SMOKING PREVALENCE AND CESSATION AMONGST IMMIGRANTS IN CANADA

SMOKING PREVALENCE AND CESSATION AMONGST IMMIGRANTS IN CANADA

By

David Neligan, B.A.

A Thesis

Submitted to the School of Graduate Studies

in Partial Fulfillment of the Requirements for the Degree

Master of Arts

McMaster University

MASTER OF ARTS (2008)   McMaster University
(Geography)   Hamilton, Ontario, Canada

TITLE: Smoking Prevalence and Cessation Amongst Immigrants in Canada

AUTHOR: David Neligan, B.A. (McGill University)

SUPERVISOR: Professor K. Bruce Newbold

NUMBER OF PAGES: x, 73

ABSTRACT

As of the 2006 census, nearly one fifth of Canada's total population was foreign born. With such a sizeable and fast-growing immigrant population, research in immigrant health in Canada is increasingly important. While there is a wealth of literature on immigrant health in general, very little is known about the smoking behaviours of Canada's immigrants. Research has shown that immigrants are significantly less likely to smoke than non-immigrants, yet differences between immigrants have yet to be fully explored.

This thesis attempts to explore the smoking behaviours of immigrants in Canada disaggregated by country of birth to reveal heterogeneity previously unseen in studies employing aggregate data. Through disaggregating by country of birth immigrants with elevated risks of smoking can be targeted in order to inform tailored cessation initiatives. Additionally, this thesis examines the impact of neighbourhood level effects on smoking cessation amongst immigrants to determine if where one lives has an impact on their likelihood of quitting smoking.

Through the use of multivariate analysis including logistic regression and multilevel modeling this study found that while immigrants in general were less likely to smoke than non-immigrants and more likely to quit, considerable variation existed between immigrant groups. Asian immigrants were the least likely to smoke but exhibited the greatest variation between countries of origin. Vietnamese men were found to be the most likely immigrant group to smoke and among the least likely to quit. While neighbourhood disadvantage was negatively associated with quitting smoking, it is not as

important as individual socioeconomic characteristics in explaining variations in smoking cessation.

This research illustrates the need for disaggregation in immigrant health research to account for the great diversity of Canada's immigrant population.

ACKNOWLEDGEMENTS

PREFACE

This thesis is organized as a compendium of related manuscripts and consists of the following chapters:

Chapter Two: **Disaggregating Canadian Immigrant Smoking Statistics by Country of Birth**

Chapter Three: **Individual and Neighbourhood Level Effects of Smoking Cessation Amongst Immigrants**

These chapters were prepared for submission to academic journals co-authored by Dr. K. Bruce Newbold, my academic supervisor. While co-authored, the contents of the chapter were the sole responsibility of the thesis author. This includes establishing research objectives, reviewing literature, conducting data analyses and writing manuscripts. The supervisor's contributions include suggestion of research area, framework and model construction, advice on the interpretation of empirical findings, critical evaluation of the manuscript prior to journal submission and editorial advice.

It is worth noting that Chapter 2 was prepared for submission to the Canadian Journal of Public Health and, as such, conforms to the journal's requirements for quantitative research manuscripts on maximum word length (2000 words) and maximum number of references (30 references).

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

CHAPTER ONE: Introduction

1.1 Research Context

Immigrants make up a large proportion of Canada's total population. As of the 2006 national census, nearly one fifth (19.8%) of all Canadians were foreign born. Since the 2001 census, the immigrant population in Canada grew by 13.6%, four times faster than the Canadian-born population (Chui, Maheux et al. 2007). Each year more than 200,000 new immigrants arrive in Canada, proportionally more than any other country (Perez 2002). While early waves of immigrants to Canada were predominantly of European origin, current immigrants are most likely to come from Asia and the Middle East which account for nearly 60% of all immigrants since 2001 (Chui, Maheux et al. 2007). In all, Canada plays host to roughly 6.2 million immigrants from more than 200 countries speaking more than 150 languages (Chui, Maheux et al. 2007) making Canada a truly diverse, multicultural society.

Due to the size of the immigrant population and its increasing share of the total population, it has become critical to account for immigrant status in research on the health of Canadians. Failure to do so is equivalent to ignoring the needs of a fifth of the population. Given the diversity of the immigrant population, it is also crucial to avoid treating immigrants as a homogenous group within the research as was commonplace in earlier immigrant health studies. Examining the differences not only between immigrants and non-immigrants but between immigrants and other immigrants allows for a better understanding of the health of immigrants. The research presented in this thesis is an

attempt to address the need for disaggregated immigrant health research through an exploration of the smoking behaviours of immigrants based on their country of birth.

1.1.1 Immigrant Health

With immigrants comprising an increasingly large proportion of the Canadian population, immigrant health has been widely chronicled and debated among Canadian researchers. A broad assessment of immigrant health would suggest that the health status, behaviours and perceptions of immigrants differ from the native born. Upon arrival in Canada, immigrants have been found to be somewhat healthier than non-immigrants (measured by both self reported health and more robust indicators of health such as the health utilities index), report lower incidence of chronic illness than non-immigrants and exhibit more positive health behaviours, such as lowered rates of smoking and drinking and healthier body mass index (BMI) profiles than non-immigrants (Dunn and Dyck 2000; Perez 2002; Newbold and Danforth 2003; Ali, McDermott et al. 2004). Recent immigrants have even been found to eat more fruits and vegetables than the native-born population (Perez 2002). The favourable health conditions of recent immigrants are most likely due to self-selection inherent in the immigration process that tends to favour younger and healthier individuals, as well as the selection process inherent in Canadian immigration policy that limits the entry of people with serious medical conditions (Dunn and Dyck 2000; Newbold and Danforth 2003; Ali, McDermott et al. 2004; McDonald and Kennedy 2004; Beiser 2005). However, the elevated health status of immigrants is short lived as studies have shown that, after an adjustment period

of anywhere from 5 to 15 years, immigrant health converges downwards towards native-born levels. This is well known within the literature as the Healthy Immigrant Effect (HIE) (Dunn and Dyck 2000; Hyman and Guruge 2002; Ali, McDermott et al. 2004; McDonald and Kennedy 2004; Beiser 2005; Newbold 2005).

A number of reasons have been given as to why immigrant health declines with increased time spent in the host country. Some research suggests that immigrants are likely to under-use Canadian health services including hospitals, clinics, and preventative screening programs (Leduc and Proulx 2004; Newbold 2005). Such under-use can result in diminished overall health and can be caused by a variety of barriers to use including language, cultural beliefs and knowledge of the system (Ali, McDermott et al. 2004; Leduc and Proulx 2004; Beiser 2005). Compounding reduced access to health services, other studies have found that immigrants experience increased stress due to resettlement, employment and job credential issues, and the absence of established social networks (Elliott and Gillie 1998; Ali 2002; Beiser 2005). Immigrants are also more likely to experience poverty and the stresses that accompany it (Beiser 2005). Declines in health may also represent the uptake of unhealthy lifestyles, including the adoption of smoking, poor diet, or negative drinking behavior (Frisbie, Cho et al. 2001). However, the time frame for such declines is likely to be longer than that observed in the literature, and it is debatable whether or not immigrants suddenly adopt an unhealthy lifestyle.

Clearly immigrants face health challenges that differ from those of the native-born population. Numerous works by Canadian researchers including Newbold, Besier, McDonald and Kennedy, and Ali have sought to explain the differing health status of

3

immigrants in Canada, but the literature falls short in explaining the differing health behaviours among and between immigrants. With regards to smoking, outside of cursory examinations that reveal immigrants in general are less likely to smoke that non-immigrants (Millar 1992; Perez 2002), very little is known about why these differences persist and whether they hold true for different groups of immigrants.

1.1.2 Smoking prevalence and Cessation

Cigarette smoking in Canada causes six times more deaths than murder, alcohol, car accidents, and suicides combined (Makomaski Illing and Kaiserman 2004). No matter how many different smoking statistics we are quoted they still never seem to lose their power. Perhaps this is because we simply cannot fathom that one of the leading causes of death worldwide is entirely preventable.

The links between smoking and lung cancer, along with other cancers, heart disease, stroke, and respiratory disease have been well established since the Surgeon General of the United States released his landmark report on the effects of cigarette smoking in 1964 (US Department of Health Education and Welfare 1964). Since about 1990, the benefits of smoking cessation have become more widely known after the release of the Surgeon General's report on the health benefits of quitting smoking (US Department of Health and Human Services 1990). Quitting smoking substantially reduces the risk of developing heart and lung disease, with both immediate and long term effects. Within the first year of quitting, the risk of developing heart disease drops by nearly one-half (Shields 2005). In the longer term, former smokers can expect the risk of

developing lung cancer to reduce to levels similar to non-smokers within roughly 15 years (Shields 2005). The health benefits of quitting even extend beyond smokers to include family members, friends and co-workers who are no longer exposed to second hand smoke.

Despite the well chronicled dangers of smoking and the clear benefits of quitting, roughly 22% of Canadians continue to smoke as of 2005 (Statistics Canada 2005). Several factors have been identified that contribute both to increased smoking prevalence and decreased smoking cessation. Socioeconomic factors including low levels of education and low income have been shown to be associated with increased smoking prevalence (Stephens and Siroonian 1998; Shields 2005), as have psychosocial factors including stress and depression (Stephens and Siroonian 1998). Increasingly present in the literature has been the inclusion of neighbourhood level factors influencing smoking, such as neighbourhood disadvantage (Duncan, Jones et al. 1999).

It has been shown that immigrants are less likely to smoke than native-born Canadians, with prevalence estimated at around 16% (Millar 1992). Estimates of smoking differences between different immigrant groups have not been widely reported. While various studies have discovered variations in smoking behaviours among ethnicities, ethnicity is not a reliable proxy for immigrant status or country of birth, as individuals can have multiple ethnicities and tend to associate themselves with the ethnicity of their ancestors. For example, a third generation Canadian of Italian descent may identify himself as Italian if asked his ethnicity. So while research has given us insight into smoking differences amongst ethnicities [see, for instance (Nevid 1996), (Fu,

Burgess et al. 2007) and (Millar 1992)] very little is known about smoking differences between immigrants.

1.2   Research objectives

The overall objective of this research is to determine whether immigrants in Canada exhibit different patterns in smoking prevalence and cessation than non-immigrants and to what extent one's immigrant status effects the likelihood of both smoking and quitting smoking. This objective will be met by addressing the following secondary research objectives:

1. To determine if data on smoking prevalence and cessation disaggregated by country of birth reveals important heterogeneity unseen in aggregate data.

2. To examine whether immigrants from certain sending countries are more likely to be smokers than the Canadian-born population, and similarly, whether immigrants from certain sending countries are less likely to have quit smoking than the Canadian-born.

3. To understand to what extent length of time since immigration affects the smoking behaviours of immigrants from a given region or country.

4. To examine the relationship between neighbourhood and smoking cessation and to determine if neighbourhood disadvantage plays a role in an immigrant's likelihood of quitting smoking.

1.3   Contributions

The most valuable potential contribution of this research is to inform smoking cessation initiatives tailored towards specific immigrant groups. It has been shown that tailored health interventions can be more effective than general health information initiatives as they provide timely, culturally sensitive information specifically designed for individuals or small groups (Ahmad, Cameron et al. 2005). In order to design such initiatives, however, a full understanding of the factors affecting at risk groups is required. It is hoped that the findings of this thesis can contribute to such an understanding of at risk groups and form the basis of tailored smoking cessation initiatives.

