

Urban Aboriginal Health:  
Using individual and contextual approaches to better understand the health of  
Aboriginal populations living in Toronto

by

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## **AUTHOR'S DECLARATION**

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

## ABSTRACT

**INTRODUCTION:** Canada's Aboriginal population is growing at a faster rate than the rest of Canada. While Aboriginal health has improved in the last few decades, life expectancy of First Nations, Inuit and Métis continues to be lower compared to the rest of the Canadian population. Furthermore, current Aboriginal health research tends to focus on those living on reserves while more than half of the Aboriginal population currently resides in urban areas. Despite the importance of neighbourhood factors for understanding health in urban areas, the importance of neighbourhood characteristics for urban Aboriginal health has yet to be examined.

**OBJECTIVE:** The objective of the research was, to determine both individual-level predictors and neighbourhood-level predictors of self-rated health and diagnosis of chronic conditions, amongst Aboriginal populations living in the City of Toronto; and to determine whether and how neighbourhood-level predictors influence individual-level predictors of self-rated health and diagnosis of a chronic conditions in Toronto neighbourhoods with Aboriginal populations living in them.

**METHODS:** This study was a secondary analysis of two samples from the 2006 Aboriginal people Survey, consisting of 1080 and 500 Aboriginal individuals in the Toronto Census Metropolitan Area. A series of logistic regressions models were created to identify individual and neighbourhood predictors of "poor" self-rated health and having one or more diagnosed chronic condition(s).

**RESULTS:** A best fitting model was derived from the individual-level variables to include the demographic variables age, gender and Aboriginal status; and the socio-economic variables average household income, education level and employment status. While neighbourhood-level variables had no significant influence in predicting either health outcome, there was some evidence to suggest influence over individual-level predictors. To further examine this relation, neighbourhoods were stratified based on income inequality, average household income and availability of Aboriginal specific services. This analysis yielded some different effects of individual-level variables for different neighbourhood types, suggesting that some effects of neighbourhood characteristics may interact with individual characteristics to influence health.

**CONCLUSION:** While contextual factors have some effect on self-rated health, individual factors serve as stronger predictors of individual health. However, more neighbourhood level studies should be considered in order to better understand the growing urban Aboriginal population and potential ecological effects on health.

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## **1.0 INTRODUCTION**

The Canadian Aboriginal population is on the rise, and the health of this population is an ongoing concern. Whether measured in terms of mortality, life expectancy or the risk of various specific health outcomes, First Nations, Inuit and Métis people continue to have poorer health status when compared to the general Canadian population (Statistics Canada 2009c; Waldram et al. 2006; Wilson & Rosenberg 2002).

From a social determinants of health perspective, health inequalities between Aboriginal people and the rest of the Canadian population can be thought of as largely due to disparities in income, education, employment, lifestyles and behaviour, and access to and use of culturally appropriate health and social services (Adelson 2005; Wilson & Rosenberg 2002). In recent years, there has been a growing focus on the effects of contextual-level characteristics on health outcomes focusing on factors that operate at the neighbourhood, city, provincial and national levels. Characteristics of place such as the physical environment, the availability of social, health and legal services, socio-economic composition and cultural characteristics can potentially affect the health of individuals. For example, lack of easy access to healthy foods within a neighbourhood has been identified as a strong predictor of obesity and overweight among residents (Harrington & Elliott 2008). Therefore, ecological approaches to health seek to identify factors that affect a group of individuals collectively and suggest policy changes needed at the neighbourhood or higher levels.

Although contextual (considering individuals' social, economic and physical environment) approaches to investigating health outcomes have been used to examine the health of non-

Aboriginal populations, they have yet to be used to understand health outcomes in urban Aboriginal people living in urban settings (Minore et al. 2009; Richmond & Ross 2009). With a growing urban Aboriginal population in Canada, such research will be essential in understanding how social conditions experienced by this population affect their overall health status. This needs to be done in order to be able to better guide policy change and program development.

The purpose of this thesis was to determine if individual-level and neighbourhood-level factors are significant in predicting self-rated health among Aboriginal people living in an urban setting, using data from the 2006 Census and the 2006 Aboriginal Peoples Survey. Our investigation focuses on the Aboriginal population living in the City of Toronto. Toronto has one of the largest urban Aboriginal populations in Canada, and it has been projected that this population will continue to increase (Minore et al. 2009; Statistics Canada 2009b). The City of Toronto has established a Social Research and Analysis Unit dedicated in facilitating contextual studies by identifying neighbourhoods for the purposes of ecological research (City of Toronto 2004). This study took advantage of the Unit's neighbourhood level social indicators.

## **2.0 BACKGROUND**

The geographical distribution of the Canadian Aboriginal population has changed greatly over the past few decades. The 2006 Canadian Census indicated that, for the first time, there were more Aboriginal people living in Canadian cities than in rural or reserve areas (INAC 2009). Aboriginal people, including those living in urban areas, continue to face poorer health outcomes relative to non-Aboriginal Canadians (Wilson & Rosenberg 2002). The social determinants of health approach helps us understand these disparities by relating them to lower socio-economic factors among Aboriginal peoples. In addition to the effects of these individual-level characteristics, Aboriginal people may tend to live in neighbourhoods with characteristics that negatively influence their health outcomes. This includes the socio-economic characteristics of the neighbourhoods, as well as limited access to various services including services targeted to Aboriginal people.

In this chapter, we first describe the demographic and health status of the Aboriginal population, with a particular focus on Aboriginal peoples living in urban areas. We then present the main aspects of a social determinant of health approach to Aboriginal peoples' health, including the characteristics of individuals and families that increase the risk of poor health outcomes. Finally, we discuss some of the aspects of neighbourhoods, which affect the health of urban Aboriginal peoples.

## **2.1 Demographics and Health Status of the Canadian Aboriginal Population**

The Canadian *Constitution Act* 1982, Section 35(2) defines Aboriginal people as First Nations, Métis and Inuit, and recognizes the important cultural differences among each of these groups (Department of Justice 2010b). With over 1.4 million people identifying themselves as Aboriginal, the 2006 Census showed that the Aboriginal population had been growing at a faster rate than the non-Aboriginal population (HRSDC 2010; Statistics Canada 2009). The Aboriginal population increased 20.1% between 2001 and 2006 and made up about 3.8% of Canada's total population in 2006 (HRSDC 2010; Statistics Canada 2009c). Some of the reasons for this growth include an increase in self-identification in the Census, and a birth rate which is 1.5 times higher that of the non-Aboriginal population (Adelson 2005).

According to the 2006 Census, more than 50% of Aboriginal people in Canada were living in urban settings as opposed to First Nations reserves, Inuit/Métis communities or other rural communities (INAC 2009). Of these 623,470 individuals, approximately 34%, lived in one of the following metropolitan areas: Winnipeg, Edmonton, Vancouver, Calgary and Toronto (INAC 2009).

### **2.1.1 Health Status of Aboriginal Peoples**

Aboriginal populations have poorer health status overall when compared to non-Aboriginal populations in Canada (Wilson and Rosenberg 2002). While Aboriginal health status has improved in the last few decades, the life expectancy of this population continues to be lower than that of other Canadians (Statistics Canada 2009; Wilson and Rosenberg 2002). In 2000,

the life expectancy for Status First Nations was 68.9 years for men and 76.3 years for women, compared with 76.3 years and 81.5 years for non-Aboriginal men and women, respectively (Statistics Canada 2009).

As mentioned, health inequality amongst Aboriginal people and the rest of the Canadian population is believed to be largely attributable to disparities in income, education, lifestyle and behaviour, and access to and use of culturally appropriate health and social services (Wilson & Rosenberg 2002). In addition, Canada's Aboriginal population faces elevated rates of suicide, drug and alcohol abuse, sexual violence, and various negative health outcomes and risk factors such as diabetes and obesity (Adelson 2005; Richmond et al. 2007; Wilson and Rosenberg 2002). While there is still some debate on the contribution of genetics to the increase in diseases such as diabetes amongst Aboriginal people, issues such as changing diets, food security, and access to culturally appropriate resources play a larger role in this complex causation model (Adelson 2005; Wilson & Rosenberg 2002). Furthermore, research has already linked social inequities to higher stress levels which affect bodily defences and in turn make individuals more susceptible to disease, disability and premature death (Adelson 2005; Cockerham 2004).

Over the past two decades there has been a significant amount of research on the health of Aboriginal people in Canada. This research has focused on understanding the complex historical, economical, social, behavioural and cultural issues associated with the ongoing health disparities between Aboriginal people and the general Canadian population (Waldram et al. 2006). Existing quantitative research on the health of Aboriginal people has generally

taken a traditional “risk factor” epidemiological approach by focusing on individual-level determinants of health and the risk of particular health outcomes (Diez Roux 2001; Richmond & Ross 2009). This is probably due to the fact that, since the Second World War, epidemiology research has generally focused on individuals, explaining systematic population differences in health with reference to individual-level differences in resources, behaviour and genetics (Macintyre et al. 2002). This resulted in an emphasis on health interventions and promotion practices that are also focused at individuals as opposed to communities or neighbourhoods as a whole. In addition, despite increasing research on Aboriginal health, most of the research tends to focus on Aboriginal people living on reserves or First Nations, with few studies pertaining to other Aboriginal populations including those living off reserves (Tjepkema 2002; Wilson and Young 2008; Young 2003).

### **2.1.2 Aboriginal Peoples in Urban Areas**

Aboriginal populations have been increasing within urban areas since the early 1950s and a significant amount of literature has been published that explained some migration issues. Focus within this area has declined over the years (Peters 2002). It was not until after the 1991 Census when Aboriginal populations began to increase considerably within urban settings that the Royal Commission on Aboriginal Peoples recognized urban Aboriginal populations as an important research population (Peters 2002). Since then, research in this area has steadily increased. Studies have indicated that a lack of education has led to unemployment or low-wage jobs. In turn, this has subsequently resulted in low levels of income, poverty and reliance on social-assistance (Peters 2002). While this is not that different than the case of other low socio-economic populations living in urban areas, the

main difference between these two populations is the apparent lack of services, such as employment, education, and housing services, required to facilitate the transition from on-reserve conditions to urban settings (Peters 2002; Kastes 1993). This difference has been further exacerbated by limited or non-existent cultural supports in larger cities and a general lack of research investigating the potential effects of cultural factors on urban Aboriginal people's overall well-being (Peters 2002; Wilson & Rosenberg 2002).

Growth of the urban Aboriginal population is due to various factors including high birth rates and increased self-identification as Aboriginal in the Census (Adelson 2005; Cooke & Bèlanger 2006). Contrary to popular belief, migration to urban settings by Aboriginal peoples has not been a major contributor to this increase. However, migration has been an important contributor to the composition of the urban population. Urban immigration to urban areas is often a result of the search for better employment, education and housing opportunities, rather than emigration resulting from leaving existing on-reserve conditions (Adelson 2005; Cooke & Bèlanger 2006). In a study conducted by Cooke and Bèlanger (2006), Aboriginal participants described the move to the city of Winnipeg as providing them with "better opportunities in employment and education in addition to better access to health care and housing" (Cooke & Bèlanger 2006). Furthermore, an increase in migration to urban areas could be influenced by desires to access Aboriginal specific social services including traditional health clinics and Aboriginal specific housing opportunities (Cooke & Bèlanger 2006).

In Canada, Toronto has the fifth largest urban Aboriginal population (City of Toronto 2010). According to 2006 Census data, there were approximately 31,910 Aboriginal people living in the Greater Toronto Area, a 33.2% increase from 2001 (Statistics Canada 2009). Of this population, approximately 26,575 Aboriginal people live within the City of Toronto (Statistics Canada 2009).

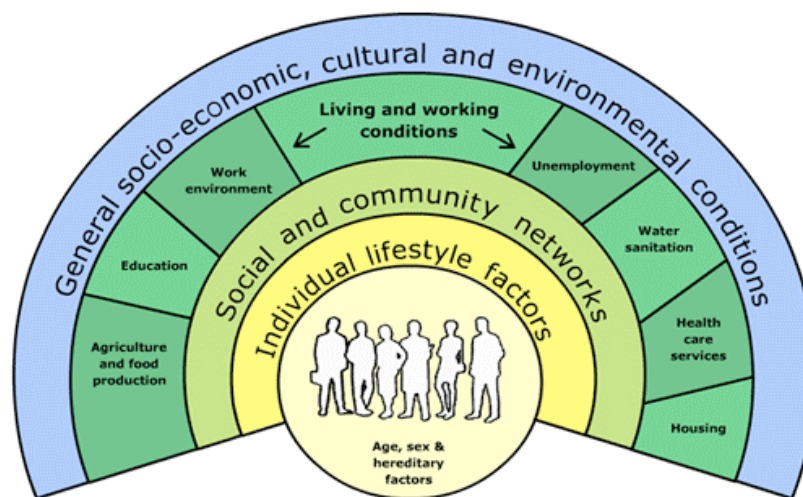
## **2.2 The Social Determinants of Health**

Over the past thirty years, the social determinants of health (SDOH) concept and approach to understanding population disease causations has become widely recognized in both research and policy. This approach considers how societal factors such as income, education and employment affect health and the unequal distribution of these factors influences the overall wellbeing of a population (Graham 2004). The 1974 Lalonde report provided Canada with its first list of determinants including *human biology, environment, lifestyle, and health systems* as important characteristics influencing the health status of the Canadian population (Lalonde 1974). Since then, the social determinants of health approach has continued to generate interest in public health research, perhaps in part, due to its interdisciplinary nature (Raphael 2010). The majority of existing research in this field focuses on two areas. The first one is whether and how these social determinants of health influence the health of individuals, communities, and the populations as a whole (Raphael 2010). The second concerns how the social determinants of health are associated with the availability, access and efficiency of a variety of resources and programs provided by a society to its population (Raphael 2010).



There have been several different determinants of health frameworks proposed. Perhaps Margaret Whitehead and colleagues' 1991 famous depiction of the *broader determinants of health* best encompasses the various determinants, including the social factors presented in Figure 1. This model provides a perspective on a range of socio-economic, cultural and environmental conditions that affect health and the relationships among each of the determinants.

**Figure 1. A conceptual model of the main determinants of health.**



Source: Whitehead et al. 1991.

Research focusing on the social determinants of health of Aboriginal peoples has been minimal and generally focuses on the on-reserve<sup>1</sup> First Nations populations or Inuit communities (Wilson and Rosenberg 2002). Furthermore, the pathways describing how these health disparities are produced remain relatively unexplored, compared to those described for the general population (Richmond & Ross 2009). Nonetheless, Aboriginal

<sup>1</sup> According to Canada's *Indian Act* an Indian reserve refers to a "tract of land, the legal title to which is vested in Her Majesty, that has been set apart by Her Majesty for the use and benefit of a band" (Department of Justice 2010a)

populations across the world continue to have poorer than average conditions for each of these determinants with potentially negative effects for the health of individuals and of these populations (Frohlich et al. 2006). This indicates the importance of also addressing some of the health determinants or causes at a higher or “upstream” level rather than focussing on the conditions and behaviours of individuals.

As useful as social determinants frameworks have been, some scholars have suggested that they may be poorly suited to understanding and addressing the health status of Aboriginal peoples, and existing frameworks should be expanded to include Aboriginal-specific determinants of health. These may include access to cultural activities, language and other traditional activities (Richmond & Ross 2009; Wilson & Rosenberg 2002). By not doing so, it is argued that social determinants frameworks tend to ignore important factors that are vital to the maintenance of Aboriginal identity and which influence health outcomes (Richmond & Ross 2009; Wilson & Rosenberg 2002).

Therefore, it is our aim to create an appropriate research framework that encompasses not only the traditional social determinants of health but also Aboriginal specific cultural variables that would provide a better and more unique conclusions about the issues affecting this population within the City of Toronto.

## 2.3 Neighbourhood Effects and Health

In recent years, interest has been generated in the area of community and neighbourhood factors influencing the health of their inhabitants. In 2008, the WHO Commission on Social Determinants of Health stated:

Communities and neighbourhoods that ensure access to basic goods, that are socially cohesive, that are designed to promote good physical and psychological well-being, and that are protective of the natural environment are essential for health equity. (CSDH 2008)

There has been increasing interest in the role of neighbourhoods, community and other definitions of place, in predicting individual health (Kawachi & Berkman 2003; Pickett & Pearl 2001). These studies have attempted to identify the characteristics of context that have effects on individual and providing good empirical and theoretical explanation for these effects, while also defining what constitutes a “healthy neighbourhood” (Diez Roux 2001; Kawachi & Berkman 2003; Pickett & Pearl 2001). Data from Statistics Canada have been used in various studies to analyse the neighbourhood-level effects on the health of Canadians. Veugelers and colleagues used Census data to categorize neighbourhoods by income levels, unemployment rates, average education level and the proportion of single mothers in order to predict individual mortality (Veugelers et al. 2001). Ross et al. (2004) used the Canadian Community Health Survey data to examine neighbourhood effects including, the concentration of lone parents, recent immigrants and the percentage with low education and median household income, on individual (HUI) scores of residents of Montreal (Ross et al. 2004).

While contextual factors may affect both Aboriginal and non-Aboriginal populations, characteristics of the Aboriginal population may provide better explanations for certain outcomes (Wilson & Rosenberg 2002). These Aboriginal specific factors have been presented in different ways by various authors. The following sections draw on these studies and focus on some of the contextual effects that are most likely important in the Aboriginal health framework. These include aspects of physical environment, access to social services, socio-economic composition and cultural characteristics of neighbourhoods (Macintyre et al. 2004).

### **2.3.1 Neighbourhood physical environments**

The physical features of the environment influence individual health through various mechanisms including exposure to toxicity, housing conditions and distances to various services including food outlets, clinics and social services (Keller-Olaman et al. 2005). For example neighbourhoods with high exposure to dangerous toxic environments on a daily basis can have severe negative effects on one's health. For example, exposure to asbestos often found in insulation of older structures has now been linked to various cancers (Ross & Mirowsky 2001). Housing conditions and quality are important for health not only because housing is a main site of exposure, but also because crowded conditions tend to foster transmission of disease (Keller-Olaman et al. 2005). Finally, the need to travel long distances to purchase healthy foods or to access medical care or social services, has had potential effects on health through patterns of activity and behaviour (Haines et al. 2009; Kawachi & Berkman 2003; Pickett & Pearl 2001). For example, individuals may be less likely to seek medical care if they must travel significant distances due to, for example, limited means of transportation.

### **2.3.2 Access to social services in the neighbourhood**

Access and availability to social, legal and health services in communities or neighbourhoods has been identified as important for individual well-being (Kawachi & Berkman 2003). In the Aboriginal context, this may not only refer to the distance to and from service centers that might provide such support, but also the actual existence of these services in small communities. Size of the community can affect the capacity of communities to provide services (Kawachi & Berkman 2003). Services in areas such as education, transportation, health, social and employment are important and may be associated with health effects. In addition, the presence of traditional Aboriginal health services within a community can mean that Aboriginal individuals within that neighbourhood may be more likely to seek medical care due to comfort and familiarity with cultural norms and forms of healing (Richmond & Ross 2009).

### **2.3.3 Socio-economic composition of the neighbourhood**

Generally, most research investigating neighbourhood effects on individual health has focused on socio-economic factors. This includes research examining at the effects of income levels, education composition and employment status (Richmond et al. 2007; Waldram et al. 2006). The role of income inequality on individual health, beyond the importance of the level of individual income, has been greatly debated over the years (Lynch et al. 2004; Wagstaff & Van Doorslaer 2000). The degree of income inequality in high-income countries is positively

associated to mortality (Wilkinson 2005). At the national level, this relation has been explained in various ways.

Psycho-social explanations refer to the stress associated to being part of the lower class in an unequal society and the resulting physiological impact including the negative effects on the neuroendocrine pathways (Wilkinson 2005). Presence of crime and “social disorder” are other aspects neighbourhoods which may contribute to stress, with effects on health (Ross & Mirowsky 2001).

