heart disease.

Table 2

Comparison between Physical Activity and Heart Disease in Survey Participants

	Heart Disease	No Heart Disease	P-value
Physical Activity	13(44.8)	70(69.3)	0.016
No Physical Activity	16(55.2)	31(30.7)	
Total	29	101	

4.4 Outcome Variables

Table 3 and Table 4 present Chi-square tests and Fisher Exact tests to compare characteristics of groups who reported being physically active with those who were not physically active, and between groups with heart disease and those without heart disease in order to determine what variables should be considered for the logistic regression equation.

4.4.1 Hypotheses 2 and 3: Physical Activity, the interpersonal index, and the community factors

As the first outcome variable of interest is physical activity (PA), we examined in detail the descriptive statistics of individuals who reported being physically active as these compared to the details of those who did not report being physically active. Table

3 presents the differences. Of the 130 respondents, 83 reported being physically active and 47 reported not being physically active. Physical activity was not related to the age of participants. Participants who were physically active differed from those who were not active in a number of ways. Individuals who reported being physically active were more likely to report increased satisfaction with friends (p=0.018), increased satisfaction with family (p=0.035), and an increased sense of belonging (p=0.007).

Physical activity was associated with one community factor. Individuals who were physically active were more likely to have a positive impression of other outdoor spaces (p=0.003). PA was not associated with any additional community factors.

Table 3

Comparison of Respondents who Reported being Physically Active and Respondents who Reported not being Physically Active

Characteristic	No. (%) of Participants: Physically Active (n=83)	Not Physically Active (n=47)	P-Value
Age			
<60	40(48.2)	25(53.3)	0.584
≥60	43(51.8)	22(46.8)	
Sex			
Male	31(37.3)	15(31.9)	0.534
Female	52(62.7)	32(68.8)	
Marital Status§			
Married	32(71.1)	49(59.8)	0.203
Not Married	13(28.9)	33(40.2)	
Education§			
High School or lower	29(35.4)	22(46.8)	0.201
University or College	53(64.6)	25(53.2)	
Retirement Status§			
Not Retired	42(51.9)	24(52.2)	0.972
Retired	39(48.1)	22(47.8)	
Variables in the Interpersonal Index			
Satisfaction with Friends	7(8.4)	11(23.4)	0.018*
Not Satisfied			
Satisfied	76(91.6)	36(76.6)	
Satisfaction with Family			
Not Satisfied	3(3.6)	7(14.9)	0.035*
Satisfied	80(96.4)	40(85.1)	
Sense of Belonging			
Low	8(9.6)	13(27.7)	0.007*
High	75(90.4)	34(72.3)	
Community Factors			
Impression of Active Outdoor Spaces§	9(11.3)	8(18.6)	0.260
Negative			
Positive	71(88.8)	35(81.4)	
Impression of Other Outdoor Spaces§			
Negative	37(47.4)	33(75.0)	0.003*
Positive	41(52.6)	11(25.0)	
Impression of Presence of Facilities§			
Negative	14(18.4)	11(26.8)	0.290
Positive	62(81.6)	30(73.2)	
Safety			
Yes	74(89.2)	37(78.7)	0.106
No	9(10.8)	10(21.3)	

P values are shown for Chi-square Analysis between physically active and not physically active, excluding missing
§Data was missing for some participants. The numbers provided is for participants with known data
*Fisher Exact Test was used in place of Chi-square Analysis

4.4.2. Hypotheses 4 and 5: Heart Disease, the interpersonal index, and the community factors

The second health outcome considered by this study is heart disease. Table 4 presents the demographic characteristics of individuals who reported having heart disease compared to those who did not have heart disease. Most participants with heart disease fell into the age category of greater than or equal to 60 years old. Of the 130 respondents, 29 reported heart disease, and 101 did not.

Participants with heart disease differed from those without heart disease in a number of descriptive characteristics. The comparisons that were statistically significant included age($p=0.001$); as noted, those with heart disease were more likely to be in the greater than 60-year-old category. Education ($p=0.05$) was another significant factor; individuals with heart disease were less likely to have a university or college education. Moreover, individuals without heart disease were less likely to be married ($p=0.036$). Individuals with heart disease in our sample were more likely to be retired ($p=0.000$). Finally, individuals in our sample were more likely to be positive about the outdoor spaces where they were active ($p=0.010$). Therefore, from our results we can deduce that heart disease and the interpersonal index were associated. However, heart disease was only associated with one of the community factors, impression of active outdoor spaces. There were no associations between any other of the outlined community factors.

Table 4

Comparison of Participants with Heart Disease and Participants without Heart Disease

Characteristic	No. (%) of Participants		P-Value
	Heart Disease n=29	No Heart Disease n=101	
Age			
<60	6 (20.7)	59(58.4)	0.001*
≥60	23(79.3)	42(41.6)	
Sex			
Male	11(37.9)	35(34.7)	0.745
Female	18(62.1)	66(65.3)	
Marital Status§			
Married	12(46.2)	69(68.3)	0.036
Not Married	14(53.8)	32(31.7)	
Education§			
High School or lower	16(55.2)	35(35.0)	0.050
University or College	13(44.8)	65(65.0)	
Retirement Status§			
Not Retired	5(17.9)	61(61.6)	0.000
Retired	23(82.1)	22(38.4)	
Variables in the Interpersonal Index			
Satisfaction with Friends	6(20.7)	12(11.9)	0.223*
Not Satisfied			
Satisfied	23(79.3)	89(88.1)	
Satisfaction with Family			
Not Satisfied	2(6.9)	7(7.9)	1.000
Satisfied	27(93.1)	93(92.1)	
Sense of Belonging			
Low	7(24.1)	14(13.9)	0.250*
High	22(75.9)	87(86.1)	
Community Factors			
Impression of Active Outdoor Spaces§	7(30.4)	10(10.0)	0.018*
Negative			
Positive	16(69.6)	90(90.0)	
Impression of Other Outdoor Spaces§	14(53.8)	56(58.3)	0.682
Negative			
Positive	12(46.2)	40(41.7)	
Impression of Presence of Facilities§			
Negative	6(25.0)	19(20.4)	0.626
Positive	18(75.0)	74(79.6)	
Safety			
Yes	22(75.9)	89(88.1)	0.134*
No	7(24.1)	12(11.9)	

P values are shown for Chi -square Analysis between heart disease and no heart disease

§§Data was missing for some participants. The numbers provided is for participants with known data

*Fisher Exact Test was used in place of Chi- square analysis

4.5. Variable Selection for Hypotheses 6 and 7: Logistic Regression Analyses for Dependent Variables (Physical Activity and Heart Disease)

This section presents the variables that was included in the logistic regression analysis. The selection of variables will be conducted based on our univariate analysis presented in Tables 3 and 4.

4.5.1. Variable Selection for Hypothesis 6: Logistic Regression with Physical Activity as Dependent Variable

To address potential confounding and identify the variables for inclusion in the model, we compared the characteristics of individuals: who scored high on the interpersonal index to those who scored low on the interpersonal index; who had negative impressions of other outdoor spaces to those who had positive impressions of other outdoor spaces; and who reported not feeling safe in their to those who reported feelings safe. We then selected our variables for inclusion in the logistic model with physical activity as the dependent variable.

4.5.1.1. Interpersonal Index

The interpersonal index was included in the logistic regression analysis for the physical activity logistic regression model because it showed a p-value of less than 0.20. Table 5 presents the interpersonal index divided into high and low scores. As a result, there were 59 participants in the low interpersonal category and 71 participants in the high interpersonal category based on our outlined

cutoff value. Table 5 compares the demographic characteristics of individuals with low interpersonal scores and high interpersonal scores. Participants differed in a number of variables; statistically significant differences between participants with low interpersonal index scores and high interpersonal index scores included satisfaction with friends (p=0.000), satisfaction with family (p=0.000) and sense of belonging (p=0.000).