This research also seeks to contribute to the relatively shallow pool of literature on smoking among immigrants both globally and in Canada in particular. While several studies of general immigrant health have included smoking as a component of their analysis, very few in-depth studies have focused on smoking exclusively. In fact, this study will be the first in Canada to examine smoking statistics disaggregated by country of birth, though such studies have been previously conducted in the US and the Netherlands [see (Baluja, Park et al. 2003) and (Nierkens, de Vries et al. 2006)]. Additionally, the second part of the thesis will be one of first studies employing multilevel models to determine the neighbourhood effects of smoking cessation among immigrants.

While this study focuses exclusively on smoking prevalence and cessation, the analytical and theoretical techniques can be applied to virtually any aspect of immigrant

health.   Employing small, disaggregated immigrant groups in analyses rather than traditional aggregations of immigrants into broad categories (where sample size permits) can be beneficial in the study of both health status and health behaviours. Disaggregate data provides the opportunity to reveal variations in health data that may go otherwise unnoticed. It could also assist in identifying specific populations at an elevated risk for developing an illness or engaging in risky health behaviours. While multilevel models such as those employed in the third chapter of this thesis are becoming increasingly common, the methodologies employed and the lessons learned from this thesis may help to inform future multilevel studies on immigrant health behaviours. In this way, this thesis has the potential to contribute to the study of immigrant health in general, not specifically immigrant smoking behaviours.

1.4   Chapter Outline

This thesis consists of four chapters including this brief introductory chapter. Chapters 2 and 3 comprise the body of the thesis and are organized as separate research papers with unique research objectives centering around the smoking behaviours of immigrants in Canada.

Chapter 2 examines smoking prevalence within the immigrant community and compared to non-immigrants. The intent of this chapter is to explore the benefits of disaggregating immigrant groups by country of birth to determine whether where one comes from plays a role in the likelihood of smoking cigarettes. By disaggregating by country of birth, this study seeks to reveal heterogeneity within immigrant smoking data

previously unseen in studies that aggregate immigrants in large homogenous groups such as "Foreign Born", "European", "Asian", etc.   Once heterogeneity is revealed, disaggregate data also makes it possible to determine whether immigrants from certain countries are at a greater risk of smoking than other immigrants.   Highlighting at risk groups has the potential to effectively inform cessation interventions targeted at and tailored to individual immigrant groups.   Finally, disaggregate data allows comparisons to be made between recent and long term immigrants to determine whether the number of years since moving to Canada has an effect on smoking cessation.

Chapter three explores the second, more positive aspect of smoking behaviour: smoking cessation.   Using an approach similar to that in chapter 2, this study disaggregates immigrants by country of birth to reveal heterogeneity within the data and identify immigrant groups who may be less likely to quit than both other immigrants and the general population as a whole.   However, this chapter also explores neighbourhood effects on smoking cessation among immigrants using multilevel modeling techniques. This analysis explores whether neighbourhood disadvantage, neighbourhood proportion of immigrants and census metropolitan area (CMA) explains differences in smoking cessation that can't be explained by individual level factors.

The thesis concludes with Chapter 4 which summarizes the major finding of the two studies, acknowledges study limitations and illustrates research contributions and possibilities for future research.

1.5   References

Ahmad, F., J. I. Cameron, et al. (2005). "A tailored intervention to promote breast cancer screening among South Asian immigrant women." Soc Sci Med **60**(3): 575-86.

Ali, J. S. (2002). "Mental Health of Canada's Immigrants." Health Reports **13**(Supplement): 101-107.

Ali, J. S., S. McDermott, et al. (2004). "Recent research on immigrant health from statistics Canada's population surveys." Can J Public Health **95**(3): I9-13.

Baluja, K. F., J. Park, et al. (2003). "Inclusion of immigrant status in smoking prevalence statistics." Am J Public Health **93**(4): 642-6.

Beiser, M. (2005). "The health of immigrants and refugees in Canada." Canadian Journal Of Public Health-Revue Canadienne De Sante Publique **96**: S30-S44.

Chui, T., H. Maheux, et al. (2007). "Immigration in Canada: A Portrait of the Foreign-born Population, 2006 Census." Statistics Canada(Catalogue no. 97-557-XIE2006001).

Duncan, C., K. Jones, et al. (1999). "Smoking and deprivation: are there neighbourhood effects?" Soc Sci Med **48**(4): 497-505.

Dunn, J. R. and I. Dyck (2000). "Social determinants of health in Canada's immigrant population: results from the National Population Health Survey." Social Science & Medicine **51**(11): 1573-1593.

Elliott, S. J. and J. Gillie (1998). "Moving experiences: a qualitative analysis of health and migration." Health and Place **4**(4): 327-339.

Frisbie, W. P., Y. Cho, et al. (2001). "Immigration and the health of Asian and Pacific Islander adults in the United States." Am J Epidemiol 153(4): 372-80.

Fu, S. S., D. Burgess, et al. (2007). "Views on smoking cessation methods in ethnic minority communities: a qualitative investigation." Prev Med 44(3): 235-40.

Hyman, I. and S. Guruge (2002). "A review of theory and health promotion strategies for new immigrant women." Canadian Journal Of Public Health-Revue Canadienne De Sante Publique 93(3): 183-187.

Leduc, N. and M. Proulx (2004). "Patterns of health services utilization by recent immigrants." J Immigr Health 6(1): 15-27.

Makomaski Illing, E. M. and M. J. Kaiserman (2004). "Mortality attributable to tobacco use in Canada and its regions, 1998." Can J Public Health 95(1): 38-44.

McDonald, J. T. and S. Kennedy (2004). "Insights into the 'healthy immigrant effect': health status and health service use of immigrants to Canada." Social Science & Medicine 59(8): 1613-1627.

Millar, W. J. (1992). "Place of birth and ethnic status: factors associated with smoking prevalence among Canadians." Health Rep 4(1): 7-24.

Nevid, J. S. (1996). "Smoking cessation with ethnic minorities: Themes and approaches." Journal Of Social Distress And The Homeless 5(1): 39-54.

Newbold, K. B. (2005). "Self-rated health within the Canadian immigrant population: risk and the healthy immigrant effect." Social Science & Medicine 60(6): 1359-1370.

Newbold, K. B. and J. Danforth (2003). "Health status and Canada's immigrant population." Social Science & Medicine **57**(10): 1981-1995.

Nierkens, V., H. de Vries, et al. (2006). "Smoking in immigrants: do socioeconomic gradients follow the pattern expected from the tobacco epidemic?" Tobacco Control **15**(5): 385-391.

Perez, C. E. (2002). "Health status and health behaviour among immigrants." Health Reports **13**(Supplement): 89-100.

Shields, M. (2005). "The journey to quitting smoking." Health Rep **16**(3): 19-36.

Statistics Canada (2005). Smoking and Diabetes Care: Results from the CCHS Cylce 3.1 (2005). Health Statistics Division. Ottawa, 82-621-XIE No. 002. **82-621-XIE**.

Stephens, M. and J. Siroonian (1998). "Smoking prevalence, quit attempts and successes." Health Rep **9**(4): 31-7(Eng); 31-8(Fre).

US Department of Health and Human Services (1990). The Health Benefits of Smoking Cessation. US Department of Health and Human Services, Public Health Service, Centers for Disease Control, Center for Chronic Disease Prevention and Health Promotion and Office on Smoking and Health.

US Department of Health Education and Welfare (1964). "Smoking and Health: Report of the Advisory Committee to the Surgeon General of the Public Health Service." Public Health Service Publication **No. 113**.

CHAPTER TWO:

Disaggregating Canadian Immigrant Smoking Statistics by Country of Birth

2.1 Abstract

Objectives: Studies of immigrant health behaviours, such as smoking, are often forced to aggregate immigrants into large groups based on geographic region, time since immigration, etc. often due to limitations in sample size. This aggregation has the potential to mask important heterogeneity within the immigrant population. This study explores smoking prevalence in Canadian immigrants disaggregated by country of birth to reveal such heterogeneity, identify at risk immigrant communities and examine the effect of time since immigration on smoking habits. **Methods:** Odds ratios were calculated using binary logistic regression to determine the effects of country of birth on the likelihood of smoking after controlling for age, educational attainment and household income. Data were drawn from three cycles of the Canadian Community Health Survey (CCHS). **Results:** While immigrants are less likely to smoke than the native-born, significant variation exists between countries. Variation can also be great within origin regions. Asian immigrants were shown to be least likely to smoke but also exhibited the greatest variations between countries and sexes. Odds ratios among Asian immigrants ranged from 0.06 for Indian females (95% CI: 0.04 – 0.08) to 1.55 for Vietnamese males (95% CI: 1.34 – 1.79). **Discussion:** Disaggregating immigrant health statistics by country of birth can reveal previously undetected heterogeneity between immigrant

groups. These data can help target specific immigrants groups at an elevated risk of smoking and lead to culturally sensitive, tailored interventions.

MeSH Terms: *Immigrants; Smoking; Canada; Cross Sectional Analysis;*

2.2 Introduction

Despite declines in smoking prevalence in recent years, cigarette smoking remains the leading preventable cause of illness and death in Canada (Makomaski Illing and Kaiserman 2004). Its links to various cancers as well as heart and pulmonary diseases are well documented in Canada, and extensive research exists on the smoking behaviours of Canadians. Little, however, has been written on the smoking behaviours of Canada's immigrants, a group that comprises nearly one fifth (19.8%) of the national population as of the 2006 Census, or over 250,000 new arrivals each year.

According to the Healthy Immigrant Effect (HIE), immigrants arrive in Canada healthier than the native-born population, although this advantage is relatively short lived as immigrant health is likely to decline towards native-born levels as quickly as ten years after arrival (Chen, Wilkins et al. 1996; Ali 2002; Perez 2002; Newbold and Danforth 2003; McDonald and Kennedy 2004; Beiser 2005; Newbold 2005). This disparity in health is most likely due to self-selection inherent in the immigration process that tends to favour younger and healthier migrants, as well as the selection process inherent in Canadian immigration policy that limits the entry of people with serious medical conditions (Dunn and Dyck 2000; Newbold and Danforth 2003; Ali, McDermott et al. 2004; McDonald and Kennedy 2004; Beiser 2005). The HIE holds true not only for health status but also for health behaviours including drinking and smoking. Indeed, immigrants have been shown to be less likely to smoke than native-born Canadians, often significantly so (Millar 1992; Perez 2002). This can be somewhat surprising considering many immigrants to Canada come from countries with fairly high smoking rates. China,

for instance, has a smoking rate over 35% (over 60% for Chinese males) (MacKay and Eriksen 2002) and is the number one source of new immigrants to Canada, accounting for 20% of Canada's total immigration intake (Wang and Lo 2004).

When studying immigrant health and health behaviours, immigrants are often aggregated into large groups such as "foreign-born", "European", "Asian", etc. This aggregation is often necessary due to limitations in sample size, or a lack of data about country of birth or ethnicity within a dataset (Chen, Wilkins et al. 1996; Georgiades, Boyle et al. 2006). Such aggregation, however, has the potential to mask heterogeneity between different immigrant groups, thereby limiting our knowledge of exactly who might be vulnerable to various health conditions and who might be at risk of engaging in detrimental health behaviours. When information about country of birth or ethnicity is available (and sample sizes are sufficient) this knowledge can enable the development of tailored health interventions that provide information conforming to the cultural and social beliefs of a targeted population, a strategy that has proven to be more effective than general health information (de Nooijer, Lechner et al. 2002).