An alternative to the suggested psycho-social explanation is a return to the material effects of inequality. An unequal community may also be one in which there is both a lack of resources among individuals, as well as ongoing under-investment in community infrastructure (Lynch 2000). The neo-material explanation suggests that inequality may be a marker for a society in which the interests of particular classes are furthered at the expense of others, leading to increased poverty, reduced investment in social resources, and poorer health (Coburn 2004). While such explanations may be useful at the national level of analysis, it is unclear exactly what effects they would have within-neighbourhood inequality, although such effects may explain some of the differences within and between neighbourhoods.

#### **2.3.4 Cultural characteristics of the neighbourhood**

Neighbourhood or community norms and values, particularly those related to reciprocity and the degree of community integration, are related to social capital (Macintyre et al. 2002).

Culture is clearly important for the transmission of health-related behaviours and beliefs.

When considering Aboriginal people, there might be other aspects of culture, including

kinship structures and norms of social support that are important for individual health. The maintenance of cultures has been identified as a separate aspect of communities that has implications for health. In particular, in 1998 Chandler and his colleagues found that community control over various services, including health and education, were protective factors against suicide (Chandler & Lalonde 2007).

In relation to the growing urban Aboriginal population, it is important to identify these neighbourhood characteristics in order to better understand the health of this population. Although past studies have merely considered neighbourhood effects on Aboriginal individual health, there are good reasons that such analysis should be conducted. One reason may be that neighbourhoods are an important determinant of health for Aboriginal people. For example, in urban areas, various authors have stated the importance of Aboriginal urban community institutions and support for outcomes such as employment (Peters & Newhouse 2003; White & Maxim 2003). For those living in discrete Aboriginal communities, the importance of community characteristics, including community resources and capacity may be clearer. In order to improve the health of Aboriginal peoples on and off reserves, it requires an understanding of the effects of both the individual and contextual determinants of health. Furthermore, by studying both neighbourhood and individual-level factors together, we can develop a better Aboriginal health framework which not only addresses individual and neighbourhood factors together, but also includes important Aboriginal specific health determinants, such as the availability of social and culturally specific care (Lafontaine 2006; Richmond & Ross 2009; Wilson & Rosenberg 2002).

### 3.0 STUDY PURPOSE AND RESEARCH QUESTIONS

Given the growth of the urban Aboriginal population and the evidence of the importance of contextual effects on individual health, the purpose of this study is to examine the relationship between aspects of urban neighbourhoods and the average health status of the Aboriginal people who live in them. This includes social and demographic characteristics of the neighbourhoods, such as average income and the proportion of Aboriginal people in the neighbourhood. In light of the importance that researchers have recently placed on the possibility that there are Aboriginal-specific determinants of health, we ask whether Aboriginal people with better overall health status may tend to live in neighbourhoods with Aboriginal-specific services available. To determine this, the following analysis will consist of the three objectives:

*Objective 1: To determine the individual-level predictors of self-rated health and diagnosis of chronic conditions amongst Aboriginal populations living in Toronto.*

We expect that age and gender will be significant predictors of self-rated health outcomes. We also expect that people with lower socio-economic outcomes will have lower overall health status.



*Objective 2: To determine neighbourhood-level predictors of self-rated health and diagnosis of chronic conditions in Toronto neighbourhoods with Aboriginal populations living in them.*

We expect that the neighbourhood-level factors studied will be significant predictors of both self-rated health and diagnosis of chronic condition. Furthermore, from this analysis, we expect that the effects of neighbourhood characteristics will modify the effects of individual characteristics on health outcomes.

*Objective 3: To determine whether and how neighbourhood-level predictors influence individual-level predictors of self-rated health and diagnosis of a chronic condition in Toronto neighbourhoods with Aboriginal populations living in them.*

We expect that people living in neighbourhoods with high income inequality and low average income will have poorer health outcomes. We also expect that Aboriginal people living in neighbourhoods with more Aboriginal specific services available will have better overall health.

## 4.0 METHODS

The study used a cross-sectional approach to study a broad range of information on Aboriginal individuals living in the City of Toronto. Individual level (demographics, socio-economic status and others) and neighbourhood level characteristics (income inequality, average household income and availability of Aboriginal specific services) were analyzed in a series of logistic regression models to examine relationships between health status and these potential predictors. The study involved secondary analysis of data from both the 2006 Census and the 2006 Aboriginal Peoples Survey (APS) datasets. The following sections discuss the general approach, the data sources and how they were modified to accommodate geographical boundaries. An explanation describing individual, neighbourhood and health outcome variables chosen for the analysis is provided followed by a description of the sub-sample including the modifications required by Statistics Canada in order to complete our analyses.

There is currently a great deal of research interest in the effects of place, whether defined as neighbourhood, administrative region, or other area, on health. One of the developments driving this interest, besides the developments of theory, has been the development of hierarchical or multilevel methods that incorporate individual-level variables and ecological variables into the same model in order to study the effects of place or area on various health outcomes (Harrington & Elliott 2009, Ross & Mirowsky 2001; Wilson et al. 2009).

In this thesis we do not take a multilevel approach, but rather estimate a series of logistic regression models that include both individual-level and neighbourhood-level variables in

order to analyze their effects on self-rated health. The main reason is that our work is somewhat exploratory, as there has not been research that has examined the effects of area characteristics on the health of Aboriginal people. It is therefore desirable to use simpler techniques to assess the relative importance of neighbourhood-level factors, and leave multilevel models for future research.

The main analysis included three steps. The first, corresponding to the first research question, was to construct a model predicting “poor” self-rated health and diagnosis of chronic conditions, using a set of individual-level predictors. These included income, education, employment status, marital status, and other individual-level characteristics derived from a social determinants of health perspective and found on the 2006 APS dataset.

In order to complete the second and third research objectives, the study made use of the 140 Toronto neighbourhoods as defined by the City of Toronto Social Research and Analysis Unit, using Statistics Canada Census Tracts (CT) (City of Toronto, 2004). This allows characteristics such as average neighbourhood income to be attributed to these neighbourhoods. Statistics Canada’s 2006 Aboriginal Peoples Survey (APS) provides individual-level information about the Aboriginal population, including demographic and social characteristics and self-rated health status. Because the APS also includes geographic information and Census Tract of residence, we are able to connect individual information from the APS to neighbourhood characteristics from the Census.

The second step consisted of selecting neighbourhood-level predictors to study their effects on the two health outcomes. *Income inequality, average household income and availability of Aboriginal specific services* were chosen as neighbourhood characteristics. While we recognize other indicators can be used, these indicators were chosen as they represent two of the four neighbourhood characteristics discussed, *access to Aboriginal-specific social and health services in the neighbourhood*, and *socio-economic composition of the neighbourhood*, and were accessible within the datasets at the neighbourhood level. The other two categories, *physical environment* and *cultural characteristics of a neighbourhood* were excluded due to a lack of strong indicators within the 2006 Census that would adequately represent these categories. One possible indicator for future analysis can be the presence of recreational spaces such as parks and walking trails as such space allows for participation in physical activity.

The third and final step of the analysis helped to further explore the effects of neighbourhood-level characteristics on individual-level predictors of our health outcomes. This step consisted of stratifying the neighbourhoods based on the three neighbourhood characteristics mentioned and analyzing the effects of individual-based indicators of “poor” self-rated health and diagnosis of chronic conditions at each of the stratification levels.

#### **4.1 Data Sources**

Two sources of data from 2006 were used for this study, the 2006 Census and the 2006 Aboriginal Peoples Survey (APS). Both datasets were provided by Statistics Canada via the Research Data Centres Programme.

The 2006 Census involved a questionnaire disseminated to every household across Canada consisting of 10 basic demographic questions including age, sex, and marital status. One in five households received the long census form consisting of 61 questions on different areas of interest including education, employment and income (Statistics Canada 2009a). Details on the Census and the sampling procedure can be found in the *2006 Census Technical Report: Sampling and Weighting* (Statistics Canada 2010b).

The Aboriginal Peoples Survey (APS) is a voluntary post-census survey given to a sample selected from individuals whose response on the 2006 Census questionnaire indicated that they “*had Aboriginal ancestors; and/or identified themselves as North American Indian, and/or Métis, and/or Inuit; and/or had treaty or registered Indian status; and/or had Indian Band membership*” (Statistics Canada 2008). The APS targets populations living across Canada, aged 6-14 years and 15 years and over and excludes individuals living in Indian settlements, on-reserves or in institutions. Note that an individual must have a valid postal code and have completed the 2006 Census in order to be included in the sampling frame. For Ontario, all questionnaires were conducted via telephone and data were collected directly from survey respondents.

In the present study, the APS data were used to create the individual-level models of self-rated health. The Census provided data on neighbourhoods, using the definitions from the City of Toronto.

## 4.2 Defining Neighbourhoods

Since the primary interest was the potential effects of neighbourhood characteristics on self-rated health, it is important to be clear about the definition of place. Studies of the effects of places or areas on health have used a number of different definitions for those areas and these have ranged from relatively small areas such as the immediate neighbourhood to counties or regions. It may be that different ecological effects operate at different geographic levels.

As well, the definitions of those areas have differed in the way they are defined. Some studies have used the term “lived neighbourhoods”, defined empirically by asking residents about what they consider to be neighbourhood boundaries (Diez Roux 2001; Kawachi & Berkman 2003; Ross & Mirowsky 2001). Others use administrative boundaries such as wards or boroughs, perhaps considering that aspects of local government are important determinants of place-level effects. Still other studies have defined area units as statistical areas such as Census Tracts (Diez Roux 2001; Kawachi & Berkman 2003; Ross & Mirowsky 2001). The term “neighbourhood” in this report refers to the boundaries developed by the City of Toronto’s Social Research and Analysis Unit in collaboration with Statistics Canada. These neighbourhoods were designed to strike a balance between representing “lived communities” and administrative units, and facilitating statistical definition. The definitions included the following criteria:

1. Originally based on an Urban Development Services Residential Communities map, based on planning areas in former municipalities, and existing Public Health neighbourhood planning areas;
2. No neighbourhood be comprised of a single census tract;
3. Minimum neighbourhood population of at least 7,000 to 10,000;

4. Where census tracts were joined with the most similar adjacent area according to the percentage of the population living in low income households;
5. Respecting existing boundaries such as service boundaries of community agencies, natural boundaries (rivers), and manmade boundaries (streets, highways, etc).
6. Maintaining neighbourhood areas small enough for service organizations to combine them to fit within their service area;
7. The final number of neighbourhood areas be “manageable” for the purposes of data presentation and reporting.

(City of Toronto 2004)

### **4.3 Study Sub-sample**

Two samples were used in our analysis, one being a sub-sample of the other. The inclusion criteria consisted of people who self-identified themselves as members of an Aboriginal group on the APS questionnaire, were 15 and older, and had answered both self-rated questions.

The first sample consisted of individuals who were living within the Toronto Census Metropolitan Area (CMA). According to Statistics Canada’s geographic classification, the Toronto CMA represents the Greater Toronto Area<sup>2</sup>, including the City of Toronto as well as adjacent urban areas. The Toronto CMA consisted of 1080<sup>3</sup> Aboriginal individuals.

From this, the City of Toronto neighbourhood boundaries were applied to the Toronto CMA sample in order to assemble a sub-sample of 500 Aboriginal individuals for the City of Toronto. Although small, this sample was sufficient for the neighbourhood-level analyses.

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<sup>2</sup> The Greater Toronto Area is defined by the City of Toronto, and the four surrounding regions of York, Peel, Durham and Halton. This is roughly the Toronto Census Metropolitan Area as defined by Statistics Canada.

<sup>3</sup> Due to Statistic Canada’s dissemination rules, all N values are rounded to the nearest 10.

From the 140 neighbourhoods, (ie. all neighbourhoods), 15 neighbourhoods that contained no Aboriginal residents were also omitted from the study since analysis including these neighbourhoods would have no value. Therefore, the final sample included 1080 Aboriginal individuals at the Toronto CMA level and 500 Aboriginal individuals within the 125 Toronto neighbourhoods.

#### **4.4 Dependent Variables: Self-Reported Health and Presence of Chronic Conditions**

Various indicators such as mortality, low birth weight, and incidents of specific diseases can be used to measure the health status of a given population through data collected and reported by hospitals, clinics and organizations. Self-rated health measures have been recognized as good predictors of mortality and morbidity and reliable indicators of overall health status (Cott et al. 1999; Haines et al. 2009; Newbold 2005). While, self-rated health is not a direct measure of health status, numerous studies have identified that self-reported health is a strong indicator of health status including for minority populations (Newbold 2005). Research focusing on perceived self-rated health has generally included indicators such as: self-reported health measured on a 5 point scale ranging from “poor” to “excellent”, smoking status, medical diagnosis of chronic conditions and health care utilization (Newbold 2005, Wong et al. 2009). While studies have proven that self-rated health is significant and not greatly affected by response biases, other health indicators as mentioned, are often paired with the self-reported measures to provide an alternative to medically assessed conditions (Cott et al. 2009; Veenstra 2009).



Substantial research has linked various individual-level characteristics such as gender and age to self-rated health and current research has shifted to study the effects of neighbourhood-level characteristics on self-rated health. In a recent Canadian study, it was concluded that “disadvantaged” Census Dissemination Areas (DAs) had “a significant effect on health status” and that the residents of those areas were less likely to report having “excellent” self-reported health compared to residents from less disadvantaged DAs (Haines et al. 2009 pg. 384).

Two indicators of health were included as dependent variables in our study. The first measure was *self-rated health*. Data for this measure was taken from the APS 2006 and based on the responses to the question: “*In general, would you say your health is (1) Excellent, (2) Very Good, (3) Good, (4) Fair, (5) Poor?*”. Due to a small sample size, the responses were regrouped and formatted into two categories. This re-categorization method has been used in various studies where the variable is collapsed in two categories; one “*Good*”, consisting of those individuals who had chosen “*excellent, very good or good*” as their response; the other, “*Poor*” consisting of all those who responded, “*fair or poor*” to the question.

Our second health outcome was *diagnosis of chronic conditions*. This measure consisted of aggregating responses to the questions “*Have you ever been told by a doctor, nurse, or other health professional that you have diabetes?*” and “*Have you been told by a doctor, nurse or other health professional that you have... arthritis or rheumatism; asthma; chronic bronchitis; emphysema; cancer; effects of a stroke; high blood pressure; heart problems; stomach problems or intestinal ulcers; hepatitis; kidney disease; tuberculosis; HIV; AIDS; or any other long term condition?*”. A binary approach was also used for this question consisting of the categories, “*No*

*chronic conditions present*” and “*One or more chronic conditions reported*”. While *self-reported health* has been used widely in the literature, the *diagnosis of chronic condition* variable was included in order to provide a control and address any questions of response bias in terms of subjectivity as diagnosis would only be assessed by a medical professional.

#### **4.5 Independent Variables: Individual-level variables**

Various organizations and researchers have proposed different lists of determinants of health when studying their effects on self-rated health outcomes. In order to select a list of indicators, we adopted the Public Health Agency of Canada’s (PHAC) Social Determinants of Health, which includes many of the indicators that have been linked to health. Furthermore, since our study was completed within Canada, the PHAC list was seen as appropriate as it addresses the Canadian context (PHAC 2010).

The list consists of 12 “key determinants”, however this study only considered 11, as *Childhood Development* was not a construct that could be measured using the APS data. As shown in Table 1, within each determinant of health a set of indicators from the APS were selected. In addition the variable “mobility” was included in the models to serve as a control, as those who had recently moved from areas would not be affected by the 2006 neighbourhood of residence in the same way. The only concept related to the *physical environment* that we were able to include from the APS data was access to clean water.

**Table 1: Individual-level determinants of health and corresponding indicators**

DETERMINANT	VARIABLES
<i>Income/Social Status</i>	1. Average household income
	2. Housing status
<i>Education/Literacy</i>	3. Highest level of education
<i>Employment</i>	4. Employment status
<i>Social Support</i>	5. Marital status
<i>Physical Environments</i>	6. Access to clean water
<i>Biology/Gender</i>	7. Age
	8. Gender
<i>Culture</i>	9. Aboriginal status
<i>Mobility</i>	10. 5-year mobility status

*Household income:*

Data for this indicator were obtained from the 2006 Census dataset. Household income was used as most existing low income measures take into consideration the average income of a household, whether being an individual or family.

While there is not one specific definition of low income in Canada, there are several measures including the Low-Income Cut-Offs (LICO) derived by Statistics Canada as an income threshold below which an individual or family (depending on the number of persons) would live in straitened circumstances. The threshold was based on the notion that families who spent 70% or more of their income on essentials (defined as food, clothing and shelter) would therefore be left with marginal amounts to spend on health, education, transportation, insurance and recreation (Statistics Canada 2010; United Way 2004). However, when considering the City of Toronto population and the income distributions, the \$41,307 LICO

value for 2009 was not felt by the researchers to be appropriate for the City of Toronto, which is known as a city with a high cost of living. For this reason, and because of the small sample size and restricted range of income, individual-level income was grouped into three categories: “Under \$44,999”, “\$45,000 to \$89,999” and “Over \$90,000”. The middle range was used as the reference category in the models. Household income, rather than individual income, was used to reflect the fact that income is commonly shared within households.

The term “household” used in this report refers to Statistics Canada’s definition:

The concept of Household applies to a person or group of persons who occupy the same dwelling and do not have a usual place of residence elsewhere in Canada or abroad. The dwelling may be either a collective dwelling or a private dwelling. The household may consist of a family group such as a census family, of two or more families sharing a dwelling, of a group of unrelated persons or of a person living alone. (Statistics Canada 2006)

### *Housing status*

The APS question “Is your home rented or owned by you or another member of this household?” was used to categorize the responses into two groups, “rented” or “owned”. The reference category was “owned”. While “household income” is a popular indicator of income and social class, we chose to include “housing status” as a measure of social status as individuals with lower income and poorer resources tend to rent dwellings. Furthermore, we know that poorer housing conditions occur in large renting complexes throughout the city which studies have linked to poorer health outcomes via various mechanisms including stress and overall usage of health care (Thomson et al. 2009).

### *Education level*

This indicator was derived from the APS using a series of questions asking individuals after the highest level of education attained. Three categories were included for our analysis: “Less than high school”, “High school Diploma” and “Post-secondary”. Because of small numbers, individuals who had some post-secondary, or had achieved a university degree, diploma or certificate from trade school were included in the “Post-secondary” category. The “High school diploma” category served as our reference category.

### *Employment status*

This indicator was derived from a series of questions from the APS on employment activity during the previous week. “Worked” indicated that individuals had “worked for pay or in self-employment, or temporarily absent from job” while “No work” indicated those who did not have a job, whether or not they were looking for work. Our “worked” category served as the reference category.

### *Marital status*

This indicator was derived from the Census questions that were attached to the APS dataset. Because of small numbers two categories were created; “Not married, widowed or separated” and “Legally married, or in a common-law relationship”. The latter category served as the reference category.

### *Access to clean water*

This indicator was derived from the APS question “Do you consider the water available to your home safe for drinking?” Two categories were once again created, with “safe drinking water available” being the reference category.

### *Age*

This indicator was derived from the APS. In order to provide the best sample distribution, three categories were created, “15-24 years”, “25-44 years” and “45+ years” with the middle age group being the reference category.

### *Gender*

This indicator was derived from the APS “sex of respondent” and like the age variable, all respondents had to complete these two questions in order to qualify in the sample. The “female” category was used as the reference category.

### *Aboriginal group*

Data were derived from a series of questions in the APS asking respondents “Are you North American Indian/Métis/Inuk?” Individuals that did not respond “yes” to any of these questions were grouped as “others”. Due to low response rates, “Inuk and others” were grouped together. The “North American Indian/First Nation” category served as the reference group.

### *Mobility*

Data were taken from 2006 Census dataset linked to the APS 2006. Mobility status described the respondents' place of residence 5 years earlier. Due to low response rates only two categories were created. "Changed residency" indicated that individuals had responded "Different CSD in Canada, outside Canada, same CSD different dwelling". "Same residency" consisted of responses "same address" and served as the reference category. Five-year mobility was selected over one year mobility due to response rates.