Table 5

Comparison of Participants with Low and High Interpersonal Index Scores

Characteristic	No. (%) of Participants: Low Interpersonal Index Score n=59	No. (%) of Participants: High Interpersonal Index Score N=71	P-Value
Age			
<60	31 (52.5)	34(47.9)	0.597
≥60	28(47.5)	37(52.1)	
Sex			
Male	22(37.3)	24(33.8)	0.679
Female	37(62.7)	47(66.2)	
Marital Status§			
Married	40(69.0)	41(59.4)	0.265
Not Married	18(31.0)	28(40.6)	
Education§			
High School or lower	24(40.7)	27(38.6)	0.807
University or College	35(59.3)	43(61.4)	
Retirement Status§			
Not Retired	31(53.4)	35(50.7)	0.760
Retired	27(46.6)	34(49.3)	
Variables in the Interpersonal Index			
Satisfaction with Friends			
Not Satisfied	17(28.8)	1(1.4)	0.000
Satisfied	42(71.2)	70(98.6)	
Satisfaction with Family			
Not Satisfied	10(16.9)	0(0.0)	0.000*
Satisfied	49(83.1)	71(100.0)	
Sense of Belonging			
Low	19(32.2)	2(2.8)	0.000*
High	40(67.8)	69(97.2)	
Community Factors			
Impression of Outdoor Spaces§	8(14.5)	9(13.2)	0.834
Negative			
Positive	47(85.5)	59(86.8)	
Impression of Other Outdoor Spaces§	32(58.2)	38(56.7)	0.871
Negative			
Positive	23(41.8)	29(43.3)	
Impression of Presence of Facilities§	12(22.2)	13(20.6)	0.871
Negative			
Positive	42(77.8)	50(79.4)	
Safety			
Yes	52(88.1)	59(83.1)	0.418
No	7(11.9)	12(16.9)	

P values are shown for Chi-square analysis between low interpersonal index score and high interpersonal index score
§§Data was missing for some participants. The numbers provided is for participants with known data
*Fisher Exact Test was used in place of Chi-square Analysis

4.5.1.2. Impression of Other Outdoor Spaces'

The variable impression of *other outdoor spaces'* is one that will be used in logistic regression model for physical activity. We looked at the differences between participants who reported a negative impression and those who reported a positive impression of other outdoor spaces; the results are shown in Table 6. There were significant differences in several characteristics, including age (p=0.000), education (p=0.018), retirement status (p=0.006), satisfaction with family (p=0.010) and Impression of presence of facilities (p=0.003).

Table 6

Comparison of Participants with Negative Impressions of Other Outdoor Spaces and Participants with Positive Impressions of Other Outdoor Spaces

Characteristic	No. (%) of Participants		
	Negative Impression of other Outdoor Spaces n=70	Positive Impression of Other Outdoor Spaces n=52	P-Value
Age			
<60	47(67.1)	17(32.7)	0.000
≥60	23(32.9)	35(67.3)	
Sex			
Male	24(34.3)	21(40.4)	0.490
Female	46(65.7)	31(59.6)	
Marital Status§			
Married	42(60.9)	36(72.0)	0.207
Not Married	27(39.1)	14(28.0)	
Education§			
High School or lower	20(29.0)	26(50.0)	0.018
University or College	49(71.0)	26(50.0)	
Retirement Status§			
Not Retired	44(63.8)	20(38.5)	0.006
Retired	25(36.2)	32(61.5)	
Interpersonal Index			
Satisfaction with Friends			
Not Satisfied	13(18.6)	4(7.7)	0.086
Satisfied	57(81.4)	48(92.3)	
Satisfaction with Family			
Not Satisfied	9(12.9)	0(0.0)	0.010*
Satisfied	61(87.1)	52(100.0)	
Sense of Belonging			
Low	10(14.3)	8(15.4)	0.866
High	66(85.7)	44(84.6)	
Community Factors			
Impression of Active Outdoor Spaces§	12(17.6)	4(8.0)	0.130
Negative			
Positive	56(82.4)	46(92.0)	
Impression of Presence of Facilities§	20(30.8)	4(8.2)	0.003
Negative			
Positive	45(69.2)	45(91.8)	
Safety			
Yes	60(85.7)	45(86.5)	0.897
No	10(14.3)	7(13.5)	

P values are shown for Chi-square Analysis between heart disease and without heart disease
§Data was missing for some participants. The numbers provided is for participants with known data
*Fisher Exact Test was used in place of Chi-square Analysis

4.5.1.3. Safety

Safety was a factor included in both logistic regression models (i.e., physical activity and heart disease) based on our univariate analysis. We examined the differences in characteristics of those who reported feeling safe in their neighbourhood and those who did not feel safe. Results are shown in Table 8. The only significant difference was age (p=0.025). Adults 60 years of age or older were more likely to report feeling unsafe in their community than individuals under the age of 60.

Table 7

Comparison of Participants who Reported not Feeling Safe in their Community and Those who Reported Feeling Safe

Characteristic	No. (%) of Participants		
	Not Safe n=19	Safe n=111	P-Value
Age			
<60	5(26.3)	60(54.1)	0.025
≥60	14(73.7)	51(45.9)	
Sex			
Male	4(21.1)	42(37.8)	0.157
Female	15(78.9)	69(62.2)	
Marital Status§			
Married	9(50.0)	72(66.1)	0.189
Not Married	9(50.0)	37(33.9)	
Education§			
High School or lower	8(42.1)	43(39.1)	0.804
University or College	11(57.9)	67(60.9)	
Retirement Status§			
Not Retired	6(31.6)	60(55.6)	0.054
Retired	13(68.4)	48(44.4)	
Interpersonal Index			
Satisfaction with Friends			
Not Satisfied	1(5.3)	17(15.3)	0.470*
Satisfied	18(94.7)	94(84.7)	
Satisfaction with Family			
Not Satisfied	1(5.3)	9(8.1)	1.000*
Satisfied	18(94.7)	102(91.9)	
Sense of Belonging			
Low	3(15.8)	18(16.2)	1.000*
High	16(84.2)	93(83.8)	
Community Factors			
Impression of Active Outdoor Spaces§	2(13.3)	15(13.9)	1.000*
Negative			
Positive	13(86.7)	93(86.1)	
Impression of Other Outdoor Spaces§			
Negative	10(58.8)	60(57.1)	0.897
Positive	7(41.2)	45(42.9)	
Impression of Presence of Facilities§			
Negative	2(13.3)	23(22.5)	0.520*
Positive	13(86.7)	79(77.5)	

P values are shown for Chi-square Analysis between heart disease and without heart disease
§Data was missing for some participants. The numbers provided is for participants with known data
*Fisher Exact Test was used in place of Chi-square Analysis

4.5.2. Variables Selection for Hypothesis 7: Logistic Regression with Heart Disease as Dependent Variable

To address potential confounding and identify the variables for inclusion in the model, we compared the characteristics of individuals: who had a negative impression of active outdoor spaces to those who had a positive impression of active outdoor spaces and who reported not feeling safe in their to those who reported feelings safe. We then selected our variables for inclusion in the logistic model with heart disease as the dependent variable.

4.5.2.1. Impression of Outdoor Spaces for Activity

As shown in Table 4, impression of active outdoor spaces met the criteria for inclusion in the logistic regression model where heart disease is the dependent variable. We examined whether there were any differences between individuals who had a positive impression of active outdoor spaces and those who had a negative impression. Table 7 illustrates the characteristics of participants who reported a negative impression of active outdoor spaces as compared to the characteristics of those who rated such spaces positively. There was a significant difference in the impression of facilities ($p=0.001$); individuals who had a positive impression of active outdoor spaces were more likely to rate their impression of presence of facilities as positive.

Table 8

Comparison of Participants with Negative Impressions of Active Outdoor Spaces and Positive Impressions of Active Outdoor Spaces

Characteristic	No. (%) of Participants		P-Value
	Negative Impression of Active Outdoor Spaces n=17	Positive Impression of Active Outdoor Spaces n=106	
Age			
<60	10(58.8)	55(51.9)	0.595
≥60	7(41.2)	51(48.1)	
Sex			
Male	8(47.1)	37(34.9)	0.334
Female	9(52.9)	69(65.1)	
Marital Status§			
Married	11(64.7)	67 (65.0)	0.978
Not Married	6(35.3)	36(35.0)	
Education§			
High School or lower	9(52.9)	37(35.2)	0.162
University or College	8(47.1)	68(64.8)	
Retirement Status§			
Not Retired	10(62.7)	56(52.8)	0.469
Retired	6(37.5)	50(47.2)	
Interpersonal Index			
Satisfaction with Friends			0.235*
Not Satisfied	4(23.5)	12(11.3)	
Satisfied	13(76.5)	94(88.7)	
Satisfaction with Family			
Not Satisfied	0(0.0)	9(8.5)	0.359*
Satisfied	17(100.0)	97(91.5)	
Sense of Belonging			
Low	3(17.6)	14(13.2)	0.704*
High	14(82.4)	92(86.8)	
Community Factors			
Impression of Other Outdoor Spaces§	12(75.0)	56(54.9)	0.130
Negative			
Positive	4(25.0)	46(45.1)	
Impression of Presence of Facilities§	9(60.0)	16(16.2)	0.001*
Negative			
Positive	6(40.0)	83(83.8)	
Safety			
Yes	15(88.2)	93(87.7)	1.000*
No	2(11.8)	13(12.3)	

P values are shown for Chi-square Analysis between heart disease and without heart disease
§Data was missing for some participants. The numbers provided is for participants with known data
*Fisher Exact Test was used in place of Chi-square Analysis

4.5.2.2. Safety

Safety is another factor that met the criteria to be included in the logistic regression model with heart disease as the dependent variable based on the p-value found in Table 4 (p=0.134). Refer to Table 8 for the differences in characteristics between residents who reported feeling safe and secure in their environment and those who did not report feeling safe.