In Canada, few studies have examined smoking prevalence disaggregated by country of birth. Millar (1992) contrasted the smoking habits of foreign-born vs. native-born Canadians and included analysis of the smoking habits of selected ethnic groups within the population. In his dataset, however, ethnicity allowed for multiple responses and could not account for individual countries of birth. Perez (2002) accounted for country of origin as a control variable in his analysis of selected health outcomes relating to smoking, but did not address the potential relationship between country of birth and

smoking itself. In the US, however, Baluja et al discovered that while the overall smoking prevalence rate among Asian/Pacific Islander immigrants was 11.8% (well below the US average), when disaggregated by country of birth these rates ranged from 4.6% among Indian immigrants to 21.4% among Japanese immigrants. Furthermore, male smoking rates among this group of immigrants ranged from 8.1% (India) to 33.0% (South Korea) (Baluja, Park et al. 2003). Similarly, Perez-Stable *et al* (2001) disaggregated US Latinos by country of origin, finding significant variations between groups. These findings show the detail that can be lost when populations are clustered into large groups and illustrate the need to disaggregate health statistics among immigrants by country of birth wherever the data will allow.

In 2000/2001, the Canadian Community Health Survey (CCHS), a comprehensive survey of health status and health behaviours, was developed and captured over 130,000 respondents. Three cycles of the CCHS have since been completed providing health information on over 400,000 Canadians, a sample size which permits more disaggregation and subgroup examinations than previously available to Canadian researchers (Ali, McDermott et al. 2004). Making use of this dataset, this study examines immigrant smoking prevalence in Canada disaggregated by country of birth to determine if disaggregate data on smoking habits reveals important heterogeneity unseen in aggregate data. In addition to revealing heterogeneity, the study asks whether immigrants from certain sending countries are more likely to be smokers than the Canadian-born population, and to what extent does length of time since immigration affect the smoking behaviours of immigrants from a given region or country. Through these questions we

can help target at-risk immigrant populations and inform tailored smoking cessation initiatives.

2.3 Methods

This study used data from three cycles of the Canadian Community Health Survey (CCHS). These cross-sectional surveys were conducted in 2000/01 (Cycle 1.1), 2003 (Cycle 2.1) and 2005 (Cycle 3.1) by Statistics Canada and gathered information regarding health status, healthcare utilization, and health determinants for Canadians. The surveys target Canadian residents aged 12 and over, representing all provinces and territories but excluding persons living on Native reserves, the institutionalized, and members of the Canadian Armed Forces.

Each cycle of the CCHS consists of over 130,000 respondents who represent 98% of Canadians over the age of 12. In order to ensure adequate sample sizes when examining country of origin, the three cycles were combined to produce a sample of over 400,000 respondents. Combining cycles is facilitated by the common sampling methods and consistency of questions pervasive through each cycle of the CCHS. Combining cycles results in more precise estimates of respondent characteristics and allows for the disaggregation of data to levels not possible with a smaller sample size. This study employed a pooled approach in combining the three cycles, which consists of combining surveys at a micro-data level and rescaling weights to produce unbiased estimates for the sample population (Thomas 2006). This technique has been used by McDonald and Kennedy (2005 and 2007) in combining cycles 1.1 and 2.1 of the CCHS to improve

sample size in their study of immigration and ethnicity on Cancer screening amongst Canadian women. Similarly, Tremblay *et al* (2006) combined cycles 1.1 and 2.1 in their study of physical activity and immigrant status.

Current smokers were defined as individuals who responded that they smoke daily or occasionally while non-smokers replied that they did not smoke at all. Current smoking status was the variable of interest in this study, so former smoking status was not explored. Immigrants were identified as respondents who identified their country of birth as other than Canada. Duration of time since immigration was also considered, with recent immigrants being defined as respondents who have been in Canada 15 years or less and long-term immigrants as being in Canada more than 15 years, consistent with literature on the Healthy Immigrant Effect which suggests immigrant health converges with the host population within roughly ten to fifteen years after immigration (Dunn and Dyck 2000; Ali, McDermott et al. 2004; McDonald and Kennedy 2004; Beiser 2005; Newbold 2005).

Respondents who were not born in Canada were grouped into six regions for the sake of comparison: North America and the Caribbean, Central and South America, Europe, Africa, Asia, and Other, which consisted of immigrants from Oceania and the South Pacific as well as immigrants from countries not assigned a code in the CCHS. Within each regional group (except 'other') the five most significant sending countries were identified.

Multivariate analysis included logistic regression to examine the relationships of country and region of birth and recency of immigration to smoking status, adjusted for

age, education and income. Separate analyses were performed on male and female subsets of the population for comparison. All analyses were performed using SPSS v14.0, except for the imputation of missing income data using R. A significant proportion (roughly 25%) of income data in the sample was given as missing. Without accounting for this all cases with missing income values would be dropped from the regression analysis, resulting in an unacceptable loss of sample size. This was avoided by running a deterministic imputation, which essentially regresses income against the other variables in the dataset to predict values for missing income (Gelman and Hill 2007).

2.4 Results

The overall smoking prevalence among both native-born Canadians and immigrants was 23.6% (25.6% for males and 21.5% for females). This prevalence is slightly higher among the Canadian-born population, at 25.6% (27.0% for males and 24.3% for females). Foreign-born respondents, who account for 21.1% of the sample, reported a prevalence of 16.1% with a much larger variation between males (20.7%) and females (11.6%).

While immigrants report a lower prevalence of smoking, there is significant variation amongst the individual countries of origin. Table 2.1 shows the results from logistic regression analysis on smoking prevalence among immigrants from six regions and twenty-five countries, after controlling for age, income and educational achievement. Among the countries included in the regression with statistically significant results, German immigrants were the most likely to smoke relative to the Canadian born, with an

odds ratio (OR) of 0.80 (95% CI: 0.73 – 0.88) while Indian immigrants were the least likely (OR: 0.17, 95% CI: 0.15 – 0.19).   Smoking among immigrant males was considerably higher than females, with ORs varying between 0.16 for Kenyan-born males (95% CI: 0.07 – 0.37) to 1.55 for Vietnamese-born males (95% CI: 1.34 – 1.79) and between 0.06 for Chinese-born females (95% CI: 0.04 – 0.08) to 1.71 for Chilean-born females (95% CI: 1.22 – 2.41).

Relative to the Canadian-born, immigrants from Europe were the most likely to be current smokers, with an odds ratio (OR) of 0.80 (95% CI: 0.78 – 0.82), while Asian immigrants were the least likely, presenting an OR of 0.40 (95% CI: 0.38 – 0.41). Within these regions, however, significant variations can be seen between countries. Specifically looking at Asia, for example, odds ratios for immigrants from the five most significant sending countries varied from 0.17 in India to 0.73 (95% CI: 0.64 – 0.82) in Vietnam.   When stratified by sex, these between-country variations are further exaggerated with ORs as low as 0.26 (95% CI: 0.22 – 0.29) for Indian males and as high as 1.55 for Vietnamese males, and between 0.06 for Chinese and Indian-born (95% CI: 0.05 – 0.08) females and 0.22 for females born in the Philippines and Hong Kong (95% CIs: 0.19 – 0.26 and 0.19 – 0.27 respectively).

Table 2.2 shows odds ratios for the same six regions and twenty-five countries by years since immigration. In general, recent immigrants (less than 15 years) were less likely to smoke than long-term immigrants. This trend holds true for immigrants from all regions except Europe, where ORs decreased from 0.92 (95% CI: 0.87-0.97) to 0.76 (95% CI: 0.74 – 0.79) with increased length of stay. Looking at individual countries,

21

distinct variations can be seen between recent and long-term immigrants. Recent immigrants from Guyana were considerably more likely to smoke than long-term Guyanese immigrants while recent Chinese immigrants showed a slightly higher tendency to smoke. Immigrants from India and Hong Kong showed virtually no difference in smoking likelihood from one cohort to another. Significant increases in odds ratios were seen, however, in long-term immigrants from Morocco, Germany, Jamaica and Trinidad.

2.5 Discussion and Conclusions

This study confirms previous findings that immigrants in Canada are less likely to smoke than the Canadian-born population. Moreover, our results show that disaggregating immigrant health statistics by country of origin reveals heterogeneity that is lost with aggregation. We found that, in general, Asian immigrants were the least likely to smoke, although this group contains the largest amount of variation between countries. While Chinese and Indian immigrants were very unlikely to smoke, Vietnamese smoking prevalence more closely resembled the native population. Further stratification by sex revealed that Vietnamese males were, in fact, much more likely to smoke than Canadian-born males and that the low smoking prevalence among Asian immigrants is largely explained by the extremely low smoking rates of Asian females, particularly those originating from China and India.

Recent immigrants have been shown to be healthier than the native-born population but are likely to converge towards native levels with increased time since immigration (McDonald and Kennedy 2004). With recent immigration to Canada

dominated by Asian immigrants and longer-term immigrants largely originating from Europe, comparing smoking likelihoods of recent and long-term immigrants is not an effective measure of this convergence. Regional comparisons are more useful but can still be misleading. In this study, smoking likelihood among European immigrants actually decreased with increased time since immigration, yet recent cohorts are comprised mostly of Eastern Europeans whereas older cohorts are largely Western Europeans. Disaggregating by country of origin allows for a comparison of apples to apples, revealing a much more accurate picture of the effects of time since immigration on smoking behaviour. The results again reveal further heterogeneity between individual countries, suggesting convergence may occur at different times at different rates depending on one's country of origin.

Disaggregation of smoking statistics by country of birth highlights immigrant groups at risk of being a daily smoker and can help target cessation initiatives more effectively. For example, while previously invisible among the light smoking Asian immigrant group, this research showed that Vietnamese men are more susceptible to cigarette smoking than both immigrants and the native-born. Communities with large Vietnamese populations would benefit by targeting smoking interventions towards this group. The main objective of this study was to highlight the heterogeneity revealed through disaggregation, but expanding the analysis to include immigrants from other countries would help target further at-risk immigrant groups such as those from Bosnia/Herzegovina who reported the highest prevalence in the CCHS.

This study purposefully avoided the inclusion of ethnic status as an explanatory variable, choosing instead country of origin. This was done to avoid complications associated with the ability to choose multiple ethnicities in the CCHS as well as to allow for a very clear distinction between the Canadian and foreign-born. Furthermore, cross-classifying country of birth with ethnicity, as discovered by Millar (1992), would lead to cell counts too small to allow for significant analysis.

The results of this study are based on self-reported data on smoking. There is evidence from the US that misclassification of smokers as non-smokers, though small, may occur in higher rates among immigrant and ethnic groups than among native-born whites (Wells, English et al. 1998). This study may also have benefited from the inclusion of additional socioeconomic variables such as employment, as well as from indicators of acculturation other than years since immigration such as the ability to speak either English or French.

Despite these limitations, this study benefited from a large sample size of over 400,000 Canadians which made disaggregation possible. This is the first Canadian study that has examined immigrant smoking prevalence by country of birth and reveals that such disaggregation can reveal previously undetected heterogeneity between immigrant groups. This data can help target specific immigrants groups at an elevated risk of smoking and lead to culturally sensitive, tailored interventions.

2.6 References

Ali, J. S. (2002). "Mental Health of Canada's Immigrants." Health Reports 13(Supplement): 101-107.

Ali, J. S., S. McDermott, et al. (2004). "Recent research on immigrant health from statistics Canada's population surveys." Can J Public Health 95(3): I9-13.

Baluja, K. F., J. Park, et al. (2003). "Inclusion of immigrant status in smoking prevalence statistics." Am J Public Health 93(4): 642-6.

Beiser, M. (2005). "The health of immigrants and refugees in Canada." Canadian Journal Of Public Health-Revue Canadienne De Sante Publique 96: S30-S44.