### **4.6 Independent Variables: Neighbourhood-Level Variables**

As indicated above, the majority of the literature looking at neighbourhood effects tends to deal with one of four types of contextual effects. These are the *physical environment of neighbourhood*, *access to social services in the neighbourhood*, *socio-economic composition of the neighbourhood* and *cultural characteristics of the neighbourhood*. Due to the limitations of the data and resources, the present study focused only the two categories, *access to social services in the neighbourhood* and *the socio-economic composition of the neighbourhood* and its three indicators, *availability of Aboriginal specific services* in social, health and legal aid, *income inequality*, and *average household income*. The following sections explain how these indicators were derived.

### *Income Inequality*

*Income inequality* was calculated using the *Gini coefficient*. The Gini coefficient is a measure of the degree of inequality in a selected population (Statistics Canada 2003; Needleman 1979). The coefficient ranges from 0, depicting complete equality, to 1, representing complete

inequality. The perfect inequality condition is one in which one individual receives all income while the rest receive none (Statistics Canada 2003; Needleman 1979). Essentially, the Gini coefficient provides an idea of the level of inequality within the population of interest (Statistics Canada 2003; Needleman 1979; Gastwirth 1971). We recognize that there are various measures of income distribution including the Theil index, the Decile dispersion ratio and percentage or proportion of poorest in the population, such as the poorest ten per cent (World Bank 2010). However, in recent years the use of the Gini coefficient has been adopted by many organizations and linked to crime, mortality and various health outcomes (World Bank 2010).

The calculation of the Gini coefficient comes from the Lorenz Curve that allows for comparison of the distribution of a specific variable (Appendix B). The curve falls below the diagonal line representing the equality distribution depending on the variable of interest, and therefore, the greater the deviation from the equality line, the greater the inequality present (Needleman 1979; Gastwirth 1971). The following formula is used to calculate the Gini coefficient (Needleman 1979; Gastwirth 1971).

**Equation 1: Gini Coefficient calculations**

$$G = \left| 1 - \sum_{k=1}^{k=n} (X_k - X_{k-1})(Y_k + Y_{k-1}) \right|$$

Where:

G is the Gini coefficient

X<sub>k</sub> is the cumulative percentage of households

Y<sub>k</sub> is the cumulative percentage of total household incomes

All calculations were completed on Excel and a sample calculation completed for this study can be found in Appendix B.



In the models stratified by neighbourhood characteristics, neighbourhoods were divided into two categories based on the City of Toronto's overall Gini coefficient value of 0.4030.

Neighbourhoods defined as having "low Gini" category were those with coefficients below the city's value while those defined as having "high Gini" values were those that fell above.

#### *Average Household Income*

The *average household income* of the neighbourhood was used as a measure of income distribution. Due to small sample sizes resulting in cell counts below ten, neighbourhoods were only divided into two categories, "low-income" and "high-income" when for the models stratified by neighbourhood characteristics. Therefore, once again by adopting the City of Toronto's Social Research and Analysis Unit approach, income categories were redefined. We acknowledge that the titles "low" and "high" may be misrepresentations of actual circumstances, however, for the purposes of this paper and due to the limitations of a small sample size, we defined "Low-income" as neighbourhoods that fell below the \$84,999 range while "High-income" included neighbourhoods with average household incomes of \$85,000 or above.

#### *Aboriginal Specific Services*

Data for services available were collected using the *Community Information Database*, a compendium of all social and health services available across the City of Toronto. The database is an initiative with the City of Toronto, United Way, provincial and federal government and is widely available on their website (United Way et al. 2002). The inclusion criteria consisted of organization that provided Aboriginal specific services in the areas of

legal, social and/or health, and their target groups were the Aboriginal population of Toronto. To assure a comprehensive list of services was created, websites of the larger Aboriginal communities were searched and any missing organizations listed were added. Once all the services were identified their exact location was searched in order to identify the corresponding neighbourhood. Once found, services in each neighbourhood were tallied and merged into the dataset.

When neighbourhoods were stratified by service characteristics, two categories were created, neighbourhoods with “no services available” and neighbourhoods with “one or more services available”.

#### **4.7 Weighting & Rounding**

Weights provided by Statistics Canada were applied to data derived from the APS in order for analyses to be representative of the population being studied, in this case the Toronto Aboriginal population. For the logistic regressions, scaled weights were used, so that the sample size for the models was not inflated. These scaled weights were calculated by dividing each individual weight by the average weight of the sub-sample. These modifications did not affect the odds ratios calculated or descriptive frequency percentages, while it allowed for estimates to be more conservative. All weighted values were rounded to the closest 10 according to Statistic Canada guidelines (Statistics Canada 2009a; 2010b).

## **4.8 Data Analysis**

In order to analyze the data, four steps were taken, *modification of data set, mapping of neighbourhood variables, univariate analyses* and *multivariate analyses*. The following describes each step including the procedures and tools used.

### **4.8.1 Modification of data set**

The first step consisted of deriving the data set by adding the neighbourhood boundaries to the existing APS data set. Since the APS does not contain an identifier for Census Tracts, neighbourhoods had to be divided into Dissemination Areas (DA) in order for the data sets to be merged. In addition, the Gini coefficient values and the average household income information also had to be merged into the data set. Finally, Aboriginal specific services had to be exactly located in order to identify the corresponding neighbourhood. Using Google Maps, the centers were identified and the total numbers of services available in each neighbourhood were merged into the working data set.

### **4.8.2 Mapping of neighbourhood variables**

The growing popularity of mapping techniques within health research has provided a better visual perspective of the analyses and become a strong tool in driving policy change. Within our research we were able to incorporate this technique and create four maps in order to illustrate the distribution of Aboriginal individuals in the City of Toronto and map each of the

neighbourhood characteristics analyzed. All data were taken from the analyses except for Aboriginal people distribution, which was taken from the City of Toronto's Social Planning and Policy Unit's neighbourhood profiles public data consisting of 2006 Census data. All maps were created using ArcView Geographical Information System (GIS) 4.4 software.

### **4.8.3 Bivariate Analyses**

Prior to analyzing the multivariate models, bivariate analyses were conducted in order to describe the relationship between each dependent and independent variable. This was done in order to describe the characteristics of the sample, evaluate and address missing variable and distribution of responses. For the bivariate analyses, the Toronto CMA dataset was used as opposed to the City of Toronto sample due to Statistic Canada's APS guidelines where for post-census surveys, sub-samples below the CMA level must contain a cell count above ten which at the City level was hard to achieve when the variables had various corresponding categories (Statistics Canada 2009a). In addition, in order to prevent further loss of participants and further decrease the sample size, any missing cases (those who responded with "*don't know*" and "*refused*") were combined with another characteristic in order to create a new category. For example, more than ten missing variables were accounted for "Inuit" status, and therefore added and recoded within the "Inuit and Others" category. All other variables that had ten or fewer cases with missing values and were simply recoded into one of the existing response categories. This included the missing variables being added to the "less than high school" category for education, the "no job" category for employment, "not married/widowed/separated" category for marriage status, "no safe drinking water available" category for water status and "rented" category for housing status.

#### 4.8.4 Multivariate Analyses

Logistic regressions were used for all multivariate analyses in order to examine the relationship between one dependent variable and various independent variables (Tabachnick & Fidell 2007, pp. 117-242). As the dependent variables in the analyses were coded into binary responses, it was necessary to choose an appropriate statistical model. Logistic regression was chosen because it allows the ability to analyze binary variables and the ease of interpretation by using odds ratios (Tabachnick & Fidell 2007, pp. 117-242). Furthermore, by using sequential logistic regression methods we were able to determine the models that best fit for our individual-level only analyses using likelihood-ratio chi square tests.

Each research question consisted of a multivariate analysis carried out in several steps. The variables, age, sex and aboriginal identity were treated as *control variables* and used in all models addressing the three research questions. The variables income, education and employment were treated as the *socio-economic variables* while the variables marriage status, housing status and physical environment were described as the *additional variables of interest* used to complete the models and look at the significance of each independent variable. The following sections explain the steps taken to create each of the models described.

#### **4.8.5 Model 1 (Individual predictors of self-rated health at the Toronto CMA population level)**

A sequential logistic regression analysis was conducted for model 1 where a group of new variables were added at each step until a full model was created. All steps were repeated for the two dependent variables, *self-rated health* and *diagnosis of a chronic condition(s)*.

- Step 1: Logistic regression model of only control variables.
- Step 2: The three socio-economic variables were added in addition to the control variables (step 1).
- Step 3: All other independent variables at the individual level were added (step 2).
- Step 4: Best-Fit model analysis

Once step 4 concluded that the inclusion of the three additional variables was not significant, these variables were no longer included in further analyses. A further explanation of this is provided in our *results* section.

#### **4.8.6 Model 2 (Individual and neighbourhood predictors of self-rated health at the City of Toronto population level)**

All steps were once again repeated for the two dependent variables.

- Step 1: Logistic regression model of only control and socio-economic variables plus the Gini coefficient variable.
- Step 2: Logistic regression model of only control and socio-economic variables plus the log of average household income variable.
- Step 3: Logistic regression model of only control and socio-economic variables plus availability of Aboriginal services variable.

- Step 4: Logistic regression model of only control and socio-economic variables plus all the neighbourhood variables.

#### **4.8.7 Model 3: (Individual predictors of self-rated health stratified by neighbourhood characteristics at the City of Toronto population level)**

Each neighbourhood was stratified based on the interested neighbourhood characteristics. This was done to further analyze the effects of neighbourhood factors on individual health status.

- Step 1: Logistic regression model of only control variables and socio-economic variables in high Gini coefficient neighbourhoods.
- Step 2: Logistic regression model of only control variables and socio-economic variables in low Gini coefficient neighbourhoods.
- Step 3: Logistic regression model of only control variables and socio-economic variables in high average household income neighbourhoods.
- Step 4: Logistic regression model of only control variables and socio-economic variables in low average household income neighbourhoods.
- Step 5: Logistic regression model of only control variables and socio-economic variables in neighbourhoods with Aboriginal specific services.
- Step 6: Logistic regression model of only control variables and socio-economic variables in neighborhoods with no Aboriginal specific service.

All statistical analyses were conducted using SAS 9.2 software and all analysis were conducted at the South Western Ontario and Toronto Research Data Centers located at the University of Waterloo and the University of Toronto respectively. All output was reviewed by Statistics Canada analysts to ensure confidentiality was maintained.

## 4.9 Limitations

We recognize several limitations with the datasets due to quality of data available and small sample size. A limitation in calculating the Gini coefficient lies in the quality of data available. Ideally the Gini coefficient would represent every household and its corresponding income. However, because the Census Public Use Microdata file was used to calculate the Gini coefficient, income was only available in categorized form. Therefore, the midpoint values for each of the income categories were used to calculate the coefficient, where values of \$5,000 and \$150,000 were assumed for the ranges of “\$10,000 or lower” and “\$100,000 or higher” respectively. There would then be a potential for under and over representation of household incomes in neighbourhoods as a result. However, such variations would not dramatically affect the overall Gini calculated for those neighbourhoods, as they would still show the great inequality occurring due to high populations living in either end of the income distribution.

Preliminary analyses of data availability demonstrated various barriers due to small sample size. This was a limitation throughout the study and an impeding factor in Model 3 where stratification by neighbourhood characteristics was conducted. Although Aboriginal status was kept in Model 3, low frequencies led to inconclusive values. Furthermore, due to small sample size within some neighbourhoods, mapping techniques were of limited validity and unable to demonstrate the relationships between some of the individual-level predictors and neighbourhood characteristics.



## **5.0 RESULTS**

Results from the data analyses are presented below in three sections. We first present the descriptive statistics for the APS sample. We then present the distribution of the Aboriginal population across the City of Toronto neighbourhoods, as well as other socio-demographic characteristics of those neighbourhoods, using the maps generated using Geographic Information Systems (GIS). Finally, we present the results from logistic regression models of self-rated health and diagnosis of chronic disease(s), using individual-level and neighbourhood-level variables.

### **5.1 Sample Description**

In Table 2 we provide the distribution of the Toronto CMA Aboriginal Identify population, on each of the individual-level variables. The data in the table are weighted to represent the estimated population percentages.

The largest Aboriginal identity group was Inuit and Others (40.5%). As described above, the small number of Inuit made it necessary to combine this category with those reporting multiple identities, and which made up a majority of this group. Forty per cent of the Toronto CMA Aboriginal population identified themselves as single-identity First Nations and 19.4% identified themselves as Métis.

**Table 2: Individual characteristics, Aboriginal identity population Toronto CMA, 2006**

<i>Demographic Variables</i>	<b>Toronto CMA</b>	<i>Additional Variables</i>	<b>Toronto CMA</b>
<b>Gender</b>		<b>Social Support</b>	
Male	48.1%	Not married/widowed/separated	48.0%
Female	51.9%	Legally married/common-law relationship	52.0%
<b>Age Group</b>		<b>Physical Environment</b>	
15-24 years	16.9%	Safe drinking water available	83.9%
25-44 years	44.3%	No safe drinking water available	16.1%
45+ years	38.8%	<b>Housing Status</b>	
<b>Aboriginal Group</b>		Rented	44.1%
First Nation	40.0%	Owned	55.9%
Métis	19.4%		
Inuit/Others	40.5%		
<b>Mobility (5-years)</b>			
Changed residence	50.2%		
Same residence	49.8%		
<b>Socio-Economic Status Variables</b>			
<b>Average Household Income</b>			
Under \$44,999	30.4%		
\$45,000-\$89,999	31.6%		
Over \$90,000	38.0%		
<b>Education Level</b>			
Less than high school	20.8%		
High School Diploma	15.4%		
Post-secondary	63.8%		
<b>Employment Status</b>			
Worked	70.4%		
No work	29.7%		

Source: 2006 Aboriginal Peoples Survey (N=1080) (Weighted percentages are presented. Totals may not sum to 100 due to rounding.

One surprising characteristic of the sample was the relatively high socio-economic status of the respondents. About 64% of Aboriginal people living in Toronto had some post-secondary education (trades or technical, CEGEP, college or university), and 38% lived in families with a total income of over \$90,000 in 2005 (Table 2). In addition, approximately 70.4% of Aboriginal people in the Toronto CMA were employed and about 55.9% were owners of their present dwelling.

Table 3 describes the distribution of Aboriginal people and the total Toronto population across neighbourhood types in Toronto. The neighbourhoods were divided according to their values on the key neighbourhood characteristics in the models: income inequality, average household income, and the availability of Aboriginal specific services. High inequality neighbourhoods were those with a Gini coefficient above the City of Toronto's Gini value of 0.4030, and high income neighbourhoods are those with an average household income that is above the \$85,000 value.

**Table 3: Toronto Aboriginal and total population by neighbourhood characteristics, 2006**

Neighbourhood-Level Characteristics		
	Aboriginal People	General Population
<b>Income Inequality</b>		
High Inequality neighbourhoods	47.2%	62.4%
Low Inequality neighbourhoods	52.8%	37.6%
<b>Average Household Income</b>		
Low-income neighbourhoods	43.3%	74.5%
High-income neighbourhoods	56.7%	24.5%
<b>Aboriginal Service Availability</b>		
No service neighbourhoods	23.5%	NA
Serviced neighbourhoods	76.5%	NA

Source: 2006 Census and Aboriginal Peoples Survey 2006 (N=500) (Weighted percentages shown. Totals may not sum to 100 due to rounding)

In general, Torontonians were more likely to live in neighbourhoods we had classified as high inequality (62.4%) or as low income (74.5%) than in more equal or higher income neighbourhoods. On the other hand, Aboriginal people were more equally distributed across low and high income neighbourhoods and low and high inequality neighbourhoods (Table 3). Perhaps as expected, Aboriginal people were much more likely to live in neighbourhoods in which Aboriginal-specific services were available (76.5%), than in neighbourhoods with no Aboriginal services (23.5%). Table 4 provides the distribution of the sample on the two dependent variables.

**Table 4: Self-rated health and presence of a diagnosed chronic condition by individual characteristics, Toronto CMA Aboriginal Population 2006**

	<u>Self-rated Health</u>		<u>Chronic Condition Diagnosis</u>	
	"Poor"	"Good"	None	Present
<b><i>Demographic Variables</i></b>				
<b>Gender</b>				
Male	11.0%	90.0%	45.5%	54.5%
Female	18.0%	82.0%	39.3%	60.7%
<b>Age Group</b>				
15-24 years	5.6%	94.4%	56.7%	43.3%
25-44 years	6.1%	93.9%	54.9%	45.1%
45+ years	28.3%	71.7%	21.5%	78.5%
<b>Aboriginal Group</b>				
First Nations	18.2%	81.8%	41.5%	58.5%
Métis	15.7%	84.3%	43.8%	56.2%
Inuit/Others	10.6%	89.4%	42.3%	57.7%
<b>Mobility (5-years)</b>				
Changed residence	14.2%	85.9%	46.8%	53.2%
Same residence	15.2%	84.9%	37.7%	62.3%
<b><i>Socio-Economic Status Variables</i></b>				
<b>Average Household Income</b>				
Under \$44,999	27.7%	72.3%	32.2%	67.9%
\$45,000-\$89,999	12.0%	88.0%	43.0%	56.9%
Over \$90,000	6.5%	93.5%	49.8%	50.3%
<b>Education Level</b>				
Less than high school	26.4%	73.6%	31.7%	68.3%
High School Diploma	10.8%	89.2%	45.8%	54.2%
Post-secondary	11.8%	88.2%	44.8%	55.2%
<b>Employment Status</b>				
Worked	8.2%	91.8%	47.5%	52.6%
No work	29.9%	70.1%	29.9%	70.1%
<b><i>Additional Variables</i></b>				
<b>Social Support</b>				
Not married/widowed/separated	17.0%	83.0%	43.1%	56.9%
Legally married/common-law relationship	12.5%	87.5%	41.5%	58.5%
<b>Physical Environment</b>				
Safe drinking water available	13.0%	87.0%	43.5%	56.5%
No safe drinking water available	23.4%	76.6%	35.8%	64.2%
<b>Housing Status</b>				
Rented	23.2%	76.8%	37.1%	62.9%
Owned	7.9%	92.1%	46.3%	53.7%

Source: Aboriginal Peoples Survey 2006 (N=1080) (Weighted percentage shown. Totals may not sum to 100 due to rounding)

Across gender, age, Aboriginal identity, mobility and socio-economic status categories, the majority of Aboriginal people reported having “good” health. Even Aboriginal people with a less than high school education, low income or non-working status, were almost three times more likely to report “good” than “poor” health.

The presence of a chronic condition was somewhat more evenly distributed across the independent variable categories. Nonetheless, it was no surprise that those in the youngest (15-24) and middle age (25-44) categories were somewhat less likely to have been diagnosed with a chronic condition(s). In addition, Aboriginal people within the low income, less than high school education or unemployed group also had higher percentages of being diagnosed with chronic conditions.

Table 5 provides a comparison of the distribution of Aboriginal people who reported having “poor” versus “good” health and having none versus one or more chronic condition(s), based on the characteristics of the neighbourhood in which they lived.