4.6 Logistic Regression Analysis: Physical Activity

The primary objective was to examine the associations between the environment, PA and heart disease; accordingly, after the univariate analysis, we performed logistic regression to predict the outcome of the two binary health outcomes (physical activity and heart disease) and test our hypotheses (Chapter 1). We used logistic regression analysis to estimate the relationship between the interpersonal and community factors and the two health outcomes: physical activity and heart disease.

Variables meeting our criteria that were selected for entry into the logistic regression included age, sex, the interpersonal index, within the community factors, and impression of other outdoor spaces. While age and sex were not selected from the univariate analysis performed earlier, these are variables we forced into the model.

After conducting the logistic regression (Table 9), we found no significant association between the dependent variable, physical activity with age, sex. However, a significant association exists between PA with the interpersonal index (p=0.004), and two community factors, namely, impression of other outdoor spaces (p=0.005) and safety (0.030)).

Table 9 presents the odds ratios and the confidence intervals from the logistic regression analysis. From Table 9, we can say that the odds of physically active people being more satisfied with their interpersonal relations is 3.36 times higher compared to those who were not physically active on regular basis. Moreover, the odds of physically active people feeling safe and secure in their neighbourhood is 3.646 times higher compared to those who were not physically active on a regular basis. Finally, the odds of physically active people having a positive impression of their other outdoor spaces in their community is 3.76 times higher than those who were not physically active. It seems, then, that the interpersonal index and community factors were associated with physical activity.

Table 9

Logistic Regression Analysis for Physical Activity as the Dependent Variable

Variables	Odds Ratio (95% CI)	P Value
Age		
<60	1.00	0.983
	0.991 (0.407-2.413)	
≥60		
Sex		0.809
Female	1.00	
Male	0.900 (3.84-2.109)	
Interpersonal Index		0.004
Not Satisfied	1.00	
Satisfied	3.360 (1.464-7.712)	
Impression of Other Outdoor Spaces		0.005
Negative	1.00	
Positive	3.768 (1.496-9.490)	
Safety		0.030
No	1.00	
Yes	3.646 (1.133-11.729)	

Abbreviation: CI, confidence interval

4.7 Logistic Regression Analysis: Heart Disease

To determine the variables for the logistic regression analysis we performed another univariate analysis using Chi-square and Fisher Exact values for individuals with and without heart disease. Based on the results in Table 4, we assessed risk factors using the same cutoff value of $p \leq 0.20$; the factors meeting the selection criteria for inclusion in the logistic regression analysis included age, marital status, education, retirement status, the interpersonal index (because

sense of belonging was significant), impression of outdoor spaces, and safety. Retirement status, education and marital status were shown to be significant in the univariate analysis; however, because these variables were related to age, we excluded them and simply kept age in the model. Also, to be consistent with the literature, we kept sex in the model. Therefore, the final variables were: age, sex, the interpersonal index (based on the significance of sense of belonging), and the two community factors, impression of outdoor spaces and safety.

Age was a significant predictor of heart disease (p=0.003), but only one other variable was statistically significant in the model: impression of active outdoor spaces (p=0.009). The odds ratio and CI are shown in Table 10. The odds of individuals with heart disease being 60 years of age and older is 5.219 times higher than individuals under the age of 60 years having heart disease. The odds of individuals with heart disease rating their impression of active outdoor spaces as negative was 5.229 times higher compared to individuals without heart disease. However, individuals with heart disease were no more likely to be negative about interpersonal factors and no more likely to rate safety in their neighbourhood as negative.

Individuals with heart disease in St. John's reported being as satisfied with their interpersonal relationships as individuals without heart disease. Participants with heart disease were more likely to report a negative impression concerning their active outdoor spaces.

Table 10

Logistic Regression Analyses for Heart Disease as the Dependent Variable

Variables	Odds Ratio (CI)	P Value
Age		
<60	1.00	0.003
≥60	5.219 (1.739-15.666)	
Sex		
Male	1.00	0.531
Female	1.389 (0.496-3.889)	
Interpersonal Index		
Satisfied	1.00	0.165
Not Satisfied	0.494 (0.182-1.338)	
Impression of Active Outdoor Spaces	1.00	0.009
Positive		
Negative	5.229 (1.511-18.099)	
Safety		
Yes	1.00	0.921
No	1.076 (0.252-4.605)	

Abbreviation: CI, confidence interval

Chapter 5
Discussion

5.1 Introduction

This section highlights the results of the research, discussing how the findings for both physical activity and heart disease relate to the existing literature. The chapter goes on to discuss the strengths and limitations of the study, noting areas for future research. The final section offers a brief conclusion.

5.2 Key Findings

The goal of this study was to understand the association between aspects of the environment and physical activity (PA), and heart disease in St. John's. Our examination of the physical environment showed a significant association between PA with the interpersonal index and community factors, including impression of other outdoor spaces and safety. We found no significant relationships between physical activity and age or sex.

Bellow *et al.* (2011), Heart and Stroke (2009) and Leung *et al.* (2007) agree that physical activity acts as a protective factor against morbidity and mortality from heart disease. Not surprisingly, then, we found that individuals without heart disease were more likely to report being physically active than those with heart disease (shown in Table 2). Additionally, most individuals who

reported being physically active did not have heart disease. When heart disease was reported, individuals were less likely to report being physical active.

After controlling for age and sex, we found that individuals who reported being physically active on a daily basis were more likely to have higher scores on the interpersonal index. Additionally, they were more likely to have a positive impression of outdoor spaces to be active and more likely to report feeling safe and secure in their environment then individuals that reported not being physically active. Finally, individuals with heart disease were more likely to rate their impression of active outdoor spaces as negative compared to individuals without heart disease.

With respect to heart disease, our results were somewhat unexpected. As hypothesized, we found a significant association between age, impression of active outdoor spaces and heart disease. However, we hypothesized that an associated would exist between the interpersonal index and heart disease; however, this was not supported in our results. Individuals with and without heart disease reported being equally satisfied with the support they received through their interpersonal relations.

5.3 Discussion of Findings

5.3.1. Health Outcome: Physical Activity

As outlined in "Healthy People" (CDC, 2010), physical activity can significantly reduce some major threats to health. Yet as discussed in Chapter 2,

more than half of Canadians do not engage in daily physical activity (Canadian Fitness and Lifestyle Research, 2001). In our sample, only 37.2% of respondents actually reported not participating in regular physical activity. Newfoundland was ranked the lowest province in terms of reporting being physically active (45.5%) (Statistics Canada, 2008).Using data from the 2003 Canadian Community Health Survey (CCHS), St. John's residents were among the least likely to report adopting a combination of healthy behaviours (CIHI, 2006). As we know, it is important to determine what motivates individuals to participate in physical activity. In this study, we have considered interpersonal and community level factors.

5.3.1.1. Physical Activity and the Interpersonal Index

The study defines the interpersonal index as composed of closely related variables that exist or occur between individuals. In this study, each of these variables was derived using a modified version of the socio-ecological model of health (see Figure 2). Through our logistic regression, we found a significant association between physical activity and the interpersonal index (p=0.004). This is consistent with the literature, which suggests that interpersonal relations such as social support translate into a belief that individuals can carry out a task (in this case, physical activity), which in turn can be translated into action (Hupcey, 1988).

From our research we found that people who were physically active were more likely to be to positive about their interpersonal relationships. In other

words, we found an association between physical activity and the interpersonal index. Some literature suggests that a relationship between PA and interpersonal level factors may not exist or may have minimal effect on PA behaviours (Darlow and Xu, 2011). However, the majority of the research favours the argument that interpersonal factors do have the ability to influence PA behaviours. In fact our research is consistent based on our logistic regression analysis, with MacNeill *et al. (2006),* Cleland *et al.* (2010), and Eyler *et al.* (1999).