Chen, J., R. Wilkins, et al. (1996). "Health expectancy by immigrant status, 1986 and 1991." Health Rep 8(3): 29-38(Eng); 31-41(Fre).

de Nooijer, J., L. Lechner, et al. (2002). "Tailored versus general information on early detection of cancer: a comparison of the reactions of Dutch adults and the impact on attitudes and behaviors." Health Educ Res 17(2): 239-52.

Dunn, J. R. and I. Dyck (2000). "Social determinants of health in Canada's immigrant population: results from the National Population Health Survey." Social Science & Medicine 51(11): 1573-1593.

Gelman, A. and J. Hill (2007). Data Analysis sing Regression and Multilevel/Hierarchical Models. New York, Cambrige University Press.

Georgiades, K., M. H. Boyle, et al. (2006). "Tobacco use among immigrant and nonimmigrant adolescents: individual and family level influences." J Adolesc Health 38(4): 443 e1-7.

MacKay, J. and M. Eriksen (2002). The Tobacco Atlas, World Health Organization.

Makomaski Illing, E. M. and M. J. Kaiserman (2004). "Mortality attributable to tobacco use in Canada and its regions, 1998." Can J Public Health **95**(1): 38-44.

McDonald, J. T. and S. Kennedy (2004). "Insights into the 'healthy immigrant effect': health status and health service use of immigrants to Canada." Social Science & Medicine **59**(8): 1613-1627.

Millar, W. J. (1992). "Place of birth and ethnic status: factors associated with smoking prevalence among Canadians." Health Rep **4**(1): 7-24.

Newbold, K. B. (2005). "Self-rated health within the Canadian immigrant population: risk and the healthy immigrant effect." Social Science & Medicine **60**(6): 1359-1370.

Newbold, K. B. and J. Danforth (2003). "Health status and Canada's immigrant population." Social Science & Medicine **57**(10): 1981-1995.

Perez, C. E. (2002). "Health status and health behaviour among immigrants." Health Reports **13**(Supplement): 89-100.

Thomas, S. (2006). Combining Cycles of the Canadian Community Health Survey. Proceedings of Statistics Canada Symposium 2006, Methodological Issues in Measuring Population Health, Satistics Canada.

Wang, S. and L. Lo (2004). "Chinese Immigrants in Canada: Their Changing Composition and Economic Performance." CERIS Working Paper Series **30**.

Wells, A. J., P. B. English, et al. (1998). "Misclassification rates for current smokers misclassified as nonsmokers." Am J Public Health **88**(10): 1503-9.

Table 2.1 – Smoking Odds Ratios By Region and Country of Origin

		All Respondents		Males		Females	
		Adjusted Odds Ratio[†]	95% C.I.	Adjusted Odds Ratio[†]	95% C.I.	Adjusted Odds Ratio[†]	95% C.I.
Canadian-born		1.00	--	1.00	--	1.00	--
Immigrants		0.58*	0.56 - 0.59	0.73*	0.71 - 0.75	0.42*	0.41 - 0.43
N. America/ Carib.		0.54*	0.51 - 0.57	0.65*	0.60 - 0.71	0.45*	0.41 - 0.49
	US	0.72*	0.66 - 0.78	0.70*	0.62 – 0.79	0.74*	0.66 - 0.83
	Jamaica	0.30*	0.26 - 0.36	0.47*	0.38 – 0.58	0.18*	0.13 - 0.23
	Mexico	0.82	0.67 - 1.00	1.08	0.83 – 1.41	0.59*	0.43 - 0.81
	Trinidad	0.42*	0.34 - 0.52	0.69*	0.53 - 0.89	0.20*	0.13 - 0.30
	Haiti	0.36*	0.28 - 0.44	0.56*	0.42 - 0.73	0.17*	0.11 - 0.27
S. America		0.60*	0.55 - 0.65	0.96	0.87 - 1.07	0.32*	0.28 - 0.37
	Guyana	0.48*	0.41 - 0.57	0.81*	0.67 - 0.99	0.19*	0.13 - 0.26
	El Salvador	0.59*	0.48 - 0.72	1.37*	1.06 - 1.76	0.19*	0.12 - 0.28
	Chile	1.09	0.86 - 1.40	0.71	0.49 - 1.02	1.71*	1.22 - 2.41
	Colombia	0.44*	0.31 - 0.64	0.78	0.49 - 1.25	0.23*	0.13 - 0.43
	Brazil	0.37*	0.24 - 0.57	0.31*	0.16 - 0.60	0.43*	0.24 - 0.75
Europe		0.80*	0.78 - 0.82	0.88*	0.84 - 0.91	0.71*	0.68 - 0.74
	UK	0.73*	0.69 - 0.77	0.70*	0.64 - 0.76	0.77*	0.72 - 0.84
	Italy	0.63*	0.58 - 0.68	0.76*	0.69 - 0.85	0.44*	0.38 - 0.50
	Germany	0.80*	0.73 - 0.88	0.91	0.80 - 1.03	0.69*	0.60 - 0.80
	Netherlands	0.58*	0.51 - 0.67	0.56*	0.47 - 0.67	0.59*	0.48 - 0.72
	Poland	0.93	0.85 - 1.02	0.98	0.86 - 1.11	0.88	0.77 - 1.00
Africa		0.49*	0.45 - 0.53	0.61*	0.54 - 0.68	0.34*	0.29 - 0.40
	South Africa	0.75*	0.59 - 0.95	0.53*	0.37 - 0.76	1.04	0.76 – 1.42
	Egypt	0.85	0.67 - 1.08	0.73	0.52 - 1.02	1.00	0.71 - 1.40
	Morocco	0.91	0.72 - 1.16	1.31	1.00 - 1.74	0.33*	0.19 - 0.57
	Algeria	0.62*	0.46 - 0.84	0.75	0.53 - 1.05	0.32*	0.16 - 0.64
	Kenya	0.18*	0.10 - 0.32	0.16*	0.07 - 0.37	0.19*	0.08 - 0.44
Asia		0.40*	0.38 – 0.41	0.61*	0.59 - 0.64	0.19*	0.17 - 0.20
	India	0.17*	0.15 - 0.19	0.26*	0.22 - 0.29	0.06*	0.04 - 0.08
	China	0.32*	0.29 - 0.35	0.61*	0.55 - 0.68	0.06*	0.05 - 0.08
	Philippines	0.45*	0.41 - 0.49	0.79*	0.70 - 0.89	0.22*	0.19 - 0.26
	Hong Kong	0.30*	0.27 - 0.34	0.38*	0.33 - 0.44	0.22*	0.19 - 0.27
	Vietnam	0.73*	0.64 - 0.82	1.55*	1.34 - 1.79	0.14*	0.10 - 0.19
Other		0.65*	0.53 – 0.79	0.70*	0.54 - 0.91	0.58*	0.43 - 0.79

* *significantly different from Canadian-born (p<0.05)*
† *adjusted for age, educational attainment and income*

Table 2.2 – Smoking Odds Ratios for Recency By Region and Country of Birth

	Recent Immigrants (<15 yrs)		Long-term Immigrants (>15 yrs)	
	Adjusted Odds Ratio[†]	95% C.I.	Adjusted Odds Ratio[†]	95% C.I.
Canadian-born	1.00	--	1.00	--
Immigrants	0.50*	0.48 - 0.69	0.67*	0.65 - 0.68
N. America/ Carib.	0.40*	0.36 - 0.45	0.60*	0.55 - 0.64
US	*0.55**	*0.46 - 0.67*	*0.75**	*0.68 - 0.83*
Jamaica	*0.16**	*0.11 - 0.23*	*0.39**	*0.32 - 0.47*
Mexico	*0.65**	*0.50 - 0.84*	*1.25*	*0.88 - 1.79*
Trinidad	*0.31**	*0.22 - 0.46*	*0.55**	*0.42 - 0.72*
Haiti	*0.33**	*0.23 - 0.46*	*0.40**	*0.30 - 0.53*
S. America	0.53*	0.48 - 0.60	0.69*	0.61 - 0.78
Guyana	*0.63**	*0.50 - 0.80*	*0.40**	*0.32 - 0.51*
El Salvador	*0.57**	*0.44 - 0.73*	*0.64**	*0.46 - 0.88*
Chile	*1.52**	*1.05 - 2.18*	*0.84*	*0.59 - 1.19*
Colombia	*0.32**	*0.20 - 0.50*	*1.22*	*0.64 - 2.30*
Brazil	*0.17**	*0.09 - 0.34*	*1.55*	*0.85 - 2.84*
Europe	0.92*	0.87 - 0.97	0.76*	0.74 - 0.79
UK	*0.57**	*0.48 - 0.69*	*0.76**	*0.72 - 0.81*
Italy	*0.51*	*0.25 - 1.01*	*0.64**	*0.58 - 0.69*
Germany	*0.55**	*0.41 - 0.75*	*0.82**	*0.74 - 0.92*
Netherlands	*0.76*	*0.51 - 1.14*	*0.56**	*0.49 - 0.65*
Poland	*1.02*	*0.89 - 1.16*	*0.87**	*0.76 - 0.99*
Africa	0.37*	0.33 - 0.41	0.77*	0.68 - 0.89
South Africa	*0.54**	*0.38 - 0.77*	*1.02*	*0.74 - 1.41*
Egypt	*0.88*	*0.61 - 1.27*	*0.83*	*0.61 - 1.14*
Morocco	*0.54**	*0.37 - 0.78*	*1.78**	*1.28 - 2.47*
Algeria	*0.59**	*0.43 - 0.82*	*0.81*	*0.37 - 1.79*
Kenya	*0.10**	*0.04 - 0.24*	*0.49*	*0.21 - 1.14*
Asia	0.37*	0.35 - 0.39	0.46*	0.44 - 0.49
India	*0.17**	*0.15 - 0.20*	*0.18**	*0.14 - 0.22*
China	*0.34**	*0.30 - 0.38*	*0.29**	*0.24 - 0.35*
Philippines	*0.41**	*0.37 - 0.47*	*0.51*[†]*	*0.43 - 0.60*
Hong Kong	*0.30**	*0.26 - 0.34*	*0.32**	*0.27 - 0.39*
Vietnam	*0.67**	*0.55 - 0.81*	*0.84**	*0.72 - 0.99*
Other	0.93	0.71 - 1.23	0.44*	0.33 - 0.61

* significantly different from Canadian-born (p<0.05)
† adjusted for age, educational attainment and income

CHAPTER THREE:

Individual and Neighbourhood Level Effects of Smoking Cessation Amongst Immigrants

3.1 Abstract

Objectives: Given the negative health effects of smoking and the overwhelming benefits of quitting, smoking cessation studies are prevalent in health literature. However, little is known about smoking cessation within Canada's sizeable immigrant population. This study examines the effect of both individual and neighbourhood level effects to determine 1) whether differences exist in smoking cessation between immigrants and non-immigrants and within immigrant groups themselves, 2) whether certain immigrant groups are more or less likely to be able to quit than the native born and 3) the neighbourhood effects impacting smoking cessation amongst immigrants. **Methods:** Phase 1: Descriptive statistics and binary logistic regression were used to calculate odds ratios of quitting smoking based on immigrant status and recency of arrival as well as region and country of origin. Phase 2: multilevel logistic regression techniques were employed to determine the likelihood of smoking cessation on individuals nested within census tracts in Canada's three largest cities. Data for both phases was drawn from three cycles of the Canadian Community Health Survey (CCHS). **Results:** Immigrants in general are more likely to quit smoking than the native-born, although significant variation exists by origin country. Immigrants from Vietnam, the Philippines, Egypt and Morocco were found to be significantly less likely to quit than non-immigrants. Neighbourhood disadvantage is negatively associated with quitting smoking but is not as

important as individual level factors in explaining between neighbourhood variation. Living in Vancouver increases the likelihood of quitting smoking. **Discussion:** Disaggregating smoking cessation statistics by country of birth can reveal previously undetected heterogeneity between immigrant groups and can help target specific immigrants groups at an elevated risk of smoking and lead to culturally sensitive, tailored interventions. Such interventions should consider the effects neighbourhood may have on the decision to quit smoking.