**Table 5: Comparison of distribution of Aboriginal peoples by self-rated health variables and neighbourhood characteristics in the City of Toronto, 2006**

	<b>Self-reported Health</b>		<b>Chronic Condition Diagnosis</b>	
	<b>"Poor"</b>	<b>"Good"</b>	<b>None</b>	<b>Present</b>
Neighbourhood-Level Characteristics				
<b>Income Inequality</b>				
High Inequality	17.0%	83.0%	38.3%	61.8%
Low Inequality	16.9%	83.1%	42.7%	57.3%
<b>Average Household Income</b>				
Low-income Neighbourhoods	16.0%	84.0%	38.6%	61.4%
High-income Neighbourhoods	17.8%	82.3%	42.1%	58.0%
<b>Aboriginal Service Availability</b>				
No service	13.9%	86.1%	17.9%	82.1%
Service(s) available	49.7%	50.3%	37.7%	62.3%

Source: 2006 Census and Aboriginal Peoples Survey 2006 (N=500) (Weighted percentages shown. Totals may not sum to 100 due to rounding)

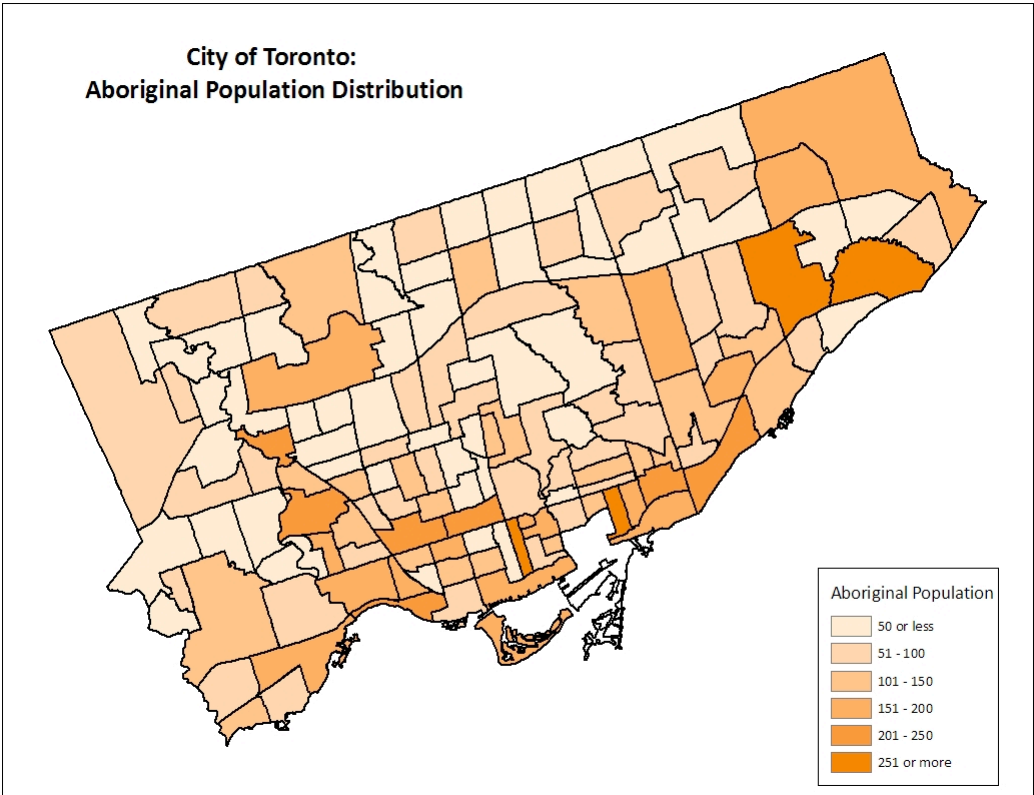
Again, more Aboriginal people reported having “good” health compared to those with “poor” health despite the neighbourhood they lived in. Furthermore, approximately the same number of people reported having “good” health in both the high and low-income neighbourhoods. More people were likely to report having “good” health in neighbourhoods with no Aboriginal service available. On the contrary, in neighbourhoods where services were available there was an approximate equal amount of people reporting having “good” or “poor” health. Note that, as discussed later, these are neighbourhoods with some of the lowest average incomes in the City of Toronto.

Considering the “diagnosis of a chronic condition” variable, there was an approximately equal distribution across neighbourhood types. Furthermore, while we saw more people reporting having “good” health in neighbourhoods with no Aboriginal specific services available, there were more people reporting being diagnosed with a chronic disease in those neighbourhoods with Aboriginal services.

### 5.2 Mapping of Aboriginal Population and Neighbourhood Characteristics

In order to better describe the characteristics of neighbourhoods and the distribution of Aboriginal peoples across City of Toronto neighbourhoods, four maps were created. Figure 2 illustrates the distribution of Aboriginal people across all 140 neighbourhoods in the City of Toronto. Note that for this map population weights were used to represent the total population of Aboriginal people living in the City of Toronto. This resulted in an estimated 26,575 individuals who identified themselves as having Aboriginal identity in the 2006 Census.

**Figure 3: City of Toronto neighbourhoods, showing Aboriginal Population, 2006**



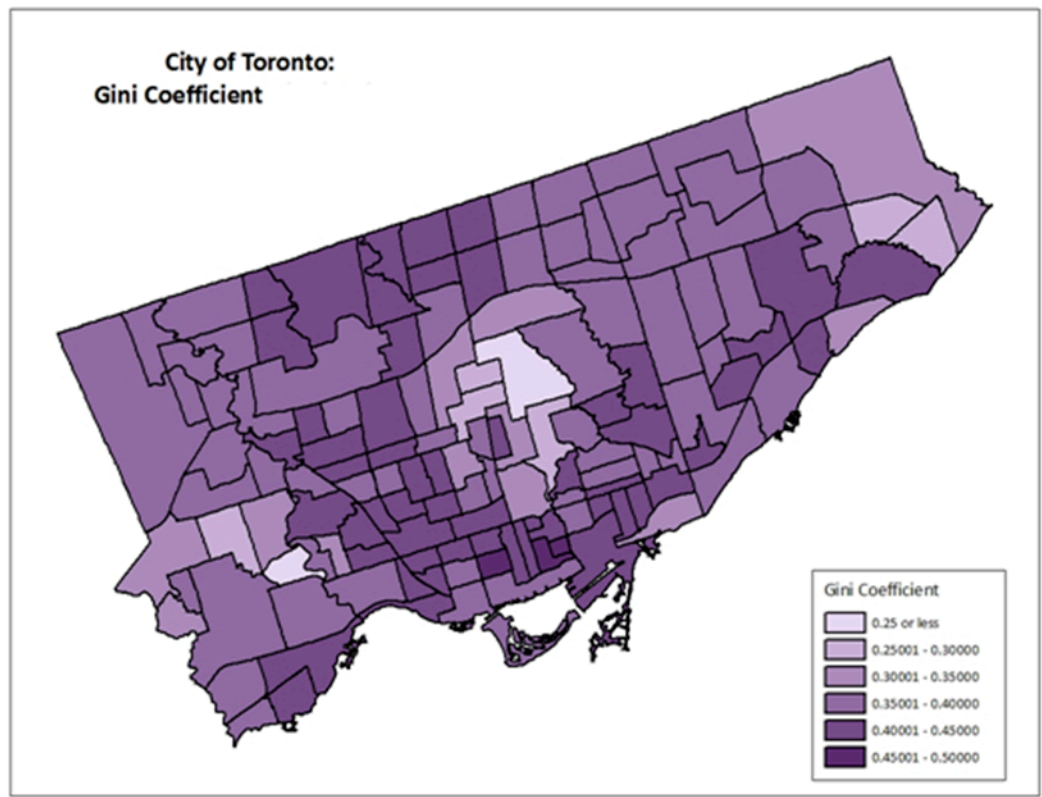
Source: 2006 Census data and City of Toronto (2004).

From the map we can see a higher concentration of the Aboriginal population within the downtown neighbourhoods and across two larger neighbourhoods towards the east of the city. As noted and illustrated in the following maps, these are also some of the neighbourhoods with the lowest average household income and high income inequality in addition to having some of the largest concentration of social housing available. In turn, they also tend to be the neighbourhoods with availability of Aboriginal services within the neighbourhoods. However, further studies of mobility are required to determine if this is because services are established neighbourhoods based on demand (or population) or whether individuals move into neighbourhoods with services available.

The independent variables, income inequality, average household income and availability of Aboriginal specific services were also individually mapped using 2006 Census information. Figure 3 presents City of Toronto neighbourhoods according to their Gini coefficient categories. Figure 4 further collapses these categories in order to identify the neighbourhoods that have “high” inequality, according to the definition used for the multivariate analyses highlights only the neighbourhoods deemed as having high income inequality (a Gini value above that for the City of Toronto, 0.4030).



**Figure 4: City of Toronto neighbourhoods showing Gini coefficient category**

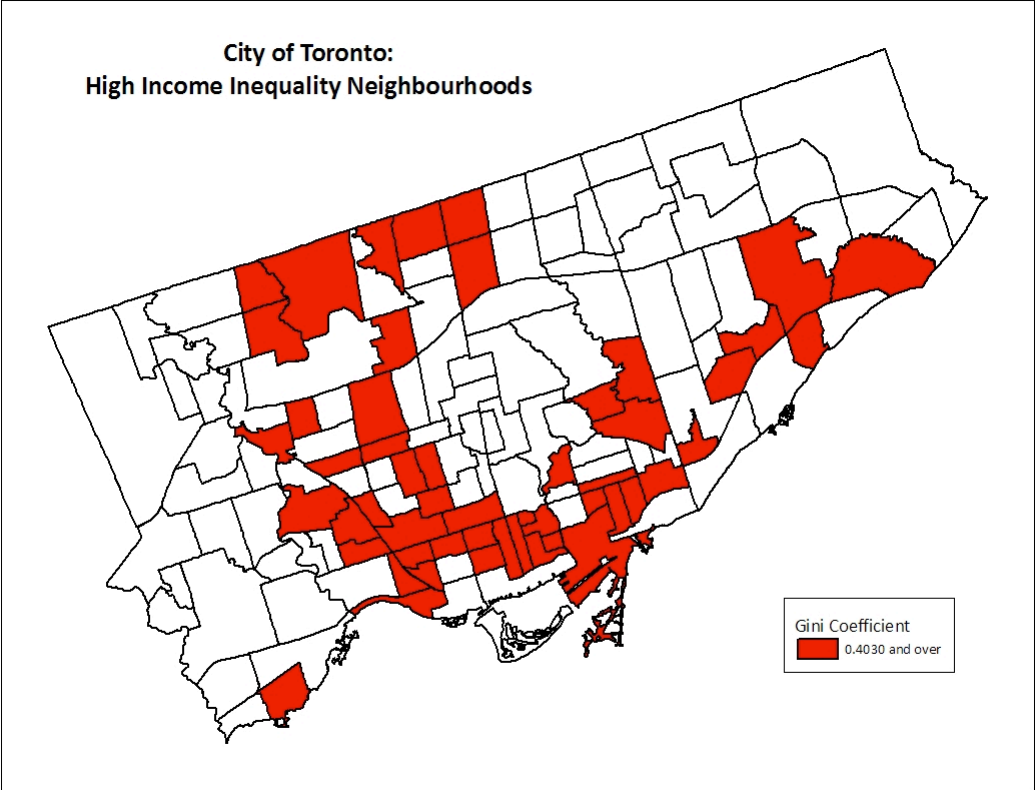


Source: 2006 Census data and City of Toronto (2004).

Again, in comparison with Figure 3, we see an association between high income inequality neighbourhoods and higher populations of Aboriginal people in those same neighbourhoods. The highest income inequality neighbourhoods were Moss Park (0.4770), Kensington-Chinatown (0.4711) and Regent Park (0.4695) all of which are located within the downtown core of Toronto and indicated by darker shades. The lowest income inequality neighbourhoods were Bridle Path-Sunnybrook-York Mills (0.1300), Kingsway South (0.2415) and Princess-Rosethorn (0.2523) all located within the center of the city and are indicated with the lighter shades. These are also neighbourhoods with the lowest population of Aboriginal people within the city. It should be noted that some of the neighbourhoods located north west of the city, might have high income inequality values as a result of the high student population due to various university residences. This explanation may also be true for the

Kensington-Chinatown neighbourhood, which was identified as one of the top three high income inequality neighbourhoods but also consists of a high student population due to the University of Toronto and various other academic institutions.

**Figure 5: City of Toronto neighbourhoods with high-income inequality neighbourhoods highlighted, 2006.**

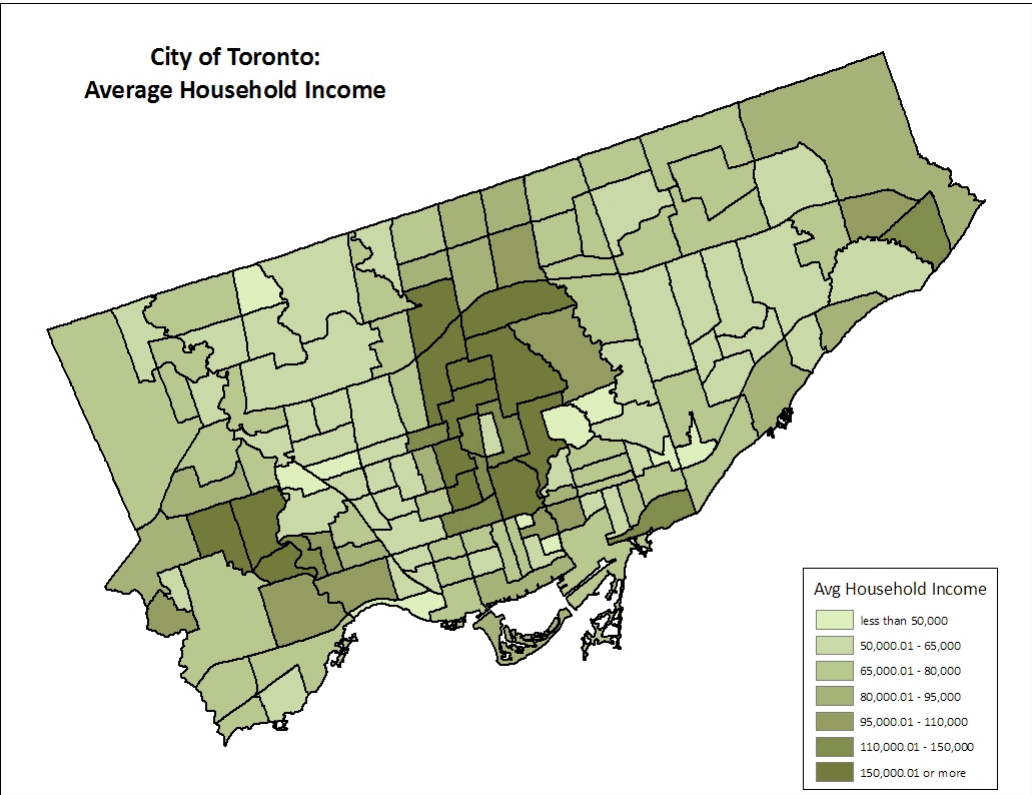


Source: 2006 Census data and City of Toronto (2004).

Figure 6 illustrates this income distribution across all 140 Toronto neighbourhoods. Again, we see a similar pattern as the income inequality map with the higher income neighbourhoods located within the center of the city and the lower income neighbourhoods concentrated downtown. The highest income neighbourhoods were Bridle Path-Sunnybrook-York Mills (\$640,282), Lawrence Park South (\$330,271) and Rosedale-Moore Park (\$267,052) illustrated with the darker shade, while the lowest income neighbourhoods were Regent Park

(\$37,387), South Parkdale (\$39,530) and Oakridge (\$40,493) shown using the lighter shades. It is interesting to note that both Bridle Path-Sunnybrook-York Mills and Regent Park were the neighbourhoods with both the highest and lowest average income and highest and lowest income inequality values, respectively.

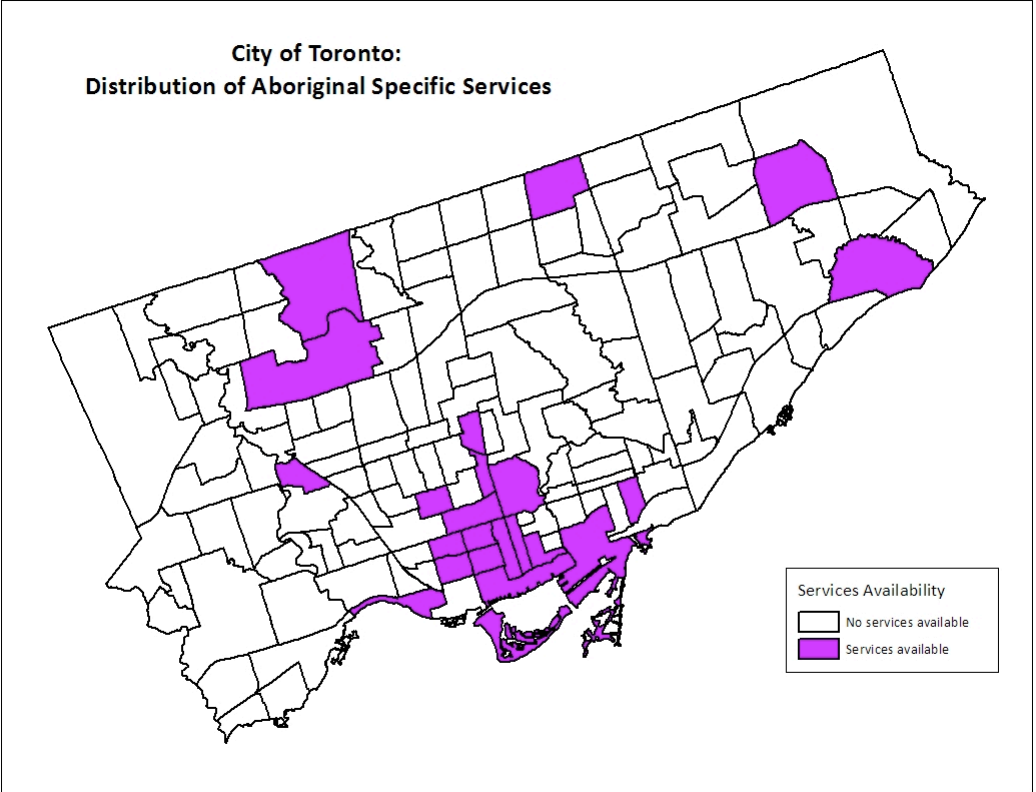
**Figure 6: City of Toronto Neighbourhoods showing average household income, 2005**



Source: 2006 Census and City of Toronto Social Research and Analysis Unit.

Aboriginal specific services were defined as those that offered services in health, legal or social services. In the City of Toronto, 48 Aboriginal specific service centers were identified in 22 neighbourhoods, which is 16% of all Toronto neighbourhoods. Of those 48 service centers, 35 were located in 13 neighbourhoods with high-income inequality and 41 were located in 18 low-income neighbourhoods. Figure 7 provides a map, identifying neighbourhoods with such services available.

**Figure 7: City of Toronto neighbourhoods, showing presence of Aboriginal-specific health and social services**



Source: 2006 Census data and City of Toronto (2004).

The neighbourhoods with the most Aboriginal specific services available were Moss Park with eight service centers. Notably, Moss Park is also among the poorest neighbourhoods and with high income inequality. Neighbourhoods, Church-Yonge corridor, the Annex, and Wychwood each had six service centers. While none of these these neighbourhoods fell within the top ten lowest income, Church-Yonge corridor had the fourth highest Gini coefficient (0.4494) in the city. Again, these are neighbourhoods are primarily located in the downtown of the city.

These maps are presented in order to illustrate the spatial distribution of Aboriginal people across the city of Toronto, and the characteristics of the neighbourhoods they live in. This is particularly necessary when referring to a city as large as Toronto with 140 neighbourhoods. From these maps we are able to conclude that Aboriginal people tend to live in the Toronto neighbourhoods with lower average household incomes and higher levels of income inequalities. They also generally live in neighbourhoods with more Aboriginal specific services available, which tend to be concentrated in the downtown core of the city. As discussed below, these conclusions are consistent with those of the multivariate analyses.

### **5.3 Model Results**

In this section the results of our multivariate analysis of the individual and neighbourhood level variables and their effects on the two self-rated health outcomes are presented. The second research question was addressed using two different approaches including the stratification by neighbourhood characteristics, in order to better examine contextual effects on self-rated health outcomes. In the first part of the multivariate analyses, a logistic regression model was estimated to examine the effects of individual-level predictors on the odds of having reported “poor” self-rated health and of being diagnosed with one or more chronic condition(s). This analysis addresses our first thesis question, by looking at only individual-level predictors without stratification by neighbourhood boundaries. Furthermore, the analysis would indicate which individual-level factors should be kept for further analysis based on their strength to predict self-rated health.

In the second part of the analyses, two logistic regression models were estimated in order to determine whether contextual factors associated with the neighbourhood of residence affected self-rated health outcomes. The first model included the modified individual-level factors chosen after the first analysis in addition to the three neighbourhood-level characteristics chosen, *income inequality*, *average household income* and *availability of Aboriginal specific services*. This analysis would not only determine whether these neighbourhood factors were significantly associated to the self-rated health outcomes but also allow us to see whether including the neighbourhood-level factors changed the effects of the individual-level variables. Finally, the last analysis would aid to strengthen findings from the previous analysis by further examining contextual effect on individual-level predictors of self-rated health by stratifying neighbourhoods based on the neighbourhood characteristics chosen. In the following sections we present the results that address each of our research questions.