There is literature supporting each of the factors we included in the index. For example, research conducted by McNeill *et al.* (2006) suggests that greater attention to social environment factors is a necessary next step in research on physical activity. They describe this environment as "the presence and nature of interpersonal relationships and interactions; extent to which one is interconnected and embedded in a community; interpersonal level characteristic." While their definition is closely related to ours, they provide no quantitative data, making it difficult to compare their work to ours.

Family support is one variable in our index that shows a significant association with PA. Our research finds physically active people are 3.36 times more likely to be positive about their interpersonal relations than those who are physically inactive. Similarly, Eyler *et al.* (1999) note the complex association between family and friends and physical activity. They suggest that these supportive roles are needed for the initiation of physical activity; however, they may not be needed to maintain PA practices.

Based on these results, it is important that future strategies be focused on

the use of interpersonal relations to encourage people to become more active. In that vein, Roux *et al.* (2008) outline some potentially cost-effective interventions. They suggest that achieving goals, such as increased physical activity, can be done by either developing a new social network or working within an existing network (Roux *et al.,* 2008). They recommend that the interventions focus on changing physical activity behaviours through building, strengthening, and maintaining social networks that provide supportive relationships for behaviour change (Roux *et al.,* 2008). Their suggested interventions include the use of a buddy system, the development of a contract with the goal of increased levels of physical activity in mind, or developing walking or other groups to provide companionship and support while being physically active (Roux *et al.,* 2008)

5.3.1.2. Physical activity and Community Factors

This study defines community factors as variables that exist or occur on a community level according to the socio-ecological model of health. Variables included in the study as community factors are impression of outdoor spaces, safety, and presence of recreational facilities. Our logistic regression analysis indicated significant associations between physical activity and two community factors – impression of outdoor spaces and safety.

Our results indicated that individuals who were physically active were 3.646 times more likely to rate their community as a safe place than those who were not physically active. Consistent with our findings, when we look at safety

alone, many cross-sectional studies suggest that safety is a significant factor in PA (Ball, 2000; Ball *et al.,* 2001; Centres for Disease and Control, 1999; Foster *et al.*, 2004). But for the most part, findings have not been equivocal. Some studies suggest that safety may not be a factor (see Chapter 2). Others argue that only women and low-income groups are affected by perceived lack of safety, but we did not single out these groups. Two older studies (Sallis *et al.*, 1989; Sallis *et al.*, 1997) examine aspects of the physical environment and find safety is not significantly related with PA; but communities have changed over the past two decades, and safety is a much greater concern in most urban areas. Takana *et al.* (2002) look at an older adult population and discover that the perception of safety does not have an influence on participation in PA, but this was not something we were concerned with. We conclude that, for the most part, our findings are consistent with the literature. We did not look at specific groups but rather a cross section of the St. John's population. If we had examined females, minority groups, or seniors, we may have had different findings.

Based on the results we argue that strategies to promote PA in the St. John's community should consider impression of other outdoor spaces and safety. The "Guide to Community Preventative Services" (2006) suggests that street-scale urban design and land use policies that involve urban planners, architects, engineers, developers, and public health professionals should be used to change the physical environment of small geographic areas (generally limited to a few blocks) in ways that support physical activity. Examples include revising building codes, establishing roadway design standards, making environmental

changes, improving street lighting, creating infrastructure projects to increase the safety of street crossing, using traffic calming approaches (e.g., speed humps, traffic circles) and enhancing the street landscaping (Guide to Community Preventative Services, 2006). Similarly, Research Digest (2006) says that a city's community design is an important aspect of total physical activity. Recreational environments support physical activity, sidewalks support physical activity, and controlling for safety is necessary to improve the physical activity of a community (Research Digest, 2006).

Our findings show that impressions of other outdoor spaces are significantly associated with PA (p=0.005). Individuals in our study who were physically active were 3.768 times more likely to be positive about their impression of other outdoor spaces. When we look at the literature on outdoor spaces, we find that having outdoor spaces in which to be active provides a supportive environment with the ability to promote PA (Ball *et al.*, 2001; Mitchell and Popham, 2007; Takano *et al.,* 2002; Troped *et al.*, 2001). Other outdoor spaces could include sidewalks, benches, and rest areas. Takano *et al.* (2002) suggest that outdoor spaces, such as green spaces, are associated with increased longevity of seniors. This result could be partially due to increased PA . Booth *et al.* (2000) illustrate that increased outdoor spaces lead to increased PA. Finally, De Vries *et al.* (2003) find increased PA when an environment expands its outdoor spaces.

The Canadian transportation research board released a report on the role of the built environment on physical activity levels. While they use the term built

environment, several of their characteristics match closely with those included in our community factors. They suggest that the characteristics of an environment facilitate or constrain physical activity (Transportation Research Board, 2005). Parks and trails may facilitate walking for exercise, and sidewalks may encourage walking for local shopping or other utilitarian purposes (Transportation Research Board, 2005). They believe that this aspect of the environment can be changed in ways that increase opportunities for and reduce barriers to physical activity. This interpretation is consistent with our research.

Only a few studies show that increasing facilities is likely to increase PA, but several studies show that the presence of facilities and PA may be linked (Bamana *et al., 2008;* Booth *et al.*, 2000; Sternfeld *et al., 1999;* Sallis *et al.*,1989). Several of these studies use methods similar to the ones used in our study. They show that when individuals perceive there that facilities are available, they are likely to engage in PA practices.

The results from the logistic regression did not show an association between physical activity and age (p=0.983) or sex (0.809). These results are inconsistent with findings cited in the literature. Based on the literature, we know that as people age, they are generally less likely to report being physically active (Sallis, 2000); however, we used a reputable way to divide our sample which was based on WHO (2012) categories. Therefore, we divided respondents into two groups, younger than 60 and older than 60.

5.3.2. Health Outcome: Heart Disease

Heart disease is one of the leading causes of death in Canada generally and in Newfoundland and Labrador specifically. As interpersonal relations and community factors may be associated with heart disease, in our study, we looked for a connection. Our logistic regression analysis included: age, sex, interpersonal index and community factors (impression of active outdoor spaces and safety). We found no significant relationships between heart disease and sex, the interpersonal index, or safety. However, our analysis revealed associations between impressions of active outdoor spaces and age of respondents with heart disease. Those with heart disease had negative impressions about their active outdoor spaces than those without heart disease.

5.3.2.1. Heart Disease and the Interpersonal Index

Our analyses found no association between the interpersonal index and heart disease (p-value=0.165). People with heart disease in St. John's were just as likely to be satisfied with their interpersonal relationships as individuals without heart disease.

Our interpersonal index included a number of variables also studied by other researchers. For example, Rowe *et al.* examine variables associated with better aging and describe each as an important element when promoting health

and disease prevention (Rowe *et al.*, 2007). Boutin-Foster (2005) uses qualitative methods to examine the role of social support on heart disease patients, finding that lifestyle modifications require the social support of family and friends. Another study suggests that peer support might increase the tendency of individuals with heart disease to improve their health practices (Parry and Watt-Watson, 2010). However, Giles Corti and Donovan (2002) believe that an individual's interpersonal surroundings have little impact on his/her health and that health practices are most likely related to intrapersonal characteristics. Echoing the socio-ecological model of health, they find that intrapersonal characteristics are closest to the individuals and therefore have more impact than interpersonal relations, community, or policy.

A Canadian report entitled "Improving the Health of Canadians: An Introduction to Health in Urban Places" was consistent with our finding that individuals with heart disease were just as likely to be satisfied with their interpersonal relations as those who did not. One explanation for our results is that Newfoundlanders are commonly known for their social nature and that interpersonal relations are a part of their culture with no relation to heart disease.

5.3.2.2. Heart Disease and Community Factors

Our results showed a significant association between the community factor *impression of active outdoor spaces* and heart disease (p-value=0.009). We found that individuals with heart disease were 5.219 times more likely to rate their

impression of outdoor spaces as negative (i.e., lack of safety) than individuals without heart disease. Other research has shown that factors such as safety and crime may have a significant impact on older adults' participation in physical activity and, in turn, might lead to increased risk of heart disease.

In summary, an explanation for our findings may be that individuals with heart disease were less likely to be using certain community elements, including impression of outdoor spaces and facilities. Poor health can act as a barrier, especially among those who suffer from chronic conditions such as heart disease.