MeSH Terms: *Immigrants; Smoking; Cessation; Canada; Cross Sectional Analysis;*

3.2 Introduction

In 1998, an estimated 48,000 Canadians died of smoking related illness. This comprised nearly 22% of all deaths in Canada for that year (Makomaski Illing and Kaiserman 2004). Smoking has been linked to various cancers (most notably lung cancer), ischemic heart disease, stroke, and chronic lung disease, incidences of which can be present in non-smokers through second-hand smoke inhalation. The tragedy underlying smoking mortality statistics is that they are entirely preventable. Indeed, cigarette smoking is the number one preventable cause of death in both Canada and the US (US Department of Health and Human Services 1990; Millar 1992; Giovino 2002; Makomaski Illing and Kaiserman 2004; Georgiades, Boyle et al. 2006).

The most effective preventative measure a smoker can take to avoid smoking-related illness and death is to quit. Quitting smoking substantially reduces the risk of developing heart and lung disease, with both immediate and long term effects. The risks of developing heart disease are reduced to nearly half that of a smoker within the first year of quitting. The risk of developing both heart disease and lung cancer even approaches the risk levels of lifetime non-smokers within roughly 15 years of quitting (US Department of Health and Human Services 1990; Shields 2004; Shields 2005). Even smokers with already developed chronic smoking-related illness can enjoy health benefits of quitting, including reduced risk of heart attack for individuals with coronary heart disease and reduced risk of developing a second primary cancer for individuals with lung or other cancers (US Department of Health and Human Services 1990). The health benefits of quitting smoking extend beyond smokers to family members, including

infants and children, exposed to the harmful effects of second-hand smoke, and the foetus of a pregnant smoker.

Despite the statistics, the warnings from physicians and public health authorities and the overwhelmingly positive benefits of smoking cessation, roughly 22% of Canadians continue to smoke (2005 estimates) (Statistics Canada 2005). While this figure is down from previous decades (national prevalence was estimated at 29% in 1995 (Statistics Canada 2005)), nearly a quarter of all Canadians continue to be at unnecessary risk of early death due to cigarette smoking.

The number one barrier preventing smoking cessation is the addictive quality of nicotine (Hyland, Borland et al. 2006). Nicotine is a psychoactive drug that has been shown to have pleasurable effects on one's mood as well as serving as a muscle relaxant. Increased consumption of nicotine can lead to diminished effects, but the absence of nicotine can result in withdrawal symptoms in smokers (US Department of Health and Human Services 1988). Evidence of the difficulty in overcoming addiction to nicotine can be seen in the high reported number of unsuccessful quit attempts. Stephens and Siroonian's (1998) examination of the 1994/95 National Population Health Survey (NPHS) revealed that 41% of smokers reported an unsuccessful quit attempt in the 12 months before the survey, compared to 16% who successfully quit. This suggests that the desire to quit smoking is often outweighed by the difficulty of the task.

While smoking cessation is a difficult undertaking for anyone with a developed addiction to nicotine, myriad factors affect both the likelihood of attempting to quit and the success of quit attempts. Socioeconomic variables have been known to play a

significant role in cessation. For example, high income and educational attainment have been associated with increased rates of quitting smoking, while increased age generally reduces the likelihood of quitting (Stephens and Siroonian 1998; West, McEwen et al. 2001; Shields 2004; Shields 2005; Farnworth 2006; Hyland, Borland et al. 2006). Additionally, ethnicity has been shown to be a factor in smoking cessation, with ethnic minorities reportedly experiencing greater difficulty in quitting than whites (Nevid 1996; Giovino 2002; Fu, Burgess et al. 2007). The observable differences between ethnicities are not only reflective of the discrepancies in socioeconomic situations facing ethnic minorities but are also a result of different access and usage of healthcare services amongst ethnic groups, and differing health beliefs and perceptions (Nevid 1996; Nevid, Javier et al. 1996; Fu, Burgess et al. 2007).

Psychosocial and lifestyle factors also contribute to one's likelihood of successfully quitting smoking. Factors such as depression, anxiety and chronic stress have been shown to reduce cessation rates (West, McEwen et al. 2001; Shields 2004) while low levels of emotional support from friends and family have also been shown to decrease the likelihood of quitting (Shields 2004). The presence of children within the household has shown to increase successful quit attempts among men while women are increasingly likely to quit if they are pregnant (Shields 2004; Shields 2005).

While individual level explanatory factors such as those above have been well researched, there exists a growing literature that suggests that place of residency may play a role in both smoking prevalence and cessation. Several studies from Europe and the United States, though few from Canada, have found that neighbourhood deprivation

has an effect on smoking behaviour independent of an individual's socioeconomic status (SES)(Kleinschmidt, Hills et al. 1995; Reijneveld 1998; Duncan, Jones et al. 1999; Stead, MacAskill et al. 2001). Kleinschmidt *et al* (1995) noted a highly significant association between being a smoker and a calculated neighbourhood deprivation score that persisted even after controlling for SES. Similar findings from Reijneveld (1998) found that in certain Amsterdam neighbourhoods, while poor health in general was explained by individual SES, neighbourhood effects were able to explain smoking prevalence independent of individual level SES. Stead *et al* (2001) and Giskes *et al* (2006) further argue that not only can deprived neighbourhoods foster higher smoking rates, they may also serve to "hinder" cessation.

The central theme to these area level studies is the idea of deprivation or disadvantage. While each study has slightly different measures of deprivation, they generally comprise measures of average income and unemployment, two of the factors seen as contributing the most to an area's perceived disadvantage (Reijneveld 1998; Duncan, Jones et al. 1999). Deprivation is seen as contributing to reduced physical and mental health. Disadvantaged neighbourhoods are perceived to have poorer health facilities and services as well as higher incidences of substandard housing and neglected infrastructure (Stead, MacAskill et al. 2001). Residents of such neighbourhoods are also more likely to be exposed to crime and violence, and are more likely to experience unemployment, which can cause increased stress and decreases in psychological health (Stead, MacAskill et al. 2001). Additional explanations for increased smoking prevalence and decreased cessation include the greater availability of cigarettes and

point-of-sale locations, and the ubiquity of other smokers in disadvantaged areas (Giskes, van Lenthe et al. 2006).   These explanations illustrate the need for area level interventions to complement individual smoking cessation programs.

There is a wealth of literature examining smoking cessation and its multiple levels of explanatory variables. And while differences in smoking cessation between genders, ethnicities and rich and poor neighbourhoods have been extensively researched, little has been written about smoking cessation among the immigrant community in Canada (ethnicity, it can be argued, is not a reliable proxy for immigrant status).   This is surprising given that immigrants make up nearly one fifth of Canada's population as of the 2006 census.

It would seem that, given the explanatory variables listed above, immigrants would face a reduced likelihood of quitting smoking. While immigrants, especially recent immigrants, are more likely to have achieved higher levels of educational attainment, they also tend to have lower incomes than the native-born and are also, on average, older than individuals born in Canada (although this has shown to be true only for European immigrants, the largest of the immigrant groups) (Dunn and Dyck 2000). Recent immigrants have been shown to be less likely to be screened for chronic conditions and less likely to make use of health services than non-immigrants (Leduc and Proulx 2004). Psychosocially, immigrants are at an increased risk of stress related to the immigration experience that can lead to anxiety and depression as well as general declines in health (Elliott and Gillie 1998; Beiser 2005). At a neighbourhood level, recent immigrants are more likely to settle in low-income areas of urban centres, placing

them at greater risk for the negative effects of living in a deprived area (Glazier, Creatore et al. 2004). The combination of these factors should suggest that immigrants would be less likely to quit smoking than non-immigrants.

Chapter 2, however, showed that despite unfavourable circumstance, immigrants were significantly less likely to smoke than non-immigrants. Moreover, it revealed that significant heterogeneity exists in smoking behaviours between immigrant groups. It stands to reason, therefore, that differences exist in smoking cessation amongst immigrants in Canada as well. The objective of this research is to examine the effects of both individual and neighbourhood level variables on smoking cessation among immigrants in Canada. Phase one of the current study focuses on individual level effects on smoking cessation amongst immigrants disaggregated by both region and country of birth to reveal heterogeneity within the immigrant community and to determine whether immigrants from certain countries are more or less likely to quit smoking than non-immigrants. The second phase of the study employs multilevel modeling techniques to examine the relationship between neighbourhood and smoking cessation and to determine if neighbourhood disadvantage plays a role in an immigrant's likelihood of quitting smoking. The results of this study have the potential to inform program development and delivery of smoking cessation initiatives to hard to reach smokers. In addition, the results should help determine the need to supplement such cessation efforts with neighbourhood level interventions.

3.3 Methods

3.3.1 Data

Data for this study are drawn from the first three cycles of the Canadian Community Health Survey (CCHS). The CCHS is a cross-sectional survey of health determinants, health status and health care use among Canadians, and is composed of a large general survey collecting data for more than 130,000 respondents representing more than 100 health regions in Canada, and a smaller survey focusing on a specific health topic with a smaller sample size of around 30,000 respondents. This study employs data solely from the larger general survey, often referred to as the '.1 cycle'. The .1 cycle provides a representative sample of 98% of Canadians aged 12 years and older, representing all provinces and territories but excluding members of the Canadian Armed Forces, the institutionalized and those living on reserves.

Between 2000 and 2005, three cycles of the CCHS were administered (1.1, 2.1, 3.1) providing a sample of over 400,000 respondents. To take advantage of this large sample size, these three cycles were combined. As the sampling methods and the majority of questions remain consistent through each cycle of the CCHS, this is a relatively simple task which results in more precise estimates of respondent characteristics and allows for the disaggregation of data to levels not possible with a smaller sample size. This study combined the three cycles using a pooled approach, which consists of combining surveys at a micro-data level and rescaling weights to produce unbiased estimates for the sample population (Thomas 2006). Such an approach is not uncommon and has been used by McDonald and Kennedy (2005 and 2007) in

combining cycles 1.1 and 2.1 of the CCHS to improve sample size in their study of immigration and ethnicity on Cancer screening amongst Canadian women (McDonald and Kennedy 2005; McDonald and Kennedy 2007). Similarly, Tremblay *et al* (2006) combined cycles 1.1 and 2.1 in their study of physical activity and immigrant status and Matheson *et al* (2008) pooled the first two cycles of the CCHS in their study of neighbourhood deprivation and body mass index.

Analysis in phase 2 also included data from the 2001 Canadian Census Public Use Micro-data File (PUMF), which provides demographic, social and economic data at the census tract level. The census tract was chosen as the neighbourhood aggregation level because they are small, stable areas of a consistent population size that serve as good proxies for the oft debated term "neighbourhood" in studies of neighbourhood effects on health (Ross, Tremblay et al. 2004), while providing access to statistically meaningful data. Census profile information was combined with the CCHS dataset using a 2001 postal code conversion file. Postal codes in the CCHS dataset were linked to census tracts in the Census profile, and used a single-link indicator to prevent single postal codes being linked to multiple census tracts.