### **5.3.1 Research Question 1: Individual-level predictors of self-rated health.**

The first analysis was conducted using the City of Toronto sample of 500 Aboriginal individuals. The analysis consisted of three models for each of the dependent variables, *self-rated health* and the *diagnosis of chronic condition(s)*. The first model included only the addition of the control variables *gender*, *age group*, *Aboriginal identity* and *mobility*. The second model included the socio-economic variables, *household income*, *education* and *employment*. The final model added three additional variables that although have not been used as often as the socio-economic status variables, they have been linked to various health

outcomes including “poor” self-rated health. Furthermore, they are reasonable self-reported proxies for the presence of social support (*marital status*), social class (*housing status*) and physical environment conditions (*access to clean drinking water*). Table 6 presents the odds ratios and the 95% CI for each of variables in the six models while reference categories are identified in brackets.

**Table 6: Models results of logistic regressions predicting “poor” self-rated health and diagnosis of a chronic condition(s) amongst Aboriginal men and women living in Toronto 2006**

Model 1	"Poor" Self-Rated Health			Chronic Condition Present		
	Model 1A OR	Model 1B OR	Model 1C OR	Model 1D OR	Model 1E OR	Model 1F OR
<i>Control variables</i>						
<b>Gender (female)</b>						
Male	0.501*** (0.46,0.54)	0.644 (0.36,1.16)	0.665 (0.36,1.20)	0.705 (0.48,1.03)	0.757 (0.51,1.12)	0.763 (0.51,1.13)
<b>Age Group (25-44 yrs)</b>						
15-24 years	0.588*** (0.48,0.72)	0.400 (0.10,1.61)	0.397 (0.10,1.62)	1.077 (0.85,1.78)	0.929 (0.54,1.60)	1.102 (0.62,1.95)
45+ years	10.536*** (9.51,11.68)	6.371*** (3.14,12.91)	6.688*** (3.28,13.62)	5.166*** (3.22,8.29)	4.326*** (2.65,7.07)	4.716*** (2.86,7.79)
<b>Aboriginal Group (First Nation)</b>						
Métis	1.233*** (1.12,1.35)	1.861 (0.94,3.67)	1.808 (0.92,3.57)	0.951 (0.59,1.53)	1.019 (0.63,1.65)	1.025 (0.63,1.67)
Inuit/others	0.253*** (0.13,0.51)	0.979 (0.01,103.14)	0.902 (0.01,91.20)	1.052 (0.09,12.62)	1.592 (1.21,20.97)	1.936 (0.14,26.28)
<b>5-year Mobility (same residence)</b>						
Changed residence	1.197*** (1.10,1.30)	0.910 (0.50,1.67)	0.896 (0.49,1.65)	0.827 (0.55,1.24)	0.785 (0.51,1.20)	0.843 (0.55,1.30)
<i>Socio-economic status variables</i>						
<b>Household Income (\$45,000-\$89,999)</b>						
Under \$44,999		1.618 (0.82,3.20)	1.357 (0.64,2.86)		1.032 (0.64,1.66)	0.969 (0.58,1.63)
Over \$90,000		0.269* (0.09,0.80)	0.301* (0.10,0.91)		0.735 (0.44,1.23)	0.766 (0.45,1.31)
<b>Education (high school diploma)</b>						
Less than high school		2.226 (0.86,5.75)	2.254 (0.87,5.87)		1.601 (0.83,3.08)	1.654 (0.85,3.21)
Post-secondary		1.322 (0.56,3.14)	1.386 (0.58,3.32)		1.305 (0.76,2.25)	1.318 (0.76,2.30)
<b>Employment (worked)</b>						
No work		2.995** (1.86,5.41)	2.858** (1.58,5.19)		1.536 (0.99,2.39)	1.533 (0.98,2.40)
<i>Additional variables of interest</i>						
<b>Social Support (legally married/common-law)</b>						
Not married/widowed/separated			1.324 (0.64,2.75)			0.756 (0.46,1.24)
<b>Physical Environment (safe drinking water available)</b>						
No safe drinking water available			1.33 (0.65,2.72)			2.067* (1.17,3.66)
<b>Housing Status (owned)</b>						
Rented			1.317 (0.62,2.81)			1.329 (0.82,2.15)
<b>-2 Log L</b>	15743.17	322.971	320.995	614.369	599.243	596.386

Source: APS 2006 (N=500 in all models. \*p<0.05, \*\*p<0.01, \*\*\*p<0.001)



### **5.3.1A Models 1A and 1D: (Control variables only)**

The first models shown in Table 6 used only the control variables to predict “poor” self-rated health (Model 1A) or the presence of a chronic condition (Model 1D). These control variables included gender, age group, Aboriginal identity group, and five-year mobility status.

The results showed that overall, individuals aged 45 and above were 10.54 ( $p < 0.001$ )<sup>4</sup> times more likely to report having “poor” health and 5.17 ( $p < 0.001$ ) times more likely to be diagnosed with a chronic condition(s) compared with those 25-44 year age bracket. Also individuals who had changed residence in the past five years were approximately 1.20 ( $p < 0.001$ ) times more likely to report “poor” health than those who had not moved. In addition, men were almost 0.50 ( $p < 0.01$ ) times less likely to report having “poor” health when compared to women. However, there were no significant gender differences in the likelihood of having been diagnosed with a chronic condition. Finally, individuals who had identified themselves as Métis or Inuit/others were 1.23 ( $p < 0.001$ ) and 0.25 ( $p < 0.001$ ) times more likely to report having “poorer” health respectively, compared to those who had identified themselves as First Nation. However, the identity group was not a significant predictor of being diagnosed with a chronic condition.

### **5.3.1B Models 1B and 1E: (Control and socio-economic variables)**

In the second step of the analysis, socio-economic variables were added to the previously included control variables. As shown in Table 6, the models included the effects household income, education, and employment status, as well as gender, age, Aboriginal identity group

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<sup>4</sup> P-values correspond to significance levels derived from model results

and mobility status, on the likelihood of reporting “poor” health (Model 1B) or having a chronic condition (Model 1E).

Here, the results showed that individuals in the highest income category were only 0.27 ( $p < 0.05$ ) times as likely to report “poor” rated health as those within the middle income category while low-income had no significant effect on either self-rated health outcomes. Individuals who were unemployed were 3.0 times more likely ( $p < 0.001$ ) to report having “poor” self-rated health compared to those that had a job.

While some socio-economic variables were significant predictors of “poor” self-rated health, they were insignificant in predicting diagnosis of chronic conditions. Furthermore, only age was a significant factor within the diagnosis of a chronic condition model. Individuals within the 45+ age category were 4.33 ( $p < 0.001$ ) times more likely to report having a chronic condition compared to the 25-44 years age category.

### **5.3.1C Models 1C and 1F: (All individual-level variables)**

During the third step of the analysis, the additional variables, *social support*, *physical environment* and *housing status*, were added to make up the full model consisting of all the individual-level variables (Models 1C and 1F in Table 6).

Age remained a strong indicator of both self-rated health outcomes. High income (\$90,000 or more) served as a protective factor of 0.30 ( $p < 0.05$ ) times less likely for an individual within this category to report having “poor” self-rated health compared to the middle income

category. In addition, Aboriginal people who were unemployed were 2.89 ( $p < 0.01$ ) times more likely to report having “poor” health when compared to those that had a job. None of the newly added variables were significant within the self-rated health model. On the other hand, none of the socio-economic factors were significant predictors of diagnosis of chronic conditions. However, Aboriginal individuals who reported that they did not have access to safe drinking water were 2.07 ( $p < 0.05$ ) times more likely to report having a chronic condition compared to those that reported having access to safe drinking water. The full model also changed the effects of the previous variables including the socio-economic status variables including unemployment status continuing to be a strong predictor of “poor” self-rated health, but no longer significant in predicting chronic condition diagnosis.

#### **5.3.1D Best-Fit Model Analysis:**

Since the models are nested, and estimated using maximum likelihood, we were able to use a likelihood ratio chi-square test to test whether the inclusion of additions variables significantly improved the model fit. Table 7 describes the calculations used in order to determine the model of best-fit based on the following formula:

#### **Equation 2: Likelihood Ratio Test**

$$LR = -2\text{Log } L (\text{model } 2) - [ -2\text{Log } L (\text{model } 3)]$$

**Table 7: Determining the model of best fit through evaluation of -2Log Likelihood values**

<u><b>Poor Self-rated health:</b></u>	<u><b>Chronic condition present:</b></u>
$X^2 = 322.971 - 320.995$	$X^2 = 599.243 - 596.386$
= 1.976 at df=3	= 2.857 at df=3
∴ 1.976 < p < 0.05 not significant	∴ 2.857 < p < 0.05 not significant

From the calculations for both dependent variables, there was no significant difference between the control + SES model and the full model. Therefore, we chose to exclude the additional variables, *marriage status*, *housing status* and *availability of clean water* from the models that included the neighbourhood characteristics below.

### **5.3.2 Research question 2A: Neighbourhood-level predictors as modifiers of individual-level effects on self-rated health.**

As mentioned, in order to answer this question two separate models were constructed for each of the dependent variables in order to further explore the effects of contextual variables. In the first model the question was addressed using the City of Toronto neighbourhood boundaries and resulting in a sample size of 500 people. In this analysis, the neighbourhood-level characteristics, *average household income*, *income inequality* and *availability of Aboriginal specific services*, were added to the best-fitting individual model from the previous section. The natural log of average household income was used instead of raw values in order to account for the decreasing marginal utility of income (Tabachnick & Fidell 2007).

This allowed us to identify the effects of these additional variables on predicted health outcomes, as well as to see how the addition of these neighbourhood characteristics may have changed the effects of the individual-level variables in the model.

**Table 8: Models results of logistic regressions predicting “poor” self-rated health amongst Aboriginal individuals living in the City of Toronto, 2006**

<b>Model 2: “Poor” Self-rated Health</b>	<b>Best Fit Individual Variables Model</b>	<b>Model 2A</b>	<b>Model 2B</b>	<b>Model 2C</b>	<b>Model 2D</b>
	<b>OR</b>	<b>OR</b>	<b>OR</b>	<b>OR</b>	<b>OR</b>
<i>Control variables</i>					
<b>Gender (Female)</b>					
Male	0.644 (0.36,1.16)	0.648 (0.36,1.18)	0.657 (0.36,1.19)	0.663 (0.37,1.20)	0.649 (0.36,1.18)
<b>Age Group (25-44 years)</b>					
15-24 years	0.400 (0.10,1.61)	0.442 (0.11,1.82)	0.454 (0.11,1.86)	0.453 (0.11,1.87)	0.443 (0.11,1.83)
45+ years	6.371*** (3.14,12.91)	7.229*** (3.44,15.20)	7.171*** (3.41,15.08)	7.250*** (3.45,15.24)	7.221*** (3.43,15.20)
<b>Aboriginal Group (First Nation)</b>					
Métis	1.861 (0.94,3.67)	1.675 (0.83,3.39)	1.646 (0.82,3.32)	1.643 (0.81,3.33)	1.678 (0.83,3.40)
Inuit/others	0.979 (0.01,103.14)	1.046 (0.01,121.36)	1.099 (0.01,121.23)	0.949 (0.01,100.89)	1.068 (0.01,125.13)
<b>5-yrs Mobility (same residence)</b>					
Changed residence	0.910 (0.50,1.67)	0.890 (0.48,1.65)	0.886 (0.48,1.64)	0.869 (0.47,1.61)	0.889 (0.48,1.65)
<i>Socio-economic status variables</i>					
<b>Household Income (\$45,000-\$89,999)</b>					
Under \$44,999	1.618 (0.82,3.20)	1.665 (0.83,3.35)	1.704 (0.84,3.45)	1.640 (0.82,3.30)	1.677 (0.83,3.40)
Over \$90,000	0.269* (0.09,0.80)	0.283* (0.09,0.86)	0.293* (0.10,0.89)	0.278* (0.09,0.84)	0.285* (0.09,0.87)
<b>Education (high school diploma)</b>					
Less than high school	2.226 (0.86,5.75)	2.116 (0.81,5.51)	2.128 (0.82,5.55)	2.128 (0.82,5.56)	2.129 (0.81,5.59)
Post-secondary	1.322 (0.56,3.14)	1.234 (0.51,2.97)	1.280 (0.53,3.09)	1.244 (0.52,2.99)	1.248 (0.51,3.03)
<b>Employment (worked)</b>					
No work	2.995** (1.86,5.41)	3.009** (1.65,5.49)	2.993** (1.64,5.46)	2.973** (1.63,5.41)	3.007** (1.65,5.49)
<i>Neighbourhood characteristic variables</i>					
Gini coefficient		38.128 (0.03>999.99)			19.213 (<0.001>999.99)
Log of average income			0.72 (0.32,1.62)		0.907 (0.28,2.93)
Service availability				0.896 (0.44,1.83)	0.976 (0.45,2.11)

Source: 2006 Census and APS 2006 (N=500 in all models. \*p<0.05, \*\*p<0.01, \*\*\*p<0.001)

Results from this analysis for the first dependent variable, the likelihood of reporting “poor” self-rated health, are presented in Table 8. The first column presents the best-fitting model from the previous analysis, including only individual characteristics as predictors. Models 2A, 2B, and 2C add the neighbourhood Gini coefficient, log-average neighbourhood income, and the presence of Aboriginal specific services, respectively. The final column (Model 2D) includes all individual and neighbourhood characteristics.

High income was again a significant protective factor against “poor” self-rated health, while unemployment was a significant predictor of “poor” health amongst the Aboriginal people living in the City of Toronto. Although being in the older age category age group continued to be a strong indicator of “poor” self-rated health across all the models, a wide 95% confidence interval indicates the potential need for a larger sample in order to strengthen the results. In addition, due to a small sample of Inuit/others, the confidence interval for these values was very wide.

Surprisingly, none of the neighbourhood-level predictors were significant in predicting “poor” reported self-rated health. Either separately or in the final model (Table 8), the confidence intervals around some of these odds ratios, particularly for the Gini coefficient were also very wide. This suggests that sample size used for these analyses may not be sufficient to observe any neighbourhood-level effects.

Table 9 presents similar models for the second dependent variable, the presence of a diagnosed chronic disease. Again, we started with the best-fitting individual variables model

and added each of the three neighbourhood characteristics separately (Models 2A, 2B and 2C) and as a group (Model 2D).

**Table 9: Models results of logistic regressions predicting diagnosis of a chronic condition(s) amongst Aboriginal individuals living in the City of Toronto, 2006**

<b>Model 2: Chronic Condition Present</b>	<b>Best Fit Model OR</b>	<b>Model 2A OR</b>	<b>Model 2B OR</b>	<b>Model 2C OR</b>	<b>Model 2D OR</b>
<i>Control variables</i>					
<b>Gender (Female)</b>					
Male	0.757 (0.51,1.12)	0.799 (0.53,1.19)	0.805 (0.54,1.20)	0.799 (0.54,1.19)	0.767 (0.51,1.52)
<b>Age Group (25-44 years)</b>					
15-24 years	0.929 (0.54,1.60)	0.900 (0.52,1.56)	0.906 (0.52,1.57)	0.936 (0.54,1.63)	0.935 (0.54,1.63)
45+ years	4.326*** (2.65,7.07)	4.600*** (2.80,7.56)	4.604*** (2.80,7.57)	4.617*** (2.80,7.60)	4.676*** (2.83,7.72)
<b>Aboriginal Group (First Nation)</b>					
Métis	1.019 (0.63,1.65)	0.929 (0.57,1.53)	0.929 (0.57,1.53)	0.902 (0.54,1.63)	0.896 (0.54,1.48)
Inuit/others	1.592 (1.21,20.97)	1.639 (0.12,22.29)	1.623 (0.12,22.37)	1.519 (0.11,20.41)	1.428 (0.11,18.71)
<b>5-yrs Mobility (same residence)</b>					
Changed residence	0.785 (0.51,1.20)	0.816 (0.53,1.25)	0.817 (0.53,1.26)	0.833 (0.54,1.28)	0.840 (0.55,1.29)
<i>Socio-economic status variables</i>					
<b>Household Income (\$45,000-\$89,999)</b>					
Under \$44,999	1.032 (0.64,1.66)	0.950 (0.58,1.55)	0.954 (0.59,1.56)	0.964 (0.59,1.58)	0.936 (0.57,1.54)
Over \$90,000	0.735 (0.44,1.23)	0.702 (0.41,1.19)	0.701 (0.41,1.19)	0.705 (0.42,1.20)	0.693 (0.41,1.18)
<b>Education (high school diploma)</b>					
Less than high school	1.601 (0.83,3.08)	1.655 (0.86,3.21)	1.651 (0.85,3.20)	1.576 (0.81,3.06)	1.56 (0.80,3.03)
Post-secondary	1.305 (0.76,2.25)	1.336 (0.77,2.32)	1.336 (0.77,2.32)	1.347 (0.77,2.34)	1.321 (0.76,2.30)
<b>Employment (worked)</b>					
No work	1.536 (0.99,2.39)	1.541 (0.99,2.41)	1.538 (0.98,2.41)	1.555 (0.99,2.44)	1.561 (0.99,2.45)
<i>Neighbourhood characteristic variables</i>					
Gini coefficient		1.89 (0.01,276.12)			126.615 (<0.05>999.99)
Log of average household income			1.015 (0.61,1.69)		1.422 (0.66,3.08)
Service availability				1.488 (0.94,2.36)	1.689* (1.02,2.80)

Source: 2006 Census and APS 2006 (N=500 in all models. \*p<0.05, \*\*p<0.01, \*\*\*p<0.001)

In this new analysis, age remained a significantly strong predictor of diagnosis of chronic conditions. However, none of the other individual-level variables were significant in predicting the presence of a diagnosed chronic condition in any of the models (Table 9). The addition of the neighbourhood characteristics separately had little effect on the models. None of the neighbourhood characteristics were themselves significant when entered separately. Although some of the individual variable estimates did change slightly, none became significant, suggesting that the individual effects are not significantly affected by neighbourhood characteristics.

We did, however, see that in the full model with all three neighbourhood-level variables included, there was a significant effect of the presence of Aboriginal-specific services (Table 9, Model 1D). Individuals living in neighbourhoods with Aboriginal specific health or social services were 1.7 ( $p < 0.05$ ) times more likely to have one or more chronic conditions present compared to those who lived in neighbourhoods without these services, controlling for average neighbourhood income and neighbourhood income inequality, as well as the individual characteristics. Note that this relationship was not observed in Model 2C (only included the service variable) suggesting that the effects of service availability are not independent of neighbourhood income characteristics (level and inequality).



### **5.3.3 Research question 2B: Neighbourhood stratification by characteristics and its effects on individual-level predictors of self-rated health.**

In order to further explore the influence of neighbourhood, this final analysis examines how the effects of the individual variables on the two dependent variables may be affected by neighbourhood characteristics. For this analysis, neighbourhoods were stratified by income, income inequality and presence of Aboriginal-specific services. Separate models were estimated using the individual characteristics included in the model above, to predict the likelihood of “poor” self-rated health and the presence of a diagnosed chronic disease.

Neighbourhoods were divided into two categories on each neighbourhood-level variable. On income inequality, “high” income inequality neighbourhoods were those with a Gini coefficient above 0.4030, the City of Toronto figure, and were compared to “low” equality neighbourhoods. “High” household income neighbourhoods were those with average incomes above \$85,000, and were compared to others with household incomes below \$85,000. Neighbourhoods were also divided into those with and without Aboriginal-specific services.

It is recognized that these cut-offs may not be ideal. It would have been preferable to be able to divide the neighbourhoods into more categories, for example to include a “middle” income category, rather than simply identify the “high” income neighbourhoods. However, the small sample size of 500 individuals, divided among the 140 Toronto neighbourhoods, was a major limitation to the analysis. This, and the distribution of neighbourhoods by income, resulted in the somewhat high income cut-off and made it impossible to further stratify the sample.

Nonetheless, these stratified models can provide some information about how neighbourhood characteristics might affect effects of individual-level predictors, such as household income and education, on the health of Aboriginal people in Toronto. In the following sections, we present the results of models of “poor” self-rated health and the presence of a diagnosed chronic condition, stratified by neighbourhood income inequality, average neighbourhood income, and presence of Aboriginal services.