5.4 Strengths of this Research

5.4.1. Knowledge exchange

This project aims to describe the associations between environmental factors , PA and heart disease. A major strength of this research was the development of contacts; we were able to quickly disseminate our results to influential members of the community. One example was the MACS. The results of our research could be added to the agenda of their monthly meetings, providing the opportunity for us to help inform their policy, programs, and initiatives. At the same time, we have allowed ourselves to be informed by the community; our research is primarily concerned with what St. John's people have to say.

5.4.2. Partnering

The partnerships formed throughout the research process constitute another strength of this research project. For one thing, we worked with specific groups: for example, the involvement of the MACS in the survey development and administration were essential. For another, we worked with the community at large. Kahan *et al.* (1999) say that best practice includes the community. In the end, we engaged a wide variety of partners and collaborators, including the MACS, city council, the community members of the AFC research team and the many volunteers (discussed in Chapter 3).

5.4.3. Innovative

This study is innovative. It is the first of its kind in St. John's, Newfoundland, to study the environment as it is related to PA and heart disease. Additionally, our creation of the interpersonal index is unique within this particular population. Finally, as noted above, the collaboration between city council and Memorial University allowed us to take an innovative approach to community health research.

5.4.4. Survey

Our survey was well thought out and easy to follow. Its administration was a definite strength of the study. By training volunteers in a consistent fashion, we

were able to create an additional filter for quality control. This ensured not only that respondents were interpreting and answering the questions correctly, but that any issues or concerns with the script and research process were immediately brought to the attention of our research team. Finally, there was a level of anonymity in the survey method that allowed respondents to be more open and forthcoming.

5.4.5. Random sample

An advantage of using a random sample is that it is highly representative of the population. It also is has the ability to provide unbiased statistics. Using this sampling technique allowed our statistical analysis to be related to sample distributions and hypothesis testing; sample size determinations assume that the sample is a simple random sample.

5.4.6. Response Rate

A final strength of our research was the response rate. For our 130 completed telephone surveys, we had a response rate of 39.5%. The average response rates for telephone surveys usually range from 10–20% (Public Works an Government Services Canada, 2012).

5.5 Limitations of this Research

Like most research, our study had several limitations. These limitations are discussed below.

5.5.1 Seasonality

The first limitation that should be considered is seasonality. While our analysis considered a number of individual variables, it did not consider the possible impact of the season on our results. Some literature suggests the importance of taking into account seasonal variability such as climate and temperature (Plotnikoff *et al.*, 2004). It finds a distinct association between season and PA. While no literature uses interpersonal and community features as we do, we can speculate that some of these variables may be affected by seasonality. For example, the fact that the study was conducted in the winter may have influenced the low ratings of other outdoor spaces (sidewalks, benches, etc.) and results may have varied somewhat had the survey been administered during another season. As for the interpersonal index, individuals may have given their satisfaction with friends and family a lower rating because they were unable to see them frequently due to inclement weather. Finally, we would expect PA to be performed less in the winter months than in the summer months; therefore, our results could vary if repeated in a different season.

5.5.2. Restricted Variables

While we took our variables from the socio-ecological model of health, several other factors could have been observed. Moreover, a more comprehensive approach to the index could have been used to measure the selected variables. For example, a database could have been used to assess the accessibility of available outdoor spaces, or recreation facilities could have been observed based on the respondents' postal code. We cannot conclusively state that we have addressed all interpersonal and community factors of the socio-ecological model. Moreover, detailed aspects of each level was outside the scope of this research but should be considered for a more comprehensive understanding of the relationship between the characteristics of the built environment and physical activity. However, an exhaustive scan of all variables goes well beyond the scope of this particular project. This should be considered for future research.

5.5.3. Defining Physical Activity

Another limitation is the use of self-reported PA. Self-reported measures may lead to under or over reporting by respondents. On the other hand, there is sufficient research to support the use of self-reported data on a population level. Additionally, as PA is a complex and intricate behaviour, a simple binary response is not ideal and did not provide us with complete information concerning this variable. Ideally, looking at stratification of PA responses (i.e.- leisurely PA,

moderate PA, vigorous PA) may have provided a deeper understanding of its association with both the interpersonal and community index. One article suggests that researchers consider providing a definition of what is considered to be included in the umbrella of physical activity (Sanderson, 2003). This was not completed within this thesis, but may be something to consider for future research in this area. Moreover, future research should consider use of an objective measure of physical activity rather than a self-reported one. An example of such could be the use of accelerometers devices. When this method is utilized, this mechanism not only allows for objective PA measurements, but further provides the intensity of the PA being completed. Objective measurements such as these reduce the self-reporting problems and further reduce the risk of errors in measurement.

5.5.4. Heart Disease Limitations

Self-reporting was also a concern with the variable of heart disease. Additionally, the survey had a limited sample size of individuals who reported having heart disease. Ideally, a purposive sample of heart disease patients recruited from a hospital setting may have provided a stronger indication of their association between the interpersonal and community index. However, we were limited by the survey data. Additionally, because of the binary variable used to measure heart disease, we were limited by information provided from these participants in our research. Furthermore, the lack of association between heart

disease and the interpersonal index may have been a result of a sample size and low power. To combat this limitation, future research should consider use of an objective measure of heart disease rather than a self-reported one and include a larger sample of individuals with heart disease.

5.5.5. Intrapersonal and Policy Indices

The four levels of the socio-ecological model of health behaviour have been cited throughout this thesis. While an index was developed for the interpersonal factors, and the community factors were examined, examinations were not included for the two other levels of the model (intrapersonal and policy factors). While these two measures were important indicators of the two health outcomes (PA and heart disease), there was limited information within the survey to truly capture these intrapersonal and policy factors sufficiently. There are theoretical implications of how these levels may interact without all four levels being examined in this research. However, this limitation did not affect the results of our research; however, it was appropriate to discuss the four levels of the socio-ecological model of health. Future research should look further into developing indices or examining factors for the remaining levels of the socio-ecological model and study the interactions between the four levels of this model.

5.5.6. Potential Errors in Providing a Definition to Community

Research in the area of community variables as they relate to health outcomes is a relatively new field; accordingly, the definition may be inconsistent across survey participants (Humpel et al, 2002). Because the survey data came directly from a project concerning Age Friendly Communities, much of the data collected referred directly to the participants' community. No direct definition of community was given to survey participants; therefore, there may be differences in how survey participants defined their community. This may lead to inconsistencies in the results, and thereby limit the generalizability of the results.

5.5.7. Survey Data

The data from the survey were intended for a project on Age Friendly Communities. Therefore, as is true of many secondary analyses, not all desired variables could be found within the dataset. Many of the variables that can be used to measure the age friendliness of a community were relatable to this study; however, it would have been ideal to develop a survey to look specifically at this research topic. This limitation is most evidenced by the lack of socio-economic status (SES) variable. The lack of SES acted as a limitation because it is most often associated with PA and heart disease. SES was not included in the data set because it was designed with the MACS, which suggested that income not be directly asked. For this reason, a proxy that looked at current satisfaction and future satisfaction with income and investment was used; however, this was not an accurate measure of one's SES and was, therefore, not included within our

analysis. Moreover, this study is cross sectional in nature and therefore no directionality or causality should be assumed. Subsequently, this limitation should be taken into careful consideration and results used with caution.

5.5.8. Non-Participation Bias

There is evidence to suggest that individuals who decline to participate in research have different characteristics than those who agree to participate (Hill, *et al.*, 1997). The impact of non-participant bias on our results may be that a section of the population may not be represented by the survey data; ergo, this population may perceive their interpersonal and community factors differently than those who did participate in the research. For this reason, it is imperative to recognize that these results may not be generalizable to the entire population. In saying this, our study had a higher response rate than most telephone surveys, and a lot of media awareness was conducted to encourage residents to take part.

5.6 Knowledge Translation

The aim of this project was to assess the relationships between the interpersonal and community environment with PA and heart disease. However, it is imperative in research that results be disseminated further to inform policy, practice, and programs. Policy makers and city planners have potential to influence members of a community to be active and in turn reduce their risk of heart disease. Consequently, members of the community must realize that they

have the opportunity to act as facilitators of health promotions and have a further impact on long-term health of communities.