3.3.2 Sample for Analyses

In phase one of the analysis (logistic analysis of smoking cessation), individuals were selected from the pooled CCHS dataset (N = 400,550) who reported having smoked 100 cigarettes or more in their lifetime (N = 205,886), referred to in this chapter as current and former smokers. This sample restriction removed never-smokers from

analysis, allowing for reasonable comparisons between those who have quit smoking and those who have not. Requiring the sample to have smoked 100 cigarettes also avoids the inclusion of those who may have tried smoking but never took to it. These individuals are referred to in the literature as 'experimenters' and are commonly classified as never smokers and thus not included in cessation studies (Shopland, Eyre et al. 1991; Pierce, Choi et al. 1998; Nuorti, Butler et al. 2000; Barbeau, Krieger et al. 2004).

Phase two of the analysis, a multi-level analysis of smoking cessation, further reduced the dataset to current and former smokers residing in the Montreal, Toronto and Vancouver census metropolitan areas (CMAs) at the time of the survey. These CMA's were chosen for their size and high concentrations of immigrants. Almost 75% of recent immigrants to Canada choose to live in these three cities, and the proportion of Toronto, Vancouver and Montreal's population being foreign-born is 44%, 40% and 18% respectively (Statistics Canada 2003).

3.3.3 Variables and Measures

The dependent variable being considered in both phases of analysis was whether the respondent had quit smoking. This was defined by respondents from the sample who identified themselves either as former daily or former occasional smokers. While it may be argued that occasional smokers have an easier time quitting than daily smokers due to a lower addiction to nicotine (Shields 2005), the inclusion of former occasional smokers maintains consistence with the analysis performed in Chapter One which defined smokers as any individual identified as smoking daily or occasionally. Additionally, the

requirement that they have smoked at least 100 cigarettes in their lifetime demonstrates that they were 'established' smokers at some point in their life (Pierce, Choi et al. 1998). Moreover, the health risks of smoking and benefits of cessation apply to daily and occasional smokers alike, thus former occasional smokers were included in the analysis.

Individual level variables incorporated in both analyses include age and sex as well as educational attainment and reported household income. Increased age has been shown to decrease the likelihood of quitting, though Shields (2004) notes that at older ages, smokers may develop chronic conditions that may increase motivation to quit. While gender plays an important role in smoking prevalence, males and females have shown little difference in quitting (Stephens and Siroonian 1998; Shields 2004). However, the vast differences in smoking prevalence among immigrant males and females (as revealed in Chapter 2) suggests that gender is a worthwhile variable to consider in this analysis. Educational attainment, shown to have a positive effect on cessation (Shields 2004; Hyland, Borland et al. 2006), was categorized as having less than a secondary school diploma, being a secondary school graduate, having some post-secondary education, and being a post-secondary school graduate. Income has also shown to positively influence cessation (Nevid 1996; Stephens and Siroonian 1998; Shields 2004; Hyland, Borland et al. 2006). Five income categories ranged from those earning less that $20,000 to those earning greater than $80,000 a year. Immigrant status accounted for both recent (those living in Canada for less than or equal to 15 years) and long-term (greater than 15 years) immigrants and for non-immigrants (either Canadian born or Canadian citizens by birth).

For phase one of the analysis, respondents who were not born in Canada were grouped into six regions: North America and the Caribbean, Central and South America, Europe, Africa, and Other, which consisted of immigrants from Oceania and the South Pacific as well as immigrants from countries not assigned a code in the CCHS. Within each regional group (except 'other'), the five most significant sending countries were identified. The smaller sample size contained in phase 2 of the analysis prohibited such disaggregation by region or country of birth.

For phase two analysis, three neighbourhood level variables were considered, including the CMA in which the respondent lived, the proportion of immigrants within the neighbourhood, and a calculated neighbourhood disadvantage score (NDIS). The NDIS was adapted from Boyle and Lipman's (2002) examination of neighbourhood disadvantage and behavioural problems in children, and is comprised of the percentage of the total neighborhood income coming from government transfer payments, percentage of the neighborhood population ages 20 years and over without a secondary school certificate, average household income, percentage of families in the neighborhood with household incomes below the low income cut-off (LICO), and neighbourhood unemployment rate. A principle component analysis was run on these five variables, producing a single factor that accounted for approximately 60% of the total explained variance between the variables and a factor regression score was calculated to determine NDIS.

3.3.4 Statistical Analyses

Phase one analysis consisted of descriptive and multivariate analyses on all current and former smokers. Multivariate analysis was composed of a series of logistic regressions against the dependent variable Quitter (coded as 1 if a former smoker, 0 if a current smoker). Separate regressions were run for immigrant status (immigrant or non-immigrant), recency of arrival (short-term immigrant, long-term immigrant, non-immigrant), region of birth and country of birth. Each regression controlled for age, gender, educational attainment and income category.

Phase two analysis consisted of descriptive statistics as well as multilevel logistic regression models. Multilevel models are designed for hierarchical data structures where micro level data are nested within macro level groups (Kreft and De Leeuw 1998). In this study, that structure is represented by i individuals (level 1) nested within j neighbourhoods in Montreal, Toronto and Vancouver (level 2). Using a multilevel approach accounts for correlations of individual responses within natural groupings and allows for the estimation of variance owing to both the variability between individuals and the variability between neighbourhoods (Kreft and De Leeuw 1998; Boyle and Lipman 2002). CMA was not included as a third level as the number of groups (3) is considered to small to constitute a separate level of analysis.

The form of the multilevel model used in the analysis is shown below:

$$\text{logit}(\pi_{ij}) = \beta_{0j} + \beta_i x_{ij}$$
$$\beta_{0j} = \beta_0 + u_{0j}$$

where π_{ij} represents the dependent variable, given as 1 if individual i in neighbourhood j has quit smoking, β_{0j} represents the intercept, comprised of both a fixed and residual component, and $\beta_i X_{ij}$ is the individual level explanatory variable.

Multilevel models were built incrementally with the first model, the null model, consisting of just the intercept and no explanatory variables. As Ross, Tremblay et al (2004) suggest, the null model is used to measure the relative importance of both the individual and neighbourhood effects in accounting for variation in the outcome. Model 2 built on the null model by adding the demographic and socioeconomic variables of age, sex, educational attainment and income. Model 3 introduced the concept of neighbourhood disadvantage through the NDIS. In Model 4, variables measuring immigration at both individual and neighbourhood levels were added while the final model, Model 5 included the dummy variables indicating CMA. For each model, odds ratios and their corresponding 95% confidence intervals were calculated.

Finally, an intra-class correlation coefficient (ICC) was calculated to judge the effect of the explanatory variables included in the model. For a two-level logistic regression, the ICC is calculated as $\rho = \sigma^2/(\sigma^2 + \pi^2/3)$ where $\pi^2/3 = 3.29$ and σ^2 represents the neighbourhood level variation (Snijders and Bosker 1998). This coefficient is the proportion of neighbourhood level variation against the total variation (neighbourhood level plus individual variation). Decreases in ICC indicate a decrease in the explanatory power of between neighbourhood differences (Ross, Tremblay et al. 2004).

Each level in multilevel analysis is associated with an unexplained residual error. In logistic multilevel regression, the residual error at the individual level is constrained to

1 while the neighbourhood level has its own error term, which estimates the residual between-neighbourhood variation (Snijders and Bosker, 1999). The proportion of variance accounted for by neighbourhoods can be calculated using the intra-class correlation coefficient (ICC), which is defined as $\rho = \sigma^2/(\sigma^2 + \pi^2/3)$ where $\pi^2/3 = 3.29$ (Snijders and Bosker, 1999). The ICC is used to judge the effect of explanatory variables included in the model (Snijders and Bosker, 1999). This coefficient is the ratio between the neighbourhood level variation and the total variation (sum of the individual and neighbourhood level variation), where a decline in the ICC indicates that the differences between neighbourhoods have been reduced by the inclusion of explanatory variables (Ross et al, 2004). Odds ratios and associated 95 percent confidence intervals were also estimated.

3.4 Results

3.4.1 Phase One Descriptive Analysis

From a total sample of 400,550 from the three cycles of the CCHS, roughly 51.4% reported being a current or former smoker (n = 205,886). Table 3.1 shows the characteristics for current and former smokers. The majority of the sample, 82%, is comprised of native-born respondents with immigrants making up less than 16% (missing data in the demographic variables accounts for the other 2%). Immigrants are slightly underrepresented in this sample (immigrants represent roughly 21% of the entire CCHS sample) which is not surprising given the findings of Chapter 2 that immigrants are less likely to be smokers than the native born. More than two thirds of the immigrants within

the sample have lived in Canada for more than 15 years. An overwhelming majority of these long-term immigrants were born in Europe (over 65%), while nearly 40% of recent immigrants (those who have been in Canada for less than fifteen years) originate from Asia.

In general, immigrant smokers tend to be older than native-born smokers and are more likely to be male. Socioeconomic variables reveal significant variation between recent, long-term and non-immigrants. While recent immigrants report the highest levels of education, they are also the lowest paid. Long-term immigrants more closely resemble non-immigrants in terms of education and income but report slightly higher education attainment and incomes.

Just over half of all respondents current and former smokers have been able to quit. This figure is highest among long-term immigrants with over 60% reporting that they are former smokers. While this appears reflective of the socioeconomic advantages reported by long-term immigrants, it is somewhat surprising given that the Healthy Immigrant Effect suggests a convergence of health to native-born levels with increased time since immigration (Chen, Wilkins et al. 1996; Newbold and Danforth 2003; McDonald and Kennedy 2004).

3.4.2 Phase One Logistic Regression Analysis

Table 3.2 shows results from the logistic regressions run on immigrant status against quitting smoking. It is important to note that immigrant status, recency of arrival, region of birth, and country of birth were all run in separate regressions but are included

in one table to facilitate comparison. In general, immigrants are slightly more likely than non-immigrants to quit (OR 1.072, 95% CI 1.042 – 1.103). Recent immigrants are more likely than both long-term immigrants and the native-born to quit (OR 1.164, 95% CI 1.110 – 1.221) while long-term immigrants were shown to be not significantly different than non-immigrants. South American immigrants are nearly 1.3 times as likely as non-immigrants to quit smoking (95% CI 1.153-1.457), while statistically significant differences were not see for African or Asian immigrants. While immigrants from both Colombia (OR 3.034, 95% CI 1.859 – 4.950) and Kenya (OR 4.976, 95% CI 2.521 – 9.832) were found to be significantly more likely to quit than non-immigrants (p < 0.001 for both groups), their wide ranging confidence intervals reflect their small sample-size numbers and should be viewed quite cautiously. The least likely immigrant group to quit smoking are respondents from Vietnam (OR 0.649, 95% CI 0.527 – 0.799) who were also found to be one of the most likely groups to smoke in Chapter 2.

3.4.3 Phase Two Descriptive Analysis

Phase two of analysis further reduced the sample size to 29,660 current and former smokers residing in Toronto, Montreal and Vancouver, roughly 15% of all current and former smokers. This figure is quite low considering that Toronto, Montreal and Vancouver comprise just over 30% of the national population and may suggest that smoking is less prevalent in urban than in rural areas, as has been noted in various studies (see, for instance, (McMillen, Breen et al. 2004)and (Northridge, Vallone et al. 2008)). Table 3.3 shows the characteristics of current and former smokers in Montreal, Toronto

or Vancouver. While non-immigrants still comprised the majority of the sample, this figure was significantly reduced from the national sample. Immigrants in this sample now represent nearly 29%, illustrating the increased likeliness of immigrants living in one of Canada's three largest cities. While the majority of immigrants in the sample are still considered long-term, recent immigrants are much better represented in these urban centres.