Table 10 presents the effects of individual variables of interest on self-rated health measures analyzed within neighbourhoods with *high* (Gini above 0.4030) and *low* (Gini below 0.4030) income inequality.

**Table 10: Models results of logistic regressions predicting “poor” self rated health and diagnosis of a chronic condition(s) amongst Aboriginal individuals living in City of Toronto neighbourhoods stratified by income inequality characteristics, 2006**

Model 3: Income Inequality	"Poor" Self-Rated Health		Chronic Condition Present	
	<u>High Inequality Neighbourhoods</u> (N=47.1%) OR (95%CI)	<u>Low Inequality Neighbourhoods</u> (N=52.7%) OR (95%CI)	<u>High Inequality Neighbourhoods</u> (N=49.1%) OR (95%CI)	<u>Low Inequality Neighbourhoods</u> (N=50.9%) OR (95%CI)
<i>Control variables</i>				
<b>Gender (female)</b>				
Male	0.472 (0.20,1.10)	0.993 (0.40,2.44)	0.637 (0.34,1.19)	0.970 (0.55,1.73)
<b>Age Group (25-44 yrs)</b>				
15-24 years	0.849 (0.15,4.74)	0.128 (0.01,1.92)	0.877 (0.37,2.06)	0.778 (0.35,1.71)
45+ years	6.180** (2.10,18.17)	9.064*** (2.88,28.55)	4.777** (2.19,10.41)	4.305*** (2.16,8.58)
<b>Aboriginal Group (First Nation)</b>				
Métis	0.593 (0.18,1.93)	3.382* (1.23,9.34)	0.534 (0.25,1.14)	1.452 (0.71,2.96)
Inuit/others	NA	NA	NA	NA
<b>5-yrs Mobility (same residence)</b>				
Changed residence	0.612 (0.25,1.52)	1.058 (0.42,2.67)	0.443* (0.23,0.86)	1.327 (0.73,2.43)
<i>Socio-economic status variables</i>				
<b>Household Income (\$45,000-\$89,999)</b>				
Under \$44,999	3.378* (1.10,10.40)	0.847 (0.30,2.39)	0.762 (0.36,1.61)	1.131 (0.56,2.27)
Over \$90,000	0.396 (0.07,2.24)	0.224* (0.05,1.04)	0.673 (0.28,1.59)	0.731 (0.36,1.51)
<b>Education (high school diploma)</b>				
Less than high school	1.329 (0.31,5.65)	3.177 (0.81,12.50)	1.436 (0.51,4.05)	1.873 (0.74,4.75)
Post-secondary	0.955 (0.25,3.69)	1.122 (0.31,4.01)	1.293 (0.54,3.11)	1.507 (0.70,3.27)
<b>Employment (worked)</b>				
No work	1.316 (0.54,3.22)	6.990*** (2.77,17.66)	1.071 (0.54,2.14)	2.035* (1.10,3.78)

Source: 2006 Census and APS 2006 (N=500 in all models. \*p<0.05, \*\*p<0.01, \*\*\*p<0.001)

Age was a significant predictor of both self-rated health outcomes, in models of both health outcomes in both high and low inequality neighbourhoods. Among those in high income inequality neighbourhoods, those 45 years and older had an odds ratio of 9.1, controlling for other variables in the model. This suggests that the effect of age on self-rated health was somewhat weaker among those living in high-inequality neighbourhoods.

Being Métis was a significant predictor of reporting “poor” health, compared to being First Nations or Inuit/others, in low inequality neighbourhoods, while insignificant in high income inequality neighbourhoods. This effect was fairly strong; among those in low-inequality neighbourhoods, Métis were 3.4 times as likely as First Nations to have “poor” self-rated health. There was no significant effect of identity group on the presence of a chronic condition.

Whereas the socioeconomic status variables were not generally significant in the previous individual-level models, some were in the models stratified by income inequality. Having low household income (less than \$44,999) was a significant predictor of “poor” self-rated health only in high income inequality neighbourhoods. Having high household income (over \$90,000) was a protective factor in low income inequality neighbourhoods. Surprisingly, unemployment was strongly significant only in low income inequality neighbourhoods while insignificant in high income inequality neighbourhoods. Those unemployed were nearly seven times as likely to have “poor” self-rated health in low inequality neighbourhoods, and more than twice as likely to have been diagnosed with a chronic condition (Table 12). However, educational attainment was again insignificant in all of these models.

One additional difference between these models and the individual-level models in Tables 5 and 6 is, that mobility status is a significant predictor of the presence of a chronic condition in the model for high inequality neighbourhoods (Table 12), while it was insignificant in all of the previous models. Although this would need much more investigation, this suggests that

there may be some mobility to these neighbourhoods that is related to a need for health services.

Stratifying the models by neighbourhood income inequality did therefore indicate some influence of contextual characteristics on individual-level predictors of self-rated health. However, income inequality is not the same as income levels, and a neighbourhood with a low level of income inequality can have higher or lower average income. Table 11 presents models stratifying neighbourhoods by *high* (above \$85,000) and *low* (below \$84,999) average household incomes.

As in the previous model stratified by income inequality, the models stratified by average income find those in the oldest age category to be much more likely to have “poor” self-rated health, and more likely to report having been diagnosed with a chronic condition (Table 11). Again, this effect is strongest in the neighbourhoods not classified as “high” average income, for the models of self-rated health. In these neighbourhoods, those 45 and older were 7.5 times as likely as those 15 to 25 to have “poor” self-rated health.

**Table 11: Models results of logistic regressions predicting “poor” self rated health and diagnosis of a chronic condition(s) amongst Aboriginal individuals living in City of Toronto neighbourhoods stratified by average household income characteristics, 2006**

Model 3: Income	"Poor" Self-Rated Health		Chronic Condition Present	
	High Income Neighbourhoods (N=40.7%) OR	Other Income Neighbourhoods (N=59.3%) OR	High Income Neighbourhoods (N=44.7%) OR	Low Income Neighbourhoods (N=55.3%) OR
<i>Control variables</i>				
<b>Gender (female)</b>				
Male	0.992 (0.42,2.35)	0.483 (0.18,1.27)	0.682 (0.39,1.20)	0.957 (0.51,1.81)
<b>Age Group (25-44 yrs)</b>				
15-24 years	NA^	1.799 (0.32,10.21)	0.567 (0.27,1.20)	2.883* (1.12,7.40)
45+ years	5.733** (2.18,15.06)	7.515** (2.12,26.70)	4.991*** (2.46,10.11)	4.223** (2.00,8.90)
<b>Aboriginal Group (First Nation)</b>				
Métis	2.369 (0.85,6.59)	1.436 (0.50,4.16)	1.134 (0.57,2.25)	0.749 (0.34,1.65)
Inuit/others	NA	NA	NA	NA
<b>5-yrs Mobility (same residence)</b>				
Changed residence	0.429 (0.17,1.07)	1.090 (0.43,2.75)	0.897 (0.49,1.65)	0.672 (0.35,1.30)
<i>Socio-economic status variables</i>				
<b>Household Income (\$45,000-\$89,999)</b>				
Under \$44,999	2.256 (0.77,6.65)	1.146 (0.41,3.19)	1.754 (0.87,3.53)	0.380* (0.18,0.81)
Over \$90,000	0.200* (0.04,0.96)	0.356 (0.07,1.86)	1.017 (0.49,2.12)	0.472 (0.20,1.11)
<b>Education (high school diploma)</b>				
Less than high school	2.547 (0.60,10.91)	1.884 (0.50,7.04)	1.749 (0.71,4.32)	1.783
Post-secondary	0.200 (0.59,8.80)	0.718 (0.21,2.51)	1.289 (0.60,2.77)	1.479 (0.62,3.54)
<b>Employment (worked)</b>				
No work	5.245** (2.18,12.61)	1.867 (0.71,4.94)	1.320 (0.73,2.39)	2.361* (1.11,5.01)

Source: 2006 Census and APS 2006 (N=500 in all models. \*p<0.05, \*\*p<0.01, \*\*\*p<0.001)

^NA: After stratification, the population within this category was too small, resulting in inconclusive results.

Among the socio-economic variables, high household income served as a significant protective factor against “poor” self-rated health. Those with household incomes over \$90,000 in 2005 were only 0.20 times likely to have poor self-rated health as those with household incomes between \$45,000 and \$89,999. As well, unemployment was a significant predictor of “poor” self-rated health, but only in high income neighbourhoods.

However, the effects of socioeconomic status on the models of chronic conditions were somewhat different. In these models, the only significant income effects was that, in non-high income neighbourhoods, those earning under \$44,999 had significantly *lower* odds of having a chronic condition than those in the reference category, controlling for the other variables in the model (Table 11). However, the effect of unemployment was significant and in the expected direction in this model. Unemployed Aboriginal people in these non-high income neighbourhoods were more than 2.3 times as likely as those employed or out of the labor force to report a chronic condition.

To continue this analysis, Table 12 presents the effects of individual variables of interest on self-rated health measures, stratifying neighbourhoods by the presence of Aboriginal-specific health or social services. It should be noted that in the previous two analyses (Table 10 and 11), the sample size was approximately equal in both neighbourhood categories observed. However, for this analysis approximately 80% of the sample lived in neighbourhoods where Aboriginal services are available while approximately 20% were in neighbourhoods without Aboriginal-specific services.

**Table 12: Models results of logistic regressions predicting “poor” self rated health and diagnosis of a chronic condition(s) amongst Aboriginal individuals living in City of Toronto neighbourhoods stratified by availability of Aboriginal specific service, 2006**

Model 3: Services	"Poor" Self-Rated Health		Chronic Condition Present	
	<u>Aboriginal Service Neighbourhoods</u> (N=80.5%) OR	<u>No Service Neighbourhoods</u> (N=19.2%) OR	<u>Aboriginal Service Neighbourhoods</u> (N=80.1%) OR	<u>No Service Neighbourhoods</u> (N=19.9%) OR
<i>Control variables</i>				
<b>Gender (female)</b>				
Male	0.718 (0.35,1.45)	0.386 (0.08,1.81)	0.851 (0.53,1.36)	0.764 (0.31,1.89)
<b>Age Group (25-44 yrs)</b>				
15-24 years	0.641 (0.11,3.72)	0.167 (0.01,3.05)	0.893 (0.47,1.70)	0.809 (0.23,2.81)
45+ years	14.368*** (5.38,38.37)	2.109 (0.38,11.70)	4.211*** (2.38,7.45)	5.000** (1.57,15.94)
<b>Aboriginal Group (First Nation)</b>				
Métis	1.659 (0.74,3.72)	0.599 (0.07,5.11)	1.012 (0.57,1.78)	0.484 (0.14,1.67)
Inuit/others	NA	NA	NA	NA
<b>5-yrs Mobility (same residence)</b>				
Changed residence	1.565 (0.75,3.26)	0.107** (0.02,0.53)	1.062 (0.64,1.75)	0.233** (0.09,0.64)
<i>Socio-economic status variables</i>				
<b>Household Income (\$45,000-\$89,999)</b>				
Under \$44,999	1.000 (0.44,2.26)	23.153* (1.27,420.99)	0.943 (0.53,1.68)	0.833 (0.29,2.38)
Over \$90,000	0.275 (0.08,1.01)	2.259 (68.03)	0.678 (0.37,1.24)	0.848 (0.24,3.01)
<b>Education (high school diploma)</b>				
Less than high school	1.528 (0.50,4.66)	9.863 (0.67,145.42)	2.176* (1.01,4.70)	0.303 (0.06,1.54)
Post-secondary	0.879 (0.31,2.47)	0.754 (0.08,6.80)	1.461 (0.77,2.78)	0.968 (0.27,3.50)
<b>Employment (worked)</b>				
No work	4.782*** (2.33,9.81)	0.497 (0.09,2.87)	1.812* (1.07,3.08)	1.552 (0.51,4.74)

Source: 2006 Census and APS 2006 (N=500 in all models. \*p<0.05, \*\*p<0.01, \*\*\*p<0.001)

In these models, being 45 and older was again a significant predictor of “poor” self-rated health and presence of a chronic condition, with the exception of those living in neighbourhoods without Aboriginal-specific services. However, the fairly wide 95% CI for this age category in non-serviced neighbourhoods suggests that there may be some age effect, but



that we require a larger sample to better identify this relationship. The effect of this age category on self-rated health was strong, with people 45 and older in neighbourhoods with Aboriginal-specific services more than 14 times as likely as those 25-44 to report “poor” self-rated health. The effects on chronic conditions were also strong and significant (Table 12).

Somewhat surprisingly, those who had moved in the previous five years were significantly less likely to report “poor” self-rated health or a chronic condition, but only in the models for neighbourhoods with no Aboriginal-specific services. This effect is difficult to understand in terms of health-related mobility. However, it is important to note once again that the majority of neighbourhoods with Aboriginal specific services available were also those with lower average incomes. We might speculate that these mobility effects are partly due to fairly healthy people moving into better-off neighbourhoods, but further analysis are needed. Low household income was a very strong and significant predictor of “poor” health, but only in neighbourhoods with no Aboriginal services available. In those neighbourhoods, people with household incomes under \$44,999 were more than 23 times as likely as those in the reference category to have “poor” self-rated health. Low household income was not a significant predictor in the models for chronic conditions.

For the first time in our entire analysis, education had a significant effect on health outcomes. Those with less than high school education were significantly more likely than those with high school (OR = 2.26) to report a chronic condition, in the model for neighbourhoods with Aboriginal services. However this was the only significant education effect.

## 5.4 Conclusions

Overall, the results of this analysis provide some limited support for the idea that characteristics of neighbourhoods are related to the health of their Aboriginal residents. The maps presented clearly indicate that Aboriginal people living in the City of Toronto are more concentrated in particular neighbourhoods, especially those within the downtown core and just east of the city centre. Moreover, these tend to be the neighbourhoods with the lowest average income levels and with Aboriginal services present. However, the small numbers of individuals in our APS sample mean that the estimates of the Aboriginal population at the neighbourhood level are somewhat unreliable, as they are based on small numbers within each of the 140 neighbourhoods.

The individual-level models found that age category was the only reliable predictor of either “poor” self-rated health or the diagnosis of a chronic condition (Table 6). Being 45 years or older was significant in all models. Aboriginal identity was significant only in one model of self-rated health, and this effect disappeared once the socio-economic status variables (household income, education and employment) were added. Those effects themselves were not reliable predictors of the presence of a chronic condition, although unemployment people were significantly more likely to report “poor” self-rated health.

The addition of the neighbourhood characteristics to these individual models did not help us to predict “poor” self-rated health. The log of neighbourhood average income, the neighbourhood Gini coefficient, and the presence of Aboriginal-specific services were insignificant when entered separately or together. However, the availability of Aboriginal-

specific services was a significant predictor of having been diagnosed with a chronic condition, in the model that also controlled for neighbourhood income and income inequality. This suggests that there may be some independent relationship between the availability of Aboriginal-specific health and social services in a neighbourhood and the likelihood that its Aboriginal residents have a chronic condition.

In the last analysis, we examined the effects of neighbourhood characteristics on the effects of the individual-level variables, by stratifying the sample into high- and low-income inequality neighbourhoods, neighbourhoods with high average income and others, and neighbourhoods with Aboriginal-specific services and those without. These models did provide some evidence that the neighbourhood context mattered, insofar as the individual-level effects changed when the models were stratified. The effects of age were fairly consistent across all models, but the effects of income and unemployment varied between high- and low-income inequality neighbourhoods (Table 10) and high and low average income neighbourhoods (Table 11).

In the following chapter, we will place these findings in the context of the broader literature about the social determinants of health, Aboriginal health, and the effects of neighbourhood socio-economic context on health.

## 6.0 DISCUSSION

Recent research has shown the association between various neighbourhood factors and negative health outcomes (Diez Roux 2001; Kawachi & Berkman 2003; Ross & Mirowsky 2001). However, research in the area of Aboriginal health has often been limited to on-reserve populations when looking at the influence of both contextual and individual-level factors on various health outcomes (Wilson & Rosenberg 2002). Furthermore, with increasing urban Aboriginal populations, such research will be critical in not only understanding the links to negative health outcomes but also to inform the creation of effective health promotion initiatives and policy changes. The analysis conducted in this research provides a preliminary picture of some of the factors that significantly influence the health of Aboriginal people in the City of Toronto.

### *Effects of Neighbourhood Characteristics: income inequality, average household income, and availability of Aboriginal-specific services*

In general, we found no real evidence of a relationship between neighbourhood characteristics and the health of Aboriginal peoples in Toronto. Contrary to what had been predicted, neither income inequality as measured by the Gini coefficient, average household income, nor the availability of Aboriginal-specific services were significant in predicting either health outcome independently. However, there were some significant effects of the presence of Aboriginal services when all three of these variables were included in a single model. As well, the inclusion of some of these variables modified some effects of the individual-level variables, as was the case when models were stratified by neighbourhood type. We discuss some potential interpretations of these effects below.

While there is very limited literature on the effects of the Gini coefficient on self-rated health outcomes at the neighbourhood level, our results were consistent with a 2009 study conducted in Hong Kong (Wong et al. 2009). Wong et al. (2009) concluded that, “contextual income inequality is unassociated with individual self-rated health across population subgroups” (Wong et al. 2009 p. 129). However, that report goes on to explain that a suggested explanation is that the role of income inequality is a confounding one on the effects of other neighbourhood measures. This could explain our findings, in which availability of Aboriginal-specific services became a significant predictor of diagnosis of chronic conditions, when all neighbourhood-level factors were included within the model (Wong et al. 2009).

Although none of the models including the neighbourhood-level factors altered the significance of the relationships of individual-level predictors on the health outcomes, we did note a slight difference in the odds ratios of the previously determined significant individual-level predictors. This change resulted in a decreased 95% confidence interval, which consequently strengthened the relationship of the variable.

Neighbourhoods were then stratified based on the three characteristics, income inequality, income and availability of Aboriginal-specific services. It was then that we observed that neighbourhood factors did in fact influence the relationship between some individual-level variables and both “poor” self-rated health and diagnosis of chronic conditions.

While age remained a significant predictor of both health outcomes in all the stratified models, we now saw a stronger significance between old age and reporting “poor” health

amongst Aboriginal individuals living in more disadvantaged (low income) neighbourhoods compared to those living in advantaged neighbourhoods.

In addition, Aboriginal people who had changed residence within the past five years were less likely to be diagnosed with chronic conditions in the high inequality neighbourhood models and in models for neighbourhoods with no availability of Aboriginal-specific services. One possible explanation may be that those who have recently moved into neighbourhoods without Aboriginal-specific services may be those with fewer health or social service needs, and therefore better health outcomes. However, this is speculative and requires further investigation.

We also observed an association between Aboriginal identity and health outcomes. While a larger sample would help provide a better analysis for the Inuit/Other category, we observed that Aboriginal people who identified themselves as Métis, and lived in low inequality neighbourhoods, were likely to report having “poor” self-rated health while those living in high inequality neighbourhoods did not. However, it should be noted that the confidence intervals are fairly wide, suggesting that this should also be investigated with a larger sample.

In addition to demographic variables, the socio-economic variables provided us with further details on the present situation of Aboriginal populations living within Toronto’s neighbourhoods. When neighbourhoods were stratified based on income inequality, having a high household income served as a protective factor against “poor” self-reported health in Aboriginal people living in low inequality neighbourhoods, while insignificant in high

inequality neighbourhoods. Since we saw a similar association in individuals with high income and living in high income neighbourhoods (neighbourhoods stratified by income), this population likely represented the most advantaged population in our sample. However this relationship was not significant in the diagnosis of chronic conditions model, consistent with the notion that self-perceived health is measuring a different aspect of health from the presence of a diagnosed chronic condition.

Having low family income (under \$44,999), was a significant predictor of only “poor” self-rated health and not diagnosis of chronic conditions in individuals living in high inequality neighbourhoods. This group would essentially encompass the most disadvantaged Aboriginal population living in the City of Toronto and again results indicate discrepancies between our two health outcomes, self-rated health and diagnosis of chronic conditions.