With the decline of manual labor jobs such as farming and fisheries within the province of Newfoundland and Labrador heart disease rates are increasingly prevalent. It is important to understand what motivates individuals to participate in regular physical activity in order to promote healthier lifestyles in this population. This study find that interpersonal relations, impression of other outdoor spaces and safety are associated with physical activity. The results of this study illuminate the association between the interpersonal index, community factors and PA. Therefore, PA strategies should include interpersonal aspects that aid in developing plans that initiate and maintain PA behaviours surrounding this concept. Moreover, PA interventions should include community level involvement and focus on building communities that are deemed to initiate and facilitate active engagement. City planners should focus on appropriately engaging the community in PA practices. Furthermore, the results illustrate that the community factor “impression of active outdoor spaces” and “heart disease” are associated. Therefore, interventions and programs for individuals with heart disease should include community components. Understanding these health behaviours is the first step to promoting healthier lifestyles in the St. John’s population.

5.7 Future Research

Given the current state of knowledge on how the environment impacts ones health, it is important that there be a continuance of well-supported research effort in this area, which looks objectively at the measures within the interpersonal index and community factors. Because these results are the first of their kind in St. John's, Newfoundland, more effort needs to be put into developing our knowledge base further.

While these results indicate the importance of the environment on physical activity, more comprehensive studies are needed to fully capture a more detailed understanding of which of these features is the driving force behind enhanced physical activity. For example, while this research examined outdoor spaces, more research surrounding what specifically related to outdoor spaces will drive increased physical activity is needed (i.e.- width or sidewalks, locations of park benches, lighting).

After a more detailed examination is conducted, strategies need to be put in place to encourage PA through what we know concerning interpersonal and community factors. This increase in PA may in turn help manage the heart disease rates within this population.

Additionally, the advantageous relationship between the Mayor's Advisory Committee on Senior's (MACS) should be continued and an uptake of this research in one of their monthly meetings is suggested. This interdisciplinary

approach, which included a unique collaboration that brought together the expertise of many diverse areas, made the research a successful process.

Future measures to improve this research area include: better research designs, particularly longitudinal studies that can begin to address causality issues, as well as designs that control more adequately for self-selection bias. In addition, a more detailed examination and matching of specific characteristics of the interpersonal and community environment with different types of health outcomes that assess the strength of the relationship and the proportion of affected population subgroups are needed.

It is believed that research on the relationship between concerning the environment (i.e.- interpersonal and community environment) and health outcomes is at a fundamental stage. The research in this area is growing rapidly as can be observed by the interdisciplinary approaches, technologies such as the Global Positioning System and geographic information systems, pedometers, and accelerometers. These technologies are now available to provide and illustrate more objective and detailed measures of the environment and should be utilized in the St. John's population. Moreover, in order for policy prescriptions to exist we require a better understanding of the relationship that currently exists, as well as of the strength of these relationships and their impact on the population. The need for conducting longitudinal studies, evaluating natural experiments, and enhancing data collection is apparent. We recommend a comprehensive approach focused on the socio-ecological model of health on physically active and heart disease behaviour. Professionals need to use this research and

develop strategies to promote healthier PA practices through the use of policies, promotions, and community programs.

5.8 Conclusion

Heart disease is the leading cause of mortality in Newfoundland and Labrador, but regular PA can significantly reduce ones risk of developing it. An individual's environment plays a major role on their health outcomes. For this reason it is important to understand how these health outcomes are associated with the ones interpersonal and community factors. Overall, our results indicate the interpersonal index and community factors such (such as impression of other outdoor spaces and safety) are associated with self-reported physical activity. Additionally, active outdoor spaces were associated with self-reported heart disease. However, there were no reported differences in how individuals with heart disease rated their interpersonal relations compared to those without heart disease.

While there are some limitations to our study, it makes a significant contribution to the literature on the associations between interpersonal and community factors associated with PA and heart disease. Importantly, this study is the first of its kind for St. John's, Newfoundland and has the potential to have an impact on the residents of St. John's if health interventions can make use of our findings. Using this research as a starting point for further research and

continuing the partnerships formed through carrying out this research may allow for prevention strategies associated with physical activity and heart disease.

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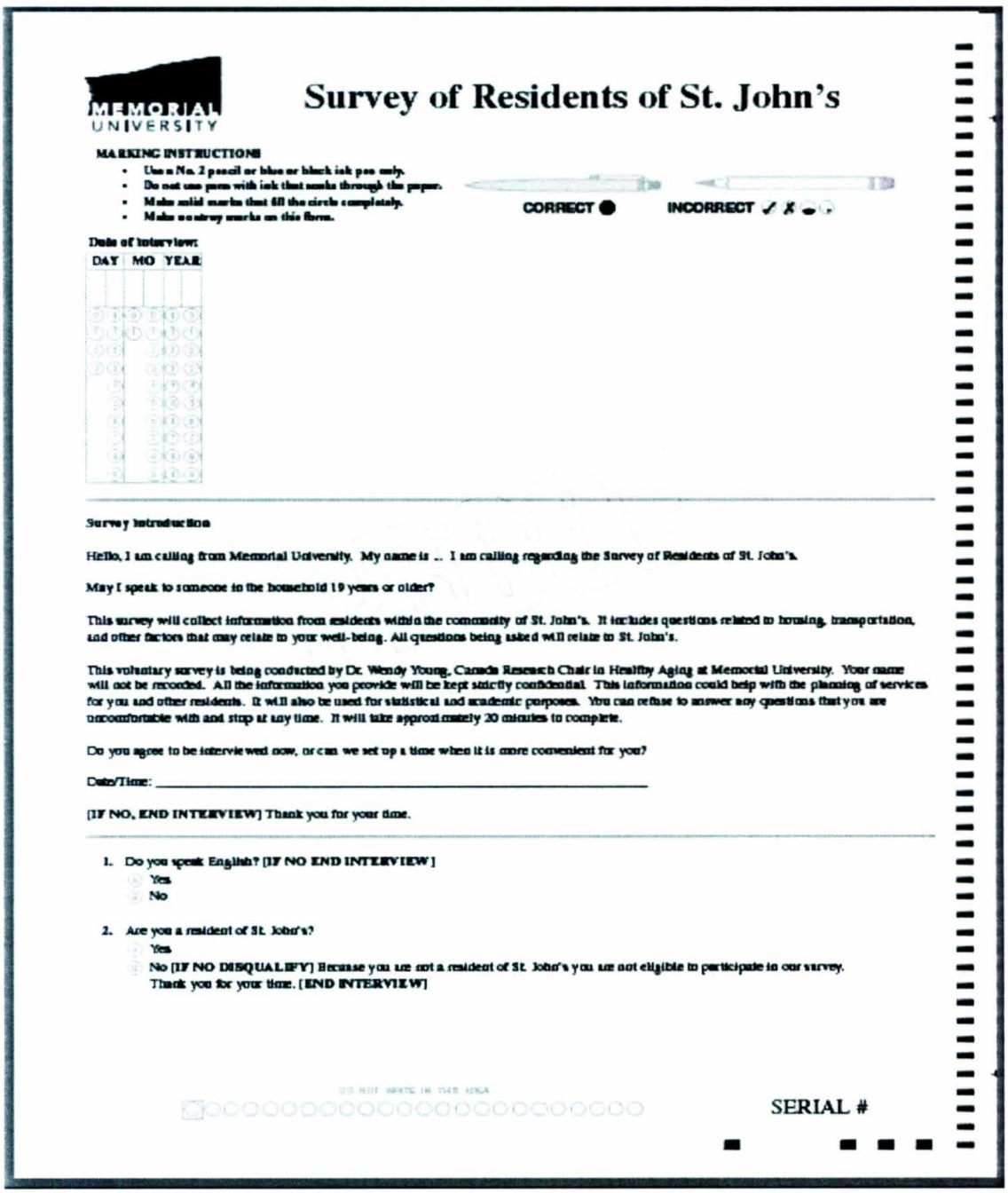
Appendix A

Survey of Residents of St. John's



MEMORIAL UNIVERSITY

Survey of Residents of St. John's

MARKING INSTRUCTIONS

- Use a No. 2 pencil or blue or black ink pen only.
- Do not use pens with ink that soaks through the paper.
- Make solid marks that fill the circle completely.
- Make no stray marks on this form.

CORRECT ● INCORRECT ✓ ✗ ◒ ◔

Date of Interview:

DAY	MO	YEAR

Survey Introduction

Hello, I am calling from Memorial University. My name is ... I am calling regarding the Survey of Residents of St. John's.

May I speak to someone in the household 19 years or older?

This survey will collect information from residents within the community of St. John's. It includes questions related to housing, transportation, and other factors that may relate to your well-being. All questions being asked will relate to St. John's.