As in the previous sample, the majority of immigrants are male and while recent immigrants are considerably younger than the sample mean, the average age of long-term immigrants (those who have been in Canada for fifteen years or longer) is nearly ten years older than the sample mean. While recent immigrants continue to have the highest levels of educational attainment and the lowest household incomes, socioeconomic characteristics of long-term immigrants in Montreal, Toronto and Vancouver virtually mirror those of non-immigrants.

The large majority of both recent and long term immigrants in this sample reside in Toronto (58.6% and 59.4%, respectively). This is contrasted by the majority of non-immigrants in the sample living in Montreal (46.5%). A relatively even proportion of immigrants and non-immigrants in the sample reside in Vancouver. As is to be expected, recent immigrants are most likely to live in high concentrations of other immigrants and are the most likely to live in disadvantaged neighbourhoods while long-term immigrants are actually the least likely of the three groups to experience neighbourhood disadvantage.

3.4.4 Phase Two Multilevel Logistic Regression Analysis

Table 3.4 presents odds ratios and 95% confidence intervals for the five increasingly complex iterations of the multilevel model measuring individual and neighbourhood effects on quitting smoking. The first model run was the Null Model with no explanatory variables included. This Null Model provides a baseline for measuring the relative importance of the explanatory variables included in the next iterations. Model 2 introduced demographic and socioeconomic control variables. Contrary to most literature on smoking cessation, increased age showed a positive, albeit small, effect on the likelihood of quitting smoking (OR 1.052, 95% CI 1.050 – 1.054). While gender appeared to have no significant effect on cessation, increased education and income were both found to significantly increase the likelihood of quitting. Model 3 introduced NDIS, a measure of neighbourhood disadvantage to the equation. Consistent with the literature, increased NDIS reduced the likelihood of quitting smoking (OR 0.861, 95% CI 0.836 – 0.886). The introduction of NDIS also slightly decreased the significance of the lowest levels of both education and income and tempered the odds ratio of the highest income quintile from 2.495 (95% CI 2.275 – 2.735) to 2.145 (95% CI 1.948 – 2.361). Model 4 introduced dummy variables for immigrant status as well as a neighbourhood level measure of the proportion of immigrants within the census tract. These variables had negligible effects on the existing explanatory variables and were not found to be significant within the model. Finally, Model 5 introduced dummy variables for CMA to the analysis. Relative to those living in Montreal, living in Vancouver was found to increase the likelihood of quitting smoking (OR 1.365, 95% CI 1.275 – 1.482) while

living in Toronto was found to be insignificant. After the introduction of CMA, recent immigrant status was found to be significant, resulting in an increased likelihood of quitting smoking (OR 1.234, 95% CI 1.112 – 1.369). Characteristics positively associated with smoking cessation in the final model, therefore, include living in Vancouver, being a recent immigrant, age, being a post secondary graduate and having a household income greater than $20,000.

Table 3.5 displays the intraclass coefficients (ICC) illustrating between neighbourhood variation in smoking cessation. According to the null model, nearly 5% of variation in smoking cessation was attributable to between neighbourhood variations. The introduction of individual level socio-demographic variables in model 2, however, explains a large portion of this variation, reducing the ICC to 1.76%. While the introduction of neighbourhood disadvantage (model 3) and immigrant status (model 4) explain very little of this variation, reducing the ICC to 1.44% and 1.38% respectively, the inclusion of CMA in the final model explains over half of the remaining variation within the model. In the end, only 0.63% of variation in smoking cessation can be explained by between-neighbourhood differences, which is virtually negligible.

3.5 Discussion and Conclusions

While research into smoking cessation has been consistently vigorous since the landmark 1964 Surgeon General's report on smoking, there has been very little literature from Canada on smoking cessation amongst immigrants. Notable exceptions include Millar's (1992) examination of smoking behaviours among immigrants, though small

sample sizes limited analysis to a simple comparison of foreign-born and native-born descriptive statistics. This study contributes to the brief literature on immigrant smoking cessation in two ways, by 1) disaggregating cessation statistics by region and country of birth to both reveal heterogeneity inherent amongst immigrant groups and to identify immigrant groups who may be less likely to be able to quit smoking, and 2) using multilevel models to account for possible neighbourhood effects on immigrant cessation statistics.

Findings from phase one of this study reveal that immigrants, in general, are slightly more likely to quit smoking than non-immigrants, and that recent immigrants in particular are significantly more likely to quit. Results from Chapter 2 also suggest that recent immigrants are less likely to quit than the native-born to population. A possible explanation for the low prevalence and high cessation amongst recent immigrants may be in both the self selection process inherent in the immigration process and the selection process built into the Canadian immigration system which tends to favour healthier and better educated individuals. However, there is no way within the data to tell whether the decision to quit smoking was taken before or after arriving in Canada. While few differences were seen between regions of origin, significant heterogeneity did exist between countries of birth. While disaggregating by country of birth did prove effective in revealing heterogeneity, small sample sizes did prevent further stratification by gender and recency of immigration.

The findings from phase one also allow us to identify immigrant groups who may be less likely to quit smoking. Of particular interest among the findings of this study is

the reduced likelihood of smoking cessation among Vietnamese immigrants. Vietnamese males were also found in Chapter 2 to be the most likely immigrant group to smoke. These findings are consistent with other findings of elevated smoking prevalence among Vietnamese communities in North America. Rahman *et al* (2005) discovered that 35% of Vietnamese men in Santa Clara County, California smoked cigarettes, compared to only 22% among the general population. They also found that acculturation level was inversely associated with smoking among this group and recommend the implementation of effective, culturally appropriate, language specific cessation interventions among the Vietnamese community (Rahman, Luong et al. 2005). Spigner *et al* (2007) discovered in a sample of Chinese and Vietnamese immigrants in Seattle, Washington that half of the current smokers in the sample indicated they had no intention to quit even though they were provided free access to cessation classes. The findings from this study reflect Spigner *et al*'s recommendation for future studies of smoking within the Vietnamese population.

Findings from the multilevel model also support the idea that immigrants are more likely to quit smoking than the native-born population, but this is only significant among recent immigrants. These results also reveal that neighbourhood disadvantage is negatively associated with smoking cessation which is, again, consistent with existing literature. However, the inclusion of NDIS in the multilevel only marginally explained between-neighbourhood variation, suggesting that it may not add much to what can be explained by individual level socioeconomic factors. What did contribute significantly to the model was the CMA of residence of the sample population. Residents of Vancouver

were significantly more likely to have quit smoking than residents of Montreal and the inclusion of this variable explained most of the residual between neighbourhood variation within the model. This may be reflective of provincial differences in smoking behaviour across Canada or may be reflective of differing psychosocial and lifestyle factors that differ between CMAs but were not included in the model.

This study may have been strengthened by the inclusion of additional variables such as measures of stress and mental well being, the presence of children within the household, and the ability to speak English or French – all factors that have been linked to smoking cessation. Language was not considered as an explanatory variable in the analysis of smoking cessation in order to maintain consistency with variables included in the prevalence analysis reported in Chapter 2. Additionally, several studies have noted that household and workplace bans on smoking, along with taxation of smoking products, are effective predictors of cessation (Stephens and Siroonian 1998; Shields 2005). However, given the paucity of literature on factors affecting smoking cessation amongst immigrants, it can be argued that the model used in this study represents an effective starting point for future research on immigrant smoking cessation to build from.

Future research on smoking cessation amongst immigrants may also benefit from the use of longitudinal datasets. While the CCHS was used in this study to make use of its large sample sizes, the cross-sectional nature of the data limits the ability to calculate annual quit rates (quit successes versus failed attempts) or to examine relapse among former smokers. Future research using the National Population Health Survey (NPHS) may provide insight into the effect of acculturation, for instance, on smoking cessation.

The findings of this study have the potential to inform smoking cessation initiatives targeted at immigrant communities. While immigrants in general were found to be slightly more likely to have quit smoking than non-immigrants, effective, culturally appropriate targeted interventions towards particular immigrant groups, including immigrants from Vietnam, Egypt, Morocco, and the Philippines may be effective in increasing cessation among these groups. While neighbourhood disadvantage was not found to explain cessation above and beyond individual level factors, it was negatively associated with smoking cessation. This suggests some benefit might be derived by complimenting individual cessation programs with neighbourhood level interventions or, at the very least, incorporating neighbourhood level variables into further research on immigrant health and health behaviours.

3.6 References

Barbeau, E. M., N. Krieger, et al. (2004). "Working class matters: socioeconomic disadvantage, race/ethnicity, gender, and smoking in NHIS 2000." Am J Public Health **94**(2): 269-78.

Beiser, M. (2005). "The health of immigrants and refugees in Canada." Canadian Journal Of Public Health-Revue Canadienne De Sante Publique **96**: S30-S44.

Boyle, M. H. and E. L. Lipman (2002). "Do places matter? Socioeconomic disadvantage and behavioral problems of children in Canada." Journal Of Consulting And Clinical Psychology **70**(2): 378-389.

Chen, J., R. Wilkins, et al. (1996). "Health expectancy by immigrant status, 1986 and 1991." Health Rep **8**(3): 29-38(Eng); 31-41(Fre).

Duncan, C., K. Jones, et al. (1999). "Smoking and deprivation: are there neighbourhood effects?" Soc Sci Med **48**(4): 497-505.

Dunn, J. R. and I. Dyck (2000). "Social determinants of health in Canada's immigrant population: results from the National Population Health Survey." Social Science & Medicine **51**(11): 1573-1593.

Elliott, S. J. and J. Gillie (1998). "Moving experiences: a qualitative analysis of health and migration." Health and Place **4**(4): 327-339.

Farnworth, M. G. (2006). "What motivates daily cigarette smokers to quit? Retrospective annual discrete duration analysis." Subst Use Misuse **41**(4): 533-54.

Fu, S. S., D. Burgess, et al. (2007). "Views on smoking cessation methods in ethnic minority communities: a qualitative investigation." Prev Med **44**(3): 235-40.

Georgiades, K., M. H. Boyle, et al. (2006). "Tobacco use among immigrant and nonimmigrant adolescents: individual and family level influences." J Adolesc Health **38**(4): 443 e1-7.

Giovino, G. A. (2002). "Epidemiology of tobacco use in the United States." Oncogene **21**(48): 7326-40.

Giskes, K., F. J. van Lenthe, et al. (2006). "Smokers living in deprived areas are less likely to quit: a longitudinal follow-up." Tob Control **15**(6): 485-8.

Glazier, R. H., M. I. Creatore, et al. (2004). "Geographic methods for understanding and responding to disparities in mammography use in Toronto, Canada." J Gen Intern Med **19**(9): 952-61.

Hyland, A., R. Borland, et al. (2006). "Individual-level predictors of cessation behaviours among participants in the International Tobacco Control (ITC) Four Country Survey." Tob Control **15 Suppl 3**: iii83-94.

Kleinschmidt, I., M. Hills, et al. (1995). "Smoking behaviour can be predicted by neighbourhood deprivation measures." Journal Of Epidemiology And Community Health **49**: S72-S77.

Kreft, I. and J. De Leeuw (1998). Introducing Multilevel Modeling. London, Sage Publications.

Leduc, N. and M. Proulx (2004). "Patterns of health services utilization by recent immigrants." J Immigr Health **6**(1): 15-27.

Makomaski Illing, E. M. and M. J. Kaiserman (2004). "Mortality attributable to tobacco use in Canada and its regions, 1998." Can J Public Health **95**(1): 38-44.