#### *Discrepancies between health outcomes*

As seen, not all “poor” health is necessarily due to the presence of chronic condition(s), and there may be two possible explanations for this. One possible explanation for these differences between the two health outcomes is that in order for an individual to be diagnosed with a chronic condition they would have to seek medical attention. Access and usage of health care is a continuing issue within the Aboriginal population in Canada, and research has shown individuals with low socio-economic status, are more likely to seek medical care less often due to barriers in access and delivery of health care (Cockerham 2004; Richmond et al. 2007; Wilson & Rosenberg 2002). Therefore, a potential explanation of the low statistical

significance for the same variables in the comparable regressions could be due to lack of access or use of medical care by this population.

A second likely explanation for the differences within the two health outcomes deals with cultural differences. The APS chronic disease question indicates only those conditions that had been diagnosed by a physician (eg. diabetes, coronary heart disease, etc.) and therefore those with undiagnosed diseases may be excluded. Moreover, some Aboriginal people may eschew biomedical approaches to healing, in favour of more traditional approaches, which would not yield a clinical diagnosis (Micozzi 2006). As a result, self-rated health and the presence of a diagnosed medical condition may be even less well-correlated in the Aboriginal population than they are among mainstream Canadians.

As explained, diagnosis of a chronic condition was included in order to include a somewhat less subjective outcome variable in the analysis. In addition, it captures a variety of specific diseases, as we were interested in the determinants of health in general. However, future research should examine the effects of individual and contextual variables on specific diseases or conditions, such as diabetes or obesity, or health-related behaviours, such as smoking or physical activity.

Finally, the significance of unemployment as a predictor of either health outcomes was consistent in predicting both health outcomes across all three stratified models. When neighbourhoods were stratified by income inequality, unemployment was significant in predicting “poor” self-rated health and diagnosis of a chronic condition only within low



inequality neighbourhoods. However, when looking at neighbourhoods stratified by average income, unemployment was a significant predictor of “poor” self-rated health only in high income neighbourhoods, while it was a predictor of diagnosis of chronic conditions only in low income neighbourhoods. A possible and obvious explanation for not being employed being a significant predictor of chronic conditions in disadvantaged (low inequality and low income) neighbourhoods could be due to people being unable to work due to severe chronic conditions and therefore unable to maintain labour force attachment. This is particularly the case, as the “no work” category included those who were out of the labour market, as well as those who were unemployed but still looking for work.

#### *Effects of Individual Characteristics*

In order to study neighbourhood effects on individual-level predictors of both self-rated health and diagnosis of chronic conditions, the individual-level predictors had to be selected and analyzed to provide an understanding of the current urban Aboriginal health status in the City of Toronto.

Our analysis was consistent with previous research indicating an association between old age and the likelihood of reporting “poor” self-rated health and the presence of a diagnosed chronic condition (Cott et al. 1999; Newbold 2005). However, on the contrary, being young (15-24 years) did not necessarily serve as a protective factor against either health outcome.

Gender itself did not play a large role in predicting either health outcome although we know that Aboriginal women experience both individual and institutional discrimination more than men (Adelson 2005). However, we chose to include it in our analysis as, from previous

research, we know that there exists a significant difference between males and females with regards to self-rated health (Harrington & Elliott 2008; Richmond & Ross 2009); yet, the influence of gender on the causal pathway between social factors such as employment and education and health outcomes is still not well defined (Richmond & Ross 2009). Therefore, a possible explanation for why gender did not play a more significant role within our analysis could be that its effects were masked by the socio-economic variables such as employment.

We predicted that Aboriginal people with lower socio-economic status would be more likely to report having “poor” health and be diagnosed with a chronic condition compared to those with higher socio-economic status. Surprisingly, education was not a significant predictor of health status, contrary to other findings (Wilson & Rosenberg 2002; Wilson & Young 2008). Although our study included only a small number of individual-level variables, they were sufficient to provide an overview of the current status of urban Aboriginal populations living within the City of Toronto. As explained in the following section, the study included some strengths and limitations that should be taken into account when conducting future research similar to ours.

### **6.1 Study Limitations**

A major limitation of our study was the small sample size available to work with. This limitation was a great barrier when neighbourhoods were stratified and the sample distribution was uneven and often times fell under Statistics Canada’s required a minimum of ten individuals for each cross-analysis. In addition, although considerable differences were still identified within the population, many of the insignificant predictors of self-rated health

should not be completely disregarded as they may have failed to reach significance due to insufficient power.

There were also several study limitations related to the Census and APS data. In order to be able to complete the APS and be included in the sample, the individual must have reported himself/herself as Aboriginal on the 2006 Census, which is only disseminated to individuals who lived in legal residences with valid postal codes. According to 2006 Census data, there were approximately 26,575 Aboriginal people living in the City of Toronto (Statistics Canada 2009). It has been estimated that the actual number of Aboriginal people living in the City of Toronto may be as high as 80,000 (Smylie 2010). Although there is not yet a conclusive estimate of the degree of undercounting, this would translate to approximately 68% of Aboriginal people in Toronto being unaccounted for due to various reasons including homelessness, illegal residing within a dwelling or not identifying themselves as Aboriginal on the census form. This raises the issue of “undercounted and underserved” where government funding would not be allocated according to the “real” need of this population. Furthermore, this would influence the distributions across the socio-economic variables and potentially strengthen neighbourhood effects, as the majority of individuals who were unaccounted for would tend to fall within the lower categories.

Finally, due to limited resources and time, other neighbourhood characteristics such as crime rates, walk-ability and access to grocery stores, all of which have been linked to having effects on individual health could not be included. In future research, we suggest including such variables in order to strengthen the analyses of the effects of neighbourhoods on individual health.

## REFERENCES

- Adelson, N. (2005). The Embodiment of Inequity: Health Disparities in Aboriginal Canada. *Canadian Journal of Public Health*. 96(2): 41-61.
- Chandler, M.J., Lalonde, M. (1998). Cultural Continuity as a Hedge against Suicide in Canada's First Nations. *Transcultural Psychiatry*. 35:191-219.
- City of Toronto. (2004). Toronto Neighbourhood Profiles. Social Research and Analysis Unit. Toronto: Retrieved on January 8, 2010 from:  
<http://www.toronto.ca/demographics/neighbourhoods.htm>
- City of Toronto (2008). Regent Park revitalization. Toronto: Retrieved on August 10, 2010 from: [http://www.toronto.ca/revitalization/regent\\_park/](http://www.toronto.ca/revitalization/regent_park/)
- City of Toronto (2010). Toronto's Racial Diversity. Toronto. Retrieved on July 26, 2010 from: [http://www.toronto.ca/toronto\\_facts/diversity.htm](http://www.toronto.ca/toronto_facts/diversity.htm)
- Cockerham, W.C. (2004). *Class and Health: Explaining the relationship. "Social Causes of Health and Disease"*. Cambridge UK: Polity Press
- Cooke, M., and Belanger, D. (2006) Migration Theories and First Nations Mobility: Towards a Systems Perspective. *The Canadian Review of Sociology and Anthropology*. 43(2): 141-164
- Cott, C. A., Gignac, A. M., and Badley, E. M. (1999) Determinants of self rated health for Canadians with chronic disease and disability. *Epidemiol Community Health* 53: 731-736
- Coburn, D. (2004) Beyond the income inequality hypothesis: class, neo-liberalism, and health inequalities. *Social Science & Medicine*. 58: 41-56.
- Department of Justice (2010a). Indian Act (R.S. 1985, c.I-5). Ottawa. Retrieved on August 10, 2010 from: <http://laws.justice.gc.ca/en/I-5/>
- Department of Justice(2010b). Constitution Act 1867 to 1982. Ottawa: Canadian Federal Government. Retrieved on July 26, 2009 from: <http://laws.justice.gc.ca/en/const/index.html>
- Diez Roux, A.V. (2001). Investigating neighbourhood and area effects on health. *American Journal of Public Health* 91: 1783-1789
- Frohlich, K.L., Ross, N. and Richmond, C. (2006) Health disparities in Canada today: Some evidence and a theoretical framework. *Health Policy*. 79:132-43
- Gastwirth, Joseph L. (1971) Notes and Comments: A General Definition of the Lorenz Curve. *Econometrica*: 39(6))

Graham, H. (2004). Social determinants and their unequal distribution: Clarifying policy understandings. *Milbank Quarterly*, 82(1), 101-124.

Haines, V. A., Godley, J., Hawe, P., Shiell, A. (2009) Socioeconomic advantage within a neighbourhood, perceived financial security and self-rated health. *Health and Place*. 15: 383-389

Harrington, D.W., and Elliott, S.J. (2008) Weighing the importance of neighbourhood: A multilevel exploration of the determinants of overweight and obesity. *Social Science & Medicine*. 68: 593-600

HRSDC - Human Resources and Skills Development Canada (2010). Canadians in Context – Aboriginal Population. Retrieved on July 19, 2010 from <http://www4.hrsdc.gc.ca/.3ndic.1t.4r@-eng.jsp?iid=36>.

INAC - Indian and Northern Affairs Canada (2009). Fact Sheet - Urban Aboriginal population in Canada. Ottawa: <http://www.ainc-inac.gc.ca/ai/of/ias/fs/index-eng.asp>

Idler, E.L., Benyamini, Y. (1997). Self-rated health and mortality: a review of twenty-seven community studies. *Journal of Health and Social Behaviour* . 38: 21-37

Kastes, W.G. (1993) *The Future of Aboriginal Urbanization in Prairie Cities: Selected annotated bibliography and literature review on urban Aboriginal issues in the Prairie Provinces*. Winnipeg: Institute of Urban Studies, University of Winnipeg.

Kawachi, I. and Berkman, L.F. (2003). *Neighbourhoods and Health*. New York: Oxford University Press.

Keller-Olaman, S.J., Eyles, J.D., Elliot, S.J, Wilson, K., Dostrovsky, N., and Jerret, M. (2005). Individual and Neighbourhood Characteristics Associated with Environmental Exposure: Exploring Relationships at Home and Work in a Canadian City. 37: 441-464.

Kunkel S., and Atchley, R. (1996) Why gender matters: being female is not the same as not being male. *American Journal of Preventive Medicine*. 12(5): 294-296

Lafontaine, C. (2006). Presentation to the Standing Senate Committee on Aging. Ottawa: National Aboriginal Health Organization (NAHO)

Lalonde, M. (1974). *A New Perspective on the Health of Canadians*. Ministry of Supply and Services. Ottawa.

Lindgren, A. (2009). News, geography and disadvantage: mapping newspaper coverage of high-needs neighbourhoods in Toronto, Canada. *Canadian Journal of Urban Research*. Retrieved on August 10 from: <http://www.highbeam.com/doc/1G1-229218931.html>

Lundberg, O., and Manderbacka, K. (1996). Assessing reliability of measures of self-rated health. *Scandinavian Journal of Social Medicine*. 24: 218-224.

Lynch, J., Smith, G.D., Harper, S.A.M., Hillemeier M., Ross, N., Kaplan, G.A., and Wolfson, M. (2004) Is income inequality a determinant of population health? Part 1. A systematic review. *82:5-99*.

Lynch, J. (2000). Income inequality and health: expanding the debate. *Social Science & Medicine*. 51:1001-1005

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

Merci, J. A. (2006). Assaultive Violence and War. In B.S. Levy and V.W. Sidel *Social Injustice and Public Health* (pg. 295-317) New York: Oxford University Press.

Mendelson, M. (2006). Aboriginal people and postsecondary education in Canada. Ottawa: Caledon Institute of Social Policy

Micozzi, M. (2006). *Fundamentals of Complementary and Integrative Medicine*. 3rd Ed. Chapter 29: Native American Healing. Missouri: Saunders Elsevier. pg. 551-570

Minore, B., Katt, M., and Hill, M.E. (2009) Planning without factors: Ontario's Aboriginal Health Information Challenge. *Journal of Agromedicine*. 14(2): 90-96

Needleman, L. (1979). Income Distribution in Canada and the Disaggregation of the Gini coefficient of Concentration. *Canadian Public Policy* 4: 497-505

Newbold, B. (2005). Self-rated health within the Canadian immigrant population: risk and the healthy immigrant effect. *Social Science & Medicine*. 60: 1359-1370.

Peters, E. (2002) *Aboriginal People in Urban Areas*. in *Urban affairs: back on the policy agenda*. McGill-Queen's University Press. 45-70.

Peters, E. J. and D. Newhouse (2003). "Introduction", in *Not Strangers in these parts: Urban Aboriginal Peoples*. D. Newhouse and E. J. Peters, Eds. Ottawa, ON.: Policy Research Institute: 3-14.

Pickett, K. E. and Pearl, M. (2001). "Multilevel analyses of neighbourhood socioeconomic context and health outcomes: A critical review." *Journal of Epidemiology & Community Health* 55: 111-122.

PHAC - Public Health Agency of Canada (2010) "What Determines Health?". Ottawa. Retrieved on July 26, 2010: <http://www.phac-aspc.gc.ca/ph-sp/determinants/index-eng.php>.

Raphael, Dennis (2010). "How do I avoid thee? Let me count the ways: Public health approaches towards the social determinants of health". Presented at the 2010 Canadian Public Health Association Conference.

Richmond, C. A. M. and Ross, N. A. (2009). "The determinants of First Nation and Inuit health: A critical population health approach." *Health and Place* 15(2): 403.

Richmond, C.A.M., Ross, N.A., and Egeland, G.M. (2007) *Social Support and Thriving Health: A New Approach to Understanding the Health of Indigenous Canadians*. *American Journal of Public Health*. 97(9): 1827-1833.

Ross, N., Tremblay, S., Graham, K. (2004) Neighbourhood influences on health in Montreal, Canada. *Social Science and Medicine*. 59(7) 1485-1494

Ross, C.E., and Mirowsky, J. (2001) Neighbourhood Disadvantage, Disorder, and Health. *Journal of Health and Social Behaviour*. 42(3): 258-276.

Statistics Canada (2003) *Income Trends in Canada 1980 to 2001: User's guide*. Income Statistics Division (Cat. No. 75F0002MIE No. 003).

Statistics Canada (2009a). *About the Census: Census 2006 Reference Material*. Ottawa. Retrieved on July 26, 2010 from: <http://www12.statcan.gc.ca/census-recensement/2006/ref/index-eng.cfm>.

Statistics Canada (2009b). *Population by Aboriginal group, by census metropolitan area (2006 Census)*. Retrieved from: <http://www40.statcan.gc.ca/l01/cst01/demo64a-eng.htm>

Statistics Canada (2009c). "2006 Census: Aboriginal peoples in Canada in 2006: Inuit, Metis and First Nations." 2006 Census, Retrieved on January 12, 2009 from: <http://www12.statcan.ca/census-recensement/2006/as-sa/97-558/p1-eng.cfm>

Statistics Canada (2010a) *Low Income Lines, 2008-2009*. Income Statistics Division. Ottawa. (Catalogue no. 75F0002M No. 005)

Statistics Canada (2010b) *2006 Census Technical Report: Sampling and Weighting*. Ottawa. Retrieved on August 10, 2010 from: [http://www12.statcan.gc.ca/census-recensement/2006/ref/rp-guides/rp/sw-ep/sw-ep\\_p03-eng.cfm#a3\\_2](http://www12.statcan.gc.ca/census-recensement/2006/ref/rp-guides/rp/sw-ep/sw-ep_p03-eng.cfm#a3_2)

Tabachnick, B. G., and Fidell, L. S. (2007) *Using Multivariate Statistics (Fifth Edition)* pp. 117-194.

Thomson, H., Thomas, S., Sellstrom, E., and Petticrew, M. (2009). *The Health Impacts of Housing Improvements: A systematic review of intervention studies from 1887 to 2007*. *American Journal of Public Health* 99(3): 681-692

Tjepkema, M. (2002). The Health of Off-reserver Aboriginal Population. Supplement to Health Reports S. Canada. Ottawa. Catalogue 82-003.

United Way et al. (2002). 211Toronto.ca City of Toronto: Retrieved on August 10 from: [http://www.211toronto.ca/about\\_us.jsp](http://www.211toronto.ca/about_us.jsp)

United Way (2004) Poverty By Postal Code: The Geography of Neighbourhood Poverty, City of Toronto 1981-2001. Canadian Council On Social Development.

Veenstra, G. (2009). Racialized identity and health in Canada: Results from a nationally representative survey. *Social Science & Medicine*. 69: 538-542.

Veuglers, P.J., Yip, A.M., Kephart, G. (2001) *American Journal of Epidemiology*. 154(8): 725-732

Wagstaff, A. and Van Doorslaer, E. (2000). Income inequality and health: what does the literature tell us? *Annual Review Public Health*. 21: 543-67

Waldram, James B., Herring, A.B., Young, T.K. (2006) *Aboriginal health in Canada: Social, Cultural, and Epidemiological perspectives*, Second Edition. Toronto: University of Toronto Press.

White, J.P., Maxim, P.S. (2003) *Social Capital, Social Cohesion and Population outcomes in Canada's First Nations Communities*. in *Aboriginal Conditions: Research as a foundation for public policy*. 7-35 UBC Press 2003.

Whitehead, M., Dahlgren, G., and Gilson, L. (1991). *Developing the policy response to inequities in health: a global perspective*. *Challenging inequities in health care: from ethics to action*. New York: Oxford University Press 2001: 309-322

Wilkinson, R. (2005). *The Impact of Inequality: How to make sick societies healthier*. New York: The New Press

Wilson, K. and M. W. Rosenberg (2002). "Exploring the determinants of health for First Nations peoples in Canada: can existing frameworks accommodate traditional activities?" *Social science & medicine* 55: 2017-2031.

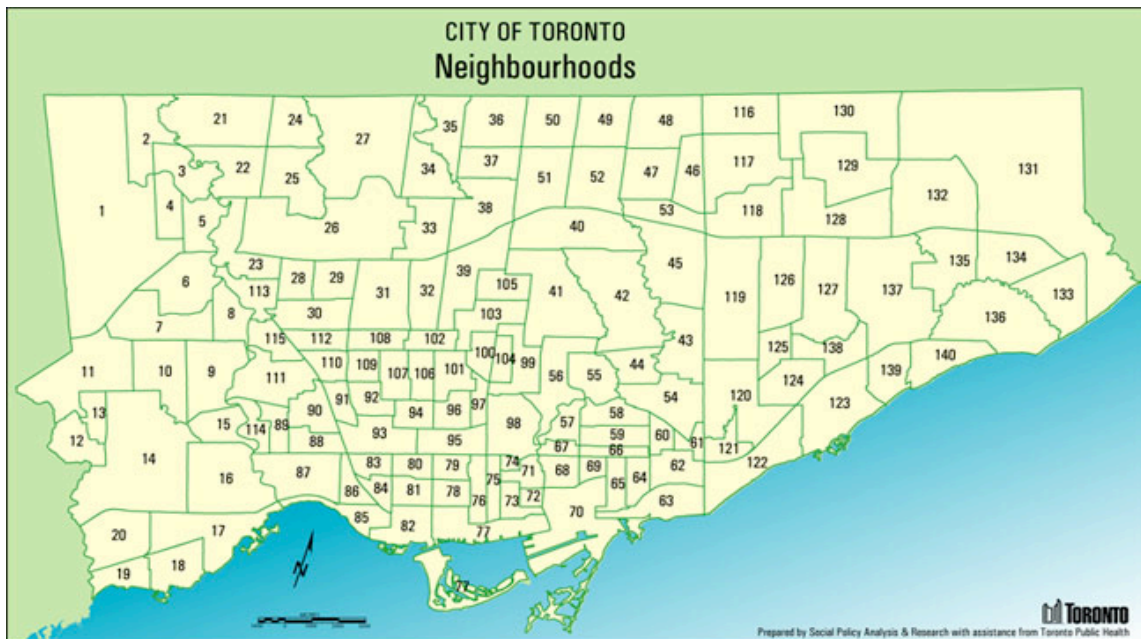
Wilson, K. and T.K. Young. 2008. An overview of Aboriginal health research in the social sciences: Current trends and future directions. *International Journal of Circumpolar Health* 67(2-3): 179-189.