This voluntary survey is being conducted by Dr. Wendy Young, Canada Research Chair in Healthy Aging at Memorial University. Your name will not be recorded. All the information you provide will be kept strictly confidential. This information could help with the planning of services for you and other residents. It will also be used for statistical and academic purposes. You can refuse to answer any questions that you are uncomfortable with and stop at any time. It will take approximately 20 minutes to complete.

Do you agree to be interviewed now, or can we set up a time when it is more convenient for you?

Date/Time: _____

[IF NO, END INTERVIEW] Thank you for your time.

1. Do you speak English? [IF NO END INTERVIEW]
   - Yes
   - No

2. Are you a resident of St. John's?
   - Yes
   - No [IF NO DISQUALIFY] Because you are not a resident of St. John's you are not eligible to participate in our survey. Thank you for your time. [END INTERVIEW]

DO NOT WRITE IN THIS AREA

SERIAL #

Show next page (→)

been a resident of St. John's? [RECORD EXACT]

years

AGE

4. For some of the questions I'll be asking, I need to know your age. [RECORD EXACT AGE IN YEARS]

years

[DISQUALIFY IF AGE IS < 19]
Because you are less than 19 years of age, you are not eligible to participate in our survey. Thank you for your time. [END INTERVIEW]

5. What is your current marital/partner status? [READ LIST IF NECESSARY, CODE ONLY ONE RESPONSE]
   - Single, never married or never lived with a partner
   - Married/Living with a partner in a common-law relationship
   - Widowed
   - Divorced
   - Separated
   - Refused [DO NOT READ]

SOCIO-DEMOGRAPHIC CHARACTERISTICS

General Background

6. Of what country were you a citizen this year? [READ LIST] [MAY CODE MORE THAN ONE]

   NOTE: "Canada by naturalization" refers to the process by which an immigrant is granted citizenship to Canada, under the Citizenship Act.

   - Canada, by birth
   - Canada, by naturalization
   - Other country, Please specify: _____

7. Are you now, or have you ever been a landed immigrant?
   Note that a "landed immigrant" is a person who has been granted the right to live in Canada permanently by immigration authorities.
   - No [IF "NO" SKIP TO QUESTION 9]
   - Yes

8. In what year did you first become a landed immigrant? [RECORD YEAR]

YEAR

Education

9. What is the highest level of education that you have ever completed? [CODE ONLY ONE RESPONSE]
   1. Grade 8 or lower
   2. High school
   3. University or college
   8. Don't know/No answer [DO NOT READ]
   9. Refused [DO NOT READ]

Retirement status

The following questions ask about your retirement experience.

10. At this time, do you consider yourself to be completely retired, partly retired or not retired? [READ LIST]
    1. Completely retired [IF YES, GO TO #11]
    2. Partly retired [IF YES, GO TO #11]
    3. Not retired [IF YES, SKIP TO #12]
    8. Don't know/No answer [DO NOT READ]
    9. Refused [DO NOT READ]

11. [IF THE ANSWER TO QUESTION 10 WAS A OR B]
    There are many reasons why people retire. What reasons contributed to your decision to retire?
    [READ LIST, MULTIPLE RESPONSES ALLOWED, CODE ALL THAT APPLY]
    1. Completed the required years of service to qualify for pension
    2. Retirement was financially possible
    3. Health/disability/stress reasons
    4. Employer offered special incentives to retirement
    5. Organizational restructuring or job eliminated
    6. Providing care to a family member or friend
    7. Employer had a mandatory retirement policy
    8. Wished to pursue hobbies or other activities of personal interest
    9. Wanted to stop working
    10. An agreement with your spouse or partner
    11. Other (please specify: _____)
    98. Don't know/No answer [DO NOT READ]
    99. Refused [DO NOT READ]

12. In general, how well do your income and investments currently satisfy your needs? [READ LIST]
    1. Very well
    2. Adequately
    3. Not very well
    4. Totally inadequately
    8. Don't know [DO NOT READ]
    9. Refused [DO NOT READ]

DO NOT WRITE IN THIS AREA

SERIAL #

13. Looking to your future, how well do you think your income and investments will continue to satisfy your needs? [READ LIST]
    1. Very well
    2. Adequately
    3. Not very well
    4. Totally inadequately
    5. Don't know [DO NOT READ]
    6. Refused [DO NOT READ]

Home ownership

The next question is about your current home.

14. Do you (and your spouse/partner) own or rent your home?
    1. Own
    2. Rent

    [IF NO] What are your current living arrangements?
    3. Other (please specify: _____)

15. How long have you lived in your home? ____ years

General Health

16. In general, would you say your health is excellent, very good, good, fair, or poor?
    [READ LIST, CODE ONLY ONE ANSWER]
    1. Excellent
    2. Very good
    3. Good
    4. Fair
    5. Poor
    7. Don't know/No answer [DO NOT READ]
    9. Refused [DO NOT READ]

17. I have talked with many adults and learned something from each of them about what they think promotes healthy aging. What do you think makes people live long and keep well? [RECORD VERBATIM, PROBE AND CLARIFY AS NECESSARY]

    _____
    _____
    _____
    _____
    _____

    7. Don't know/No answer [DO NOT READ]
    9. Refused [DO NOT READ]

I want to ask you some questions about the types of things you do on a daily basis to stay healthy. Do you:

18. Eat a balanced diet
    - Yes
    - No
    - Don't know [DO NOT READ]
    - Refused [DO NOT READ]

19. Get enough rest and sleep
    - Yes
    - No
    - Don't know [DO NOT READ]
    - Refused [DO NOT READ]

20. Keep physically active
    - Yes
    - No
    - Don't know [DO NOT READ]
    - Refused [DO NOT READ]

21. Avoid smoking
    - Yes
    - No
    - Don't know [DO NOT READ]
    - Refused [DO NOT READ]

22. Avoid alcohol or drink in moderation?
    - Yes
    - No
    - Don't know [DO NOT READ]
    - Refused [DO NOT READ]

23. Are you at all limited in the kind or amount of activity you can do because of a long-term illness, physical condition or health problem? By long term I mean a condition that lasted or is expected to last more than six months.
    - Yes [GO TO #24]
    - No [SKIP TO #25]
    - Don't know [DO NOT READ; SKIP TO #25]
    - Refused [DO NOT READ; SKIP TO #25]

24. [IF THE ANSWER TO QUESTION 23 WAS A]
    How well do you feel you are coping with this limitation? Would you say:
    - Very well
    - Fairly well
    - Not very well
    - Not at all well
    - Don't know [DO NOT READ]
    - Refused [DO NOT READ]

25. How would you describe your sense of belonging to your local community? Would you say it is:
    - Very strong
    - Somewhat strong
    - Somewhat weak
    - Very weak
    - Don't know [DO NOT READ]
    - Refused [DO NOT READ]

DO NOT WRITE IN THIS AREA

SERIAL #

Now I'd like to ask about certain chronic health conditions which you may have. We are interested in "long-term conditions" which are expected to last, or have already lasted, 6 months or more and that have been diagnosed by a health professional.

26. Do you have diabetes?
    1. Yes
    2. No
    3. Don't know
    4. Refused

27. Do you have high blood pressure?
    1. Yes
    2. No
    3. Don't know
    4. Refused

28. Do you have lung disease?
    1. Yes
    2. No
    3. Don't know
    4. Refused

29. Do you have heart disease (including stroke)?
    1. Yes
    2. No
    3. Don't know
    4. Refused

30. Do you have cancer?
    1. Yes
    2. No
    3. Don't know
    4. Refused

31. Have you ever been diagnosed with cancer?
    1. Yes
    2. No
    3. Don't know
    4. Refused

32. Do you have another chronic condition?
    1. Yes (please specify: _____)
    2. No
    3. Don't know
    4. Refused

Social Participation

33. Are you satisfied or dissatisfied with the kind and frequency of contact you have with *friends*, including personal contact, phone calls and letters? [READ LIST]
    1. Very satisfied
    2. Satisfied
    3. Neither satisfied nor dissatisfied
    4. Dissatisfied
    5. Very dissatisfied
    6. Don't know [DO NOT READ]
    7. Refused [DO NOT READ]

34. Are you satisfied or dissatisfied with the kind and frequency of contact you have with *family*, including personal contact, phone calls and letters? [READ LIST]
    1. Very satisfied
    2. Satisfied
    3. Neither satisfied nor dissatisfied
    4. Dissatisfied
    5. Very dissatisfied
    6. Don't know [DO NOT READ]
    7. Refused [DO NOT READ]