McDonald, J. T. and S. Kennedy (2004). "Insights into the 'healthy immigrant effect': health status and health service use of immigrants to Canada." Social Science & Medicine **59**(8): 1613-1627.

McDonald, J. T. and S. Kennedy (2005). "Ethnicity, Immigration and Cancer Screening: Evidence for Canadian Women." Social and Economic Dimensions of an Aging Population, Working Paper Series **McMaster University**(145).

McDonald, J. T. and S. Kennedy (2007). "Cervical cancer screening by immigrant and minority women in Canada." J Immigr Minor Health **9**(4): 323-34.

McMillen, R., J. Breen, et al. (2004). "Rural-urban differences in the social climate surrounding environmental tobacco smoke: a report from the 2002 Social Climate Survey of Tobacco Control." J Rural Health **20**(1): 7-16.

Millar, W. J. (1992). "Place of birth and ethnic status: factors associated with smoking prevalence among Canadians." Health Rep **4**(1): 7-24.

Nevid, J. S. (1996). "Smoking cessation with ethnic minorities: Themes and approaches." Journal Of Social Distress And The Homeless **5**(1): 39-54.

Nevid, J. S., R. A. Javier, et al. (1996). "Factors predicting participant attrition in a community-based, culturally specific smoking-cessation program for Hispanic smokers." Health Psychol **15**(3): 226-9.

Newbold, K. B. and J. Danforth (2003). "Health status and Canada's immigrant population." Social Science & Medicine **57**(10): 1981-1995.

Northridge, M. E., D. Vallone, et al. (2008). "The importance of location for tobacco cessation: rural-urban disparities in quit success in underserved West Virginia Counties." J Rural Health **24**(2): 106-15.

Nuorti, J. P., J. C. Butler, et al. (2000). "Cigarette smoking and invasive pneumococcal disease. Active Bacterial Core Surveillance Team." N Engl J Med **342**(10): 681-9.

Pierce, J. P., W. S. Choi, et al. (1998). "Tobacco industry promotion of cigarettes and adolescent smoking." Jama **279**(7): 511-5.

Rahman, M. M., N. T. Luong, et al. (2005). "Prevalence and predictors of smoking behavior among Vietnamese men living in California." Nicotine Tob Res **7**(1): 103-9.

Reijneveld, S. A. (1998). "The impact of individual and area characteristics on urban socioeconomic differences in health and smoking." Int J Epidemiol **27**(1): 33-40.

Ross, N. A., S. S. Tremblay, et al. (2004). "Neighbourhood influences on health in Montreal, Canada." Soc Sci Med **59**(7): 1485-94.

Shields, M. (2004). "A step forward, a step back: Smoking Cessation and Relapse." Healthy Today, Healthy Tomorrow? Findings from the National Population Health Survey **Catalogue 82-618**.

Shields, M. (2005). "The journey to quitting smoking." Health Rep **16**(3): 19-36.

Shopland, D. R., H. J. Eyre, et al. (1991). "Smoking-attributable cancer mortality in 1991: is lung cancer now the leading cause of death among smokers in the United States?" J Natl Cancer Inst **83**(16): 1142-8.

Snijders, T. and R. Bosker (1998). Multilevel analysis: an introduction to basic and advanced multilevel modeling. London, Sage Publications.

Statistics Canada. (2003). "Canada's Ethnocultural Portrait: The Changing Mosaic." Census 2001: analysis series. http://www12.statcan.ca/english/census01/products/analytic/companion/etoimm/pdf/96F0030XIE2001008.pdf.

Statistics Canada (2005). Smoking and Diabetes Care: Results from the CCHS Cylce 3.1 (2005). Health Statistics Division. Ottawa, 82-621-XIE No. 002. **82-621-XIE**.

Stead, M., S. MacAskill, et al. (2001). ""It's as if you're locked in": qualitative explanations for area effects on smoking in disadvantaged communities." Health Place **7**(4): 333-43.

Stephens, M. and J. Siroonian (1998). "Smoking prevalence, quit attempts and successes." Health Rep **9**(4): 31-7(Eng); 31-8(Fre).

Thomas, S. (2006). Combining Cycles of the Canadian Community Health Survey. Proceedings of Statistics Canada Symposium 2006, Methodological Issues in Measuring Population Health, Satistics Canada.

US Department of Health and Human Services (1988). The Health Consequences of Smoking: Nicotine Addiction. US Department of Health and Human Services, Public Health Service, Centers for Disease Control, Center for Chronic Disease Prevention and Health Promotion and Office on Smoking and Health, (CDC) 88-846.

US Department of Health and Human Services (1990). The Health Benefits of Smoking Cessation. US Department of Health and Human Services, Public Health Service, Centers for Disease Control, Center for Chronic Disease Prevention and Health Promotion and Office on Smoking and Health.

West, R., A. McEwen, et al. (2001). "Smoking cessation and smoking patterns in the general population: a 1-year follow-up." Addiction **96**(6): 891-902.

Table 3.1 – Descriptive characteristics (%) of current and former smokers, weighted.

Variables	Total Sample	Native-born	Recent Immigrant	Long-term Immigrant
Sample	100	82.0	4.9	10.8
Quit Smoking				
Yes	53.0	51.8	47.3	64.9
No	46.9	48.2	52.7	35.1
Age (Mean)	46.4	45.6	38.4	56.2
Sex				
Male	54.5	52.4	70.5	63.0
Female	45.5	47.6	29.5	37.0
Educational Attainment				
< Secondary	24.3	25.3	13.1	21.7
Secondary Grad	19.7	19.8	17.1	19.4
Some Post Secondary	8.4	8.6	8.5	6.6
Post Secondary Grad	47.7	46.3	61.4	52.3
Income				
<20,000	11.2	11.2	14.5	9.9
20-40,000	20.1	20.0	21.4	19.8
40-60,000	18.8	18.8	20.9	17.5
60-80,000	15.0	15.1	15.4	14.3
>80,000	24.2	24.3	16.7	27.2
North America & Caribbean	1.45	-	7.0	10.2
USA	1.0		2.9	6.8
Jamaica	0.2		0.7	1.4
Mexico	0.1		1.6	0.4
Trinidad	0.1		0.5	0.6
Haiti	0.1		0.4	0.4
South America	0.71	-	6.5	3.6
Guyana	0.2		1.0	1.0
El Salvador	0.1		1.1	0.5
Chile	0.1		0.8	0.6
Colombia	0.05		0.6	0.2
Brazil	0.03		0.2	0.2
Europe	8.57	-	30.4	65.5
UK	2.7		4.0	21.8
Germany	0.8		1.2	6.0
Italy	1.1		0.3	10.0
Netherlands	0.6		0.6	4.9
Poland	0.7		5.7	3.6
Africa	0.62	-	6.3	2.9
South Africa	0.1		0.9	0.6
Egypt	0.1		0.5	0.6
Morocco	0.1		0.6	0.5
Algeria	0.1		0.9	0.1
Kenya	0.04		0.4	0.1
Asia	3.19	-	39.4	11.6
China	0.6		7.6	1.9
India	0.4		3.8	1.5
Philippines	0.5		5.5	1.6
Hong Kong	0.3		4.2	1.2
Vietnam	0.3		2.1	1.4
Other	0.12		1.0	0.7
N (weighted)	205886	168799	10121	22221

Table 3.2 – Results of logistic regression of immigrant status against quitting smoking (after controlling for age, sex, income and education)

	Adjusted Odds Ratio		-95% CI	+95% CI
Immigrant	**1.072**	‡	**1.042**	**1.103**
Recent	*1.164*	‡	*1.110*	*1.221*
Long Term	*1.030*		*0.995*	*1.066*
NA	**1.182**	‡	**1.088**	**1.284**
USA	*1.093*		*0.983*	*1.216*
Jamaica	*1.500*	‡	*1.202*	*1.872*
Mexico	*1.896*	‡	*1.428*	*2.517*
Trinidad	*0.746*		*0.544*	*1.023*
Haiti	*0.897*		*0.618*	*1.302*
SA	**1.296**	‡	**1.153**	**1.457**
Guyana	*0.949*		*0.741*	*1.215*
El Salvador	*1.210*		*0.893*	*1.640*
Chile	*1.436*	*	*1.052*	*1.961*
Colombia	*3.034*	‡	*1.859*	*4.950*
Brazil	*1.185*		*0.674*	*2.082*
Europe	**1.048**	*	**1.010**	**1.089**
UK	*1.117*	†	*1.044*	*1.196*
Germany	*0.928*		*0.823*	*1.047*
Italy	*1.206*	‡	*1.088*	*1.337*
Netherlands	*1.505*	‡	*1.290*	*1.756*
Poland	*0.961*		*0.845*	*1.092*
Africa	**1.069**		**0.938**	**1.218**
South Africa	*1.096*		*0.790*	*1.519*
Egypt	*0.644*	*	*0.457*	*0.907*
Morocco	*0.638*	*	*0.450*	*0.904*
Algeria	*1.702*	*	*1.130*	*2.564*
Kenya	*4.976*	‡	*2.521*	*9.832*
Asia	**1.037**		**0.977**	**1.099**
China	*1.274*	†	*1.104*	*1.471*
India	*1.229*	*	*1.031*	*1.464*
Philippines	*0.832*	*	*0.716*	*0.967*
Hong Kong	*1.200*	*	*1.005*	*1.434*
Vietnam	*0.649*	‡	*0.527*	*0.799*
Other	**0.740**	*	**0.554**	**0.989**

* p < 0.05, † p < 0.01, ‡ p < 0.001

Table 3.3 – Descriptive characteristics (%) of current and former smokers living in Montreal, Toronto, Vancouver, weighted.

Variables	Total Sample	Native-born	Recent Immigrant	Long-term Immigrant
Sample	100	68.1	10.9	18.0
Quit Smoking				
Yes	52.6	50.9	47.2	62.1
No	47.3	49.0	52.7	37.8
Age (Mean)	46.1	44.9	38.4	55.0
Sex				
Male	56.0	51.1	71.7	65.0
Female	44.0	48.9	28.3	35.0
Educational Attainment				
< Secondary	19.3	19.4	12.4	23.1
Secondary Grad	19.3	19.5	17.0	19.6
Some Post Secondary	8.9	9.5	8.6	6.6
Post Secondary Grad	52.6	51.6	61.9	50.7
Income				
<20,000	10.0	9.3	15.0	9.4
20-40,000	17.1	16.5	21.1	17.1
40-60,000	17.6	17.1	20.9	17.1
60-80,000	15.1	15.2	15.4	14.5
>80,000	29.8	31.8	16.4	30.7
CMA				
Montreal	39.2	46.5	22.2	21.8
Toronto	42.7	35.7	58.6	59.4
Vancouver	18.1	17.8	19.1	18.8
Neighbourhood Disadvantage Score (Mean)	0.006	-0.036	.301	-0.050
Neighbourhood Proportion Immigrants (Mean)	0.30	0.26	0.45	0.39
N (weighted)	29660	20187	3242	5347

Table 3.4 – Multilevel Logistic Regression Model, dv = Quit Smoking

	Null Model		Model 2			Model 3			Model 4			Model 5		
	B	SD	B	SD		B	SD		B	SD		B	SD	
Intercept	0.178	0.013	-0.771	0.045		-0.599	0.047							
			Odds Ratio	-95 %	+95 %	Odds Ratio	-95 %	+95 %	Odds Ratio	-95 %	+95 %	Odds Ratio	-95 %	+95 %
Age (Centred)			1.052 ‡	1.050	1.054	1.051 ‡