World Bank (2010). *Measuring Inequality*. Retrieved on June 24, 2010 <http://go.worldbank.org/3SLYUTVY00>

Young (2003) *Review of research on Aboriginal populations in Canada: relevance to their health needs*. *BMJ*. 327:419-422



## Appendix A: City of Toronto Neighbourhoods and neighbourhood characteristics for 2006

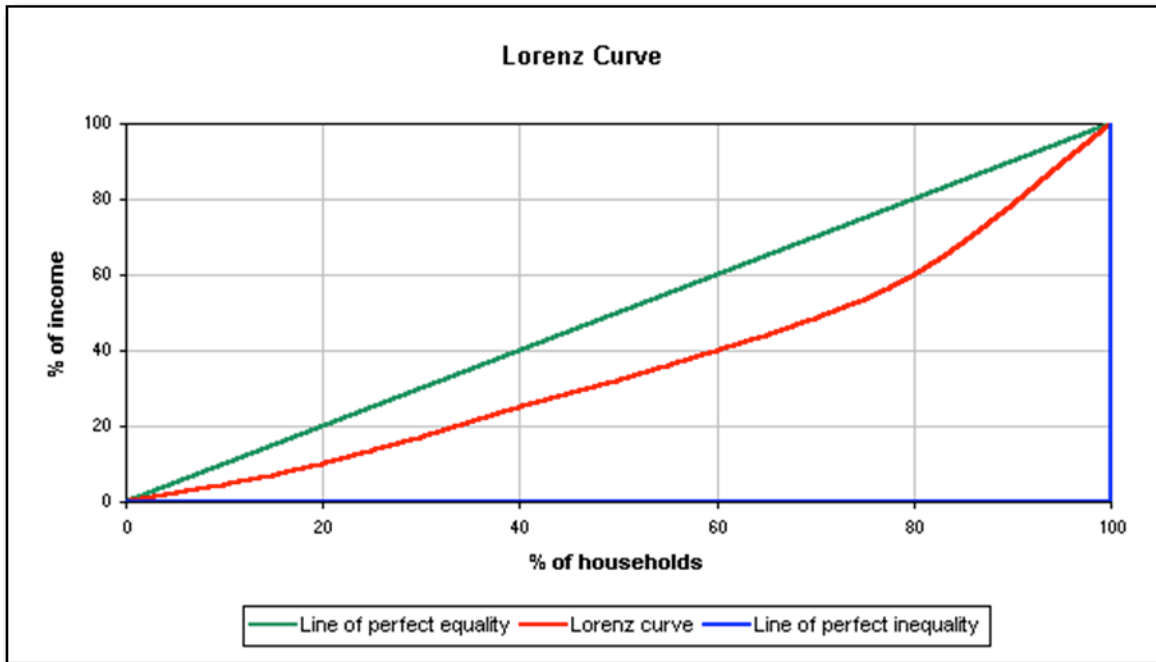


NEIGH ID#	Neighbourhood Name	Total Population	Gini Coefficient	Average Household Income	Aboriginal services available
1	West Humber-Clairville	32,255	0.3594	\$73,213	0
2	Mount Olive-Silverstone-Jamestown	32,120	0.3788	\$57,410	0
3	Thistletown-Beaumont Heights	9,930	0.3666	\$78,069	0
4	Rexdale-Kipling	10,720	0.3953	\$65,885	0
5	Elms-Old Rexdale	9,435	0.3632	\$62,257	0
6	Kingsview Village-The Westway	21,405	0.3835	\$65,715	0
7	Willowridge-Martingrove-Richview	20,905	0.3734	\$80,862	0
8	Humber Heights-Westmount	10,530	0.3919	\$73,154	0
9	Edenbridge-Humber Valley	14,455	0.3436	\$198,094	0
10	Princess-Rosethorn	10,960	0.2523	\$206,470	0
11	Eringate-Centennial-West Deane	18,530	0.3323	\$83,332	0
12	Markland Woods	10,240	0.3288	\$102,871	0
13	Etobicoke West Mall	10,675	0.3742	\$62,784	0
14	Islington-City Centre West	32,820	0.3839	\$79,422	0
15	Kingsway South	8,775	0.2415	\$245,554	0
16	Stonegate-Queensway	23,805	0.3696	\$99,816	0
17	Mimico	24,970	0.4005	\$70,016	0
18	New Toronto	10,650	0.4358	\$56,459	0
19	Long Branch	9,625	0.3946	\$65,435	0
20	Alderwood	11,655	0.3577	\$74,883	0
21	Humber Summit	12,760	0.3711	\$66,434	0
22	Humbermede	14,775	0.3854	\$56,687	0
23	Pelmo Park-Humberlea	8,735	0.3524	\$72,525	0
24	Black Creek	21,720	0.4055	\$49,212	0
25	Glenfield-Jane Heights	30,885	0.4046	\$52,097	0
26	Downsview-Roding-CFB	32,005	0.3987	\$59,185	1
27	York University Heights	26,145	0.4146	\$51,802	1
28	Rustic	10,040	0.4361	\$51,370	0

29	Maple Leaf	10,270	0.3934	\$63,366	0
30	Brookhaven-Amesbury	17,320	0.4021	\$57,968	0
31	Yorkdale-Glen Park	14,830	0.4043	\$62,268	0
32	Englemount-Lawrence	21,110	0.3824	\$73,359	0
33	Clanton Park	13,735	0.4106	\$75,349	0
34	Bathurst Manor	14,940	0.402	\$72,093	0
35	Westminster-Branson	24,400	0.4297	\$63,464	0
36	Newtonbrook West	20,485	0.4079	\$67,697	0
37	Willowdale West	12,515	0.402	\$81,126	0
38	Lansing-Westgate	14,440	0.3809	\$164,104	0
39	Bedford Park-Nortown	21,965	0.3206	\$188,854	0
40	St.Andrew-Windfields	17,560	0.3069	\$203,497	0
41	Bridle Path-Sunnybrook-York Mills	8,210	0.13	\$640,282	0
42	Banbury-Don Mills	25,445	0.3515	\$109,454	0
43	Victoria Village	17,050	0.4099	\$55,340	0
44	Flemingdon Park	21,285	0.4037	\$45,053	0
45	Parkwoods-Donalda	33,825	0.3805	\$76,396	0
46	Pleasant View	16,605	0.3619	\$72,045	0
47	Don Valley Village	26,650	0.3855	\$70,277	0
48	Hillcrest Village	18,330	0.3942	\$76,480	1
49	Bayview Woods-Steeles	13,295	0.3761	\$92,552	0
50	Newtonbrook East	15,560	0.4138	\$88,554	0
51	Willowdale East	41,045	0.4107	\$86,312	0
52	Bayview Village	15,375	0.3789	\$98,738	0
53	Henry Farm	11,285	0.3832	\$75,577	0
54	O'Connor-Parkview	17,755	0.4104	\$64,355	0
55	Thornccliffe Park	17,945	0.3905	\$46,721	0
56	Leaside-Bennington	15,990	0.2986	\$180,476	0
57	Broadview North	11,590	0.4267	\$54,698	0
58	Old East York	9,025	0.372	\$78,338	0
59	Danforth Village - East York	16,500	0.383	\$67,249	0
60	Woodbine-Lumsden	8,050	0.3745	\$59,476	0
61	Crescent Town	15,210	0.3971	\$45,787	0
62	East End-Danforth	20,095	0.417	\$68,285	0
63	The Beaches	20,415	0.3404	\$135,001	0
64	Woodbine Corridor	11,550	0.4096	\$68,050	1
65	Greenwood-Coxwell	14,705	0.413	\$58,760	0
66	Danforth Village - Toronto	9,575	0.4048	\$72,094	0
67	Playter Estates-Danforth	7,690	0.395	\$89,378	0
68	North Riverdale	12,425	0.3583	\$96,691	0
69	Blake-Jones	7,765	0.4262	\$64,525	0
70	South Riverdale	24,415	0.4302	\$65,270	2
71	Cabbagetown-South St.Jamestown	11,120	0.4283	\$104,519	0
72	Regent Park	10,390	0.4695	\$37,387	0
73	Moss Park	15,475	0.477	\$59,825	8
74	North St.Jamestown	17,115	0.4279	\$46,489	0
75	Church-Yonge Corridor	24,370	0.4494	\$74,103	6
76	Bay Street Corridor	15,325	0.4342	\$76,914	5
77	Waterfront Communities-The Island	26,020	0.3855	\$88,728	4
78	Kensington-Chinatown	17,100	0.4711	\$51,014	1
79	University	5,900	0.4238	\$77,541	1
80	Palmerston-Little Italy	13,770	0.4066	\$69,337	1
81	Trinity-Bellwoods	16,605	0.3993	\$67,534	2
82	Niagara	14,555	0.3706	\$79,027	0
83	Dufferin Grove	11,810	0.418	\$57,591	0
84	Little Portugal	12,115	0.4144	\$54,203	0

85	South Parkdale	21,015	0.4418	\$39,530	1
86	Roncesvalles	14,655	0.4225	\$64,561	0
87	High Park-Swansea	19,985	0.375	\$98,485	0
88	High Park North	20,965	0.4049	\$81,033	0
89	Runnymede-Bloor West Village	9,560	0.3314	\$97,340	0
90	Junction Area	13,175	0.4032	\$65,604	0
91	Weston-Pellam Park	12,095	0.4222	\$56,623	0
92	Corsa Italia-Davenport	14,400	0.4028	\$62,602	0
93	Dovercourt-Wallace Emerson-Junction	34,740	0.4095	\$57,001	0
94	Wychwood	14,195	0.4138	\$77,953	6
95	Annex	27,480	0.4186	\$118,792	6
96	Casa Loma	9,815	0.356	\$178,322	0
97	Yonge-St.Clair	11,235	0.3702	\$135,824	1
98	Rosedale-Moore Park	20,600	0.3257	\$267,052	1
99	Mount Pleasant East	15,215	0.3452	\$115,899	0
100	Yonge-Eglinton	10,500	0.3694	\$118,981	2
101	Forest Hill South	10,840	0.3314	\$240,817	0
102	Forest Hill North	12,290	0.398	\$127,311	0
103	Lawrence Park South	14,825	0.2527	\$330,217	0
104	Mount Pleasant West	23,730	0.4012	\$63,006	0
105	Lawrence Park North	13,750	0.281	\$154,976	0
106	Humewood-Cedarvale	13,925	0.4219	\$91,385	0
107	Oakwood-Vaughan	21,435	0.4134	\$57,556	0
108	Briar Hill-Belgravia	14,195	0.4047	\$60,650	0
109	Caledonia-Fairbanks	10,280	0.3791	\$59,434	0
110	Keelestone-Eglinton West	11,235	0.3962	\$54,902	0
111	Rockcliffe-Smythe	22,390	0.4065	\$52,500	0
112	Beechborough-Greenbrook	6,525	0.4199	\$48,290	0
113	Weston	16,475	0.4371	\$52,438	0
114	Lambton Baby Point	7,785	0.3996	\$132,526	0
115	Mount Dennis	12,840	0.3889	\$48,180	1
116	Steeles	24,705	0.3944	\$69,602	0
117	L'Amoreaux	45,860	0.3882	\$62,588	0
118	Tam O'Shanter-Sullivan	27,235	0.3995	\$66,893	0
119	Wexford/Maryvale	26,640	0.3888	\$63,075	0
120	Clairlea-Birchmount	19,850	0.3883	\$65,454	0
121	Oakridge	13,365	0.4326	\$40,493	0
122	Birchcliffe-Cliffside	21,660	0.3831	\$74,551	0
123	Cliffcrest	14,530	0.3837	\$83,050	0
124	Kennedy Park	17,035	0.4273	\$50,759	0
125	Ionview	13,025	0.3933	\$51,353	0
126	Dorset Park	24,375	0.3852	\$56,704	0
127	Bendale	25,480	0.3877	\$63,274	0
128	Agincourt South-Malvern West	21,560	0.3805	\$67,548	0
129	Agincourt North	30,150	0.3769	\$68,714	0
130	Milliken	26,270	0.3729	\$68,744	0
131	Rouge	43,190	0.3127	\$90,313	0
132	Malvern	44,325	0.3558	\$64,128	1
133	Centennial Scarborough	12,450	0.2602	\$119,326	0
134	Highland Creek	12,855	0.2895	\$95,672	0
135	Morningside	17,205	0.3924	\$65,564	0
136	West Hill	25,640	0.4218	\$59,091	1
137	Woburn	52,455	0.4035	\$59,789	0
138	Eglinton East	22,385	0.4098	\$53,301	0
139	Scarborough Village	15,590	0.4159	\$59,255	0
140	Guildwood	10,030	0.3241	\$85,236	0

## Appendix B: Lorenz Curve and Gini Coefficient Sample Calculation



Source: Gastwirth, Joseph L. 1971. Notes and Comments: A General Definition of the Lorenz Curve. *Econometrica*: 39(6)

Neighbourhood 1  
Total population:  
32586

Household Income	Number of Households	Estimated Total Income	Cumulative % of Householdss	Cumulative % of Total Income	Height Xi+1- Xi	Top+Base Yi+Yi+1	Area (F*G)/2
Under \$10,000	430	2150000	4.84%	0.36%	4.84	0.36	0.86
\$ 10,000 - \$19,999	650	9750000	12.16%	1.97%	7.32	2.33	8.51
\$ 20,000 - \$29,999	785	19625000	20.99%	5.22%	8.84	7.19	31.78
\$ 30,000 - \$39,999	975	34125000	31.96%	10.88%	10.97	16.10	88.32
\$ 40,000 - \$49,999	730	32850000	40.18%	16.32%	8.22	27.19	111.71
\$ 50,000 - \$59,999	850	46750000	49.75%	24.06%	9.57	40.38	193.14
\$ 60,000 - \$69,999	910	59150000	59.99%	33.86%	10.24	57.92	296.61
\$ 70,000 - \$79,999	725	54375000	68.15%	42.87%	8.16	76.73	313.03
\$ 80,000 - \$89,999	700	59500000	76.03%	52.72%	7.88	95.59	376.55
\$ 90,000 - \$99,999	620	58900000	83.01%	62.48%	6.98	115.20	401.95
\$100,000 and over	1510	226500000	100.00%	100.00%	16.99	162.48	1380.67
Sum	8885	603675000					3203.12
<b>Gini Coefficient of Income Disparity</b>							<b>0.3594</b>

Source: Mehdipanah, R. 2006. Measuring Income & Health Inequality in the City of Toronto, University of Toronto Faculty of Medicine.

## Appendix C: Database of Aboriginal Specific Services Available in the City of Toronto

NEIGH ID#	NAME	STREET	POSTAL CODE	HEALTH	LEGAL	SOCIAL
73	Anishnawbe Health Toronto	225 Queen St. E.	M5A 1S4	Y		Y
73		179 Gerrard St. E.	M5A 2E5	Y		
94		22 Vaughan Rd	M6G 2N1	Y		
75	Two spirits	593 Yonge St. Suite 202	M4Y 1Z4	Y*		Y
132	Aboriginal Housing Support Centre	20 Sewells Rd.	M1B 3G5	Y*	Y	Y
75	Aboriginal Legal Services of Toronto	803-415 Yonge St.	M5B 2E7		Y	
70	Toronto Council Fire Native Cultural Centre	439 Dundas St. E.	M5A 1B2			Y
76	John Howard Society of Toronto: Aboriginal Outreach Program	60 Wellesley St. W.	M5S 3L2			Y
73	Miziwe Biik: Aboriginal Employment and Training	167 Gerrard St. E.	M5A 2E4	Y*		Y
94	Na-Me-Res: Native Men's Residence	14 Vaughan Rd.	M6G 2N1	Y*		Y
94		26 Vaughan Rd.	M6G 2C4	Y*		Y
94		20a Vaughan Rd.	M6G 2C4	Y*		Y
95	Native Canadian Centre of Toronto	16 Spadina Rd	M5R 2S7	Y*		Y
76	Native Child and Family Services of Toronto	30 College St.	M5G 1K2	Y	Y	Y
94	NCFS - Epnigishmok Aboriginal Head Start Program	611 St. Clair Ave. W.	M6C 1A3	Y		Y
26	NCFS - Kiiwednong Aboriginal Head Start Program	2784 Keele St	M3M 2G4	Y		Y

81	NCFS - Shaawnong Aboriginal Head Start Program, First Nations School	935 Dundas St. E. room 215	M4M 1R4	Y		Y
80	NCFS - Transition House for Men	558 Bathurst St.	M5S 2P9	Y*		Y
85	NCFS - Transition House for Women	179 Dowling Ave	M6K 3B2	Y*		Y
136	NCFS - Waabanong Aboriginal Head Start Program	20 Waldock St.	M1E 2E5	Y		Y
73	Native Women's Resource Centre	191 Gerrard St. E.	M5A 2B5	Y	Y	Y
75	Nojimawin Health Authority	25 Wood St.	M4Y 2P9	Y		Y
76	Aboriginal Healing and Wellness Strategy	880 Bay Street, 4th floor	M7A 2B6	Y		Y
73	Aboriginal Labour Force Development Circle	167 Gerrard St. E.	M5A 2E4		Y	
94	Association For Native Development in the Performing and Visual Arts	61 Christie St. Studio 171	M6G 4C7			
95	Anduhyaun Emergency Women's Shelter	106 Spadina Rd.	M5R 2T8	Y*	Y	Y
115	Anduhyaun Inc: Nekenan Second Stage Housing	1296 Weston Rd.	M6M 4R3			Y
77	Canadian Council for Aboriginal Business	250 The Esplanade Suite 204	M5A 1J2		Y	Y
95	Canadian Friends Service Committee: Aboriginal Affairs Committee	60 Lowther Ave	M5R 1C7			Y
73	CAMH: Aboriginal Service	393 King St. E.	M5A 1L3	Y		
98	Dodem Kanonhsa' Cultural Facility	55 St. Clair Ave E. 6th floor	M4T 1M2			Y
70	First Nations Elementary School	935 Dundas St. E.	M4M 1R4			Y
79	First Nations House, University of Toronto	563 Spadina Ave. 3rd floor	M4M 1R4			Y

77	First Nations Technical Services	606-111 Peter St.	M5V 2H1			Y
64	Frontiers Foundation	419 Coxwell Ave.	M4L 3B9			Y
97	Indian and Northern Affairs Canada - Ontario Regional Offices	25 St. Clair Ave.	M4T 1M2		Y	Y
73	Metis Nation of Ontario	75 Sherbourne St. Suite 222	M5A 2P9		Y	Y
81	St Christopher House - Meeting Place	588 Queen St. W.	M6J 1E3	Y*		Y
78	National Aboriginal Achievement Foundation	215 Spadina Ave. Suite 450	M5T 2C7			Y
77	Native Women in the Arts	401 Richmond St. W.	M5V 3A8			Y
75	Ontario Aboriginal HIV/AIDS Strategy	7 Hayden St	M4Y 2P2	Y		Y
73	Ontario Federation of Indian Friendship Centres	219 Front St.	M5A 1E8			Y
95	Ontario Ministry of Aboriginal Affairs	160 Bloor St. E. suite 400	M7A 2E6		Y	Y
75	Ryerson Aboriginal Student Services	379 Victoria St.	M5B 2K3			Y
48	Seneca Aboriginal Student Services Seneca College	1750 Finch Ave. E.	M2J 2X5			Y
77	The Centre for Indigenous Theatre	401 Richmond St. W.	M5V 1X3			Y
76	Toronto Aboriginal Care Team	30 College St.	M5G 1K2	Y		Y
95	Toronto Urban Aboriginal Strategy	16 Spadina Rd suite 303	M5R 2S7			Y
100	Wigwamen Inc.	25 Imperial Street Suite 310	M5P 1B9			Y
100	Wigwamen Terrace (Senior Housing)	25 Imperial Street Suite 310	M5P 1B9			Y
27	York U First Nations and Aboriginal Student Association	York University 4700 Keele St.	M3J 1P3			Y
75	Nishnawbe Homes Inc.	244 Church St.	M5B 1Z3			Y

95	Spirit of the People	360 Bloor St. We. Suite 306	M5S 1X1		Y	Y
76	Centre for Indigenous Sovereignty	22 College St suite 305	M5G 1K2		Y	Y

\* Provide referral to health services required.