Outdoor Spaces and Buildings

35. In general, do you feel safe and secure in your house/apartment?
    1. Yes
    2. No
    3. Don't know [DO NOT READ]
    4. Refused [DO NOT READ]

36. In general, do you feel safe and secure outside in your neighbourhood? [IF YES, SKIP TO QUESTION 38]
    1. Yes
    2. No
    3. Don't know [DO NOT READ]
    4. Refused [DO NOT READ]

37. Does this concern limit your activities outside your home? [READ LIST]
    1. A great deal
    2. Somewhat
    3. Not at all
    4. Don't know [DO NOT READ]
    5. Refused [DO NOT READ]

Transportation

38. In general, which is your most common form of transportation? [READ CATEGORIES, SELECT ONLY ONE ANSWER]
    1. Drive a motor vehicle
    2. Passenger in a motor vehicle
    3. Taxi
    4. Bus
    5. Wheelway
    6. Cycling
    7. Walking
    8. Wheelchair or motorized cart
    9. Don't know [DO NOT READ]
    10. Refused [DO NOT READ]

Characteristics of St. John's

Using the five point scale, please tell us if you have a very positive, positive, neutral, negative, or very negative impression of the following features of St. John's (5 meaning very positive).
[DO NOT READ *F* OR *G*].

		Very Negative	2	3	4	Very Positive	Don't know	Refused
39	Buildings (public museums, community centres)	1	2	3	4	5	8	9
40	Outdoor spaces to be active (parks, trails, fields)	1	2	3	4	5	8	9
41	Other Outdoor Spaces (sidewalks, shelters, rest areas)	1	2	3	4	5	8	9
42	Recreational Facilities (gym, pools)	1	2	3	4	5	8	9
43	Transportation	1	2	3	4	5	8	9
44	Housing	1	2	3	4	5	8	9
45	How respectfully people are treated	1	2	3	4	5	8	9
46	How respectfully older people are treated	1	2	3	4	5	8	9
47	Public events or activities (including physical recreation)	1	2	3	4	5	8	9
48	Communication about public events	1	2	3	4	5	8	9
49	Public recognition given to people for their contributions	1	2	3	4	5	8	9
50	Public support given to volunteers	1	2	3	4	5	8	9
51	Opportunities for employment	1	2	3	4	5	8	9
52	Openness of City Council	1	2	3	4	5	8	9
53	Availability of support and services for health and wellness (medical and personal care)	1	2	3	4	5	8	9

DO NOT WRITE IN THIS AREA

SERIAL #

[SELECT UP TO THREE STATEMENTS FROM ABOVE THAT INDICATE "VERY NEGATIVE" OR WERE GIVEN THE NUMBER "1". SKIP TO QUESTION 63 IF NONE.

54. You have said that you have a negative or very negative impression of... [Read Corresponding Characteristics of St. John's]
Write question number:

55. How important do you think it is for the city of St. John's to improve ...
- Very important
- Somewhat important
- Not at all important

56. How could City Council improve ...?

57. You have said that you have a negative or very negative impression of... [Read Corresponding Characteristics of St. John's]
Write question number:

58. How important do you think it is for the city of St. John's to improve ...
- Very important
- Somewhat important
- Not at all important

59. How could City Council improve ...?

60. You have said that you have a negative or very negative impression of... [Read Corresponding Characteristics of St. John's]
Write question number:

61. How important do you think it is for the city of St. John's to improve ...
- Very important
- Somewhat important
- Not at all important

62. How could City Council improve ...?

We are getting close to the end now, I have just a few more questions I'd like to ask you.

63. Off the top of your head, what are the best things about living in St. John's generally?

64. Off the top of your head, what specific changes and or improvements might make it easier for you to live in St. John's?

65. Are there any other specific changes and or improvements that might make it easier for people to live in St. John's?

66. How would you describe St. John's as a place to live for all ages, abilities and financial means?
    1. Exceptional
    2. Very good
    3. Good
    4. Fair
    5. Poor
    6. Don't know [DO NOT READ]
    7. Refused [DO NOT READ]

    Please explain your rating. [RECORD VERBATIM, PROBE AND CLARIFY AS NECESSARY]

SEX

67. Are you male or female?
    1. Male
    2. Female

DO NOT WRITE IN THIS AREA

SERIAL #

POSTAL CODE

68. For statistical purposes, please provide your postal code.

69. Any other comments?

PROOF

Thanks so much for your time and help. Your input will help us to help others. If you would like a copy of the final report, you can find it on the Memorial University, School of Nursing website: www.mun.ca/nursing.

If you have any questions about taking part in this study, you can speak with the investigator who is in charge of the study. That person is Dr. Wendy Young and her phone number is 777-7333.

Or you can talk to someone who is not involved with the study at all, but can advise you on your rights as a participant in a research study. This person can be reached by calling the office of the Human Investigation Committee 777-6974.

Version date: Sep 22, 2011

DO NOT WRITE IN THIS AREA

SERIAL #

Appendix B
Contact Information for Volunteers

Thanks so much for your time and help. Your input will help us to help others. If you would like a copy of the final report, you can find it on the Memorial University, School of Nursing website: www.mun.ca/nursing.

If you have any questions about taking part in this study, you can speak with the investigator who is in charge of the study. That person is Dr. Wendy Young and her phone number is 777-7333.

Or you can talk to someone who is not involved with the study at all, but can advise you on your rights as a participant in a research study. This person can be reached by calling the office of the Human Investigation Committee 777-6974.

Appendix C
Permission to Use Figure 1

June 12th , 2012

Ref: HC2012-0175

Devonne Ryan
4 Surrey Place
St.John's, Nfld
A1A 5A7

Email: devonneryan@gmail.com

RE: Copyright Request –*Cardiovascular Disease Morbidity, Mortality and Risk Factors Surveillance Information*

Dear Sir/Madam

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Yours sincerely,

Louise Sicard

Publishing & Copyright Administrative Officer
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Steven Chapman, Communication Executive, Creative Services, PHAC
Mark Grantham, Corporate Communications, HC

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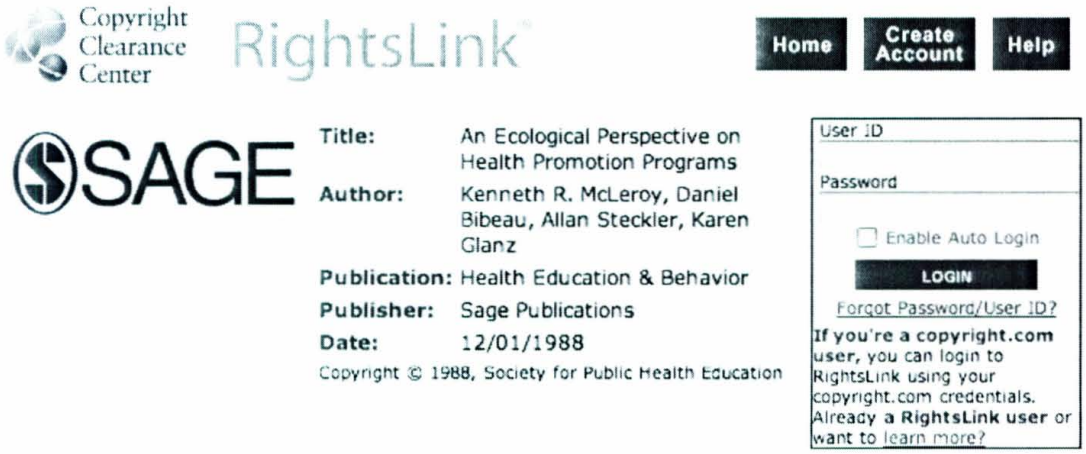
Appendix D
Permission to Adapt Figure



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Appendix E
Permission to Adapt Figure 3

June 12th , 2012

Ref: HC2012-0174

Devonne Ryan
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Email: devonneryan@gmail.com

RE: Copyright Request –*Economic Burden of Illness in Canada, 1998*

Dear Sir/Madam

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Appendix F
Permission to Adapt Figure 4

June 12th , 2012

Ref: HC2012-0177

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RE: Copyright Request –*Economic Burden of Illness in Canada, 1998 – Table 17*

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Appendix G
Permission to Adapt Figure 5

June 12th , 2012

Ref: HC2012-016

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RE: Copyright Request –*Economic Burden of Illness in Canada, 1998 – Figure 16*

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Yours sincerely,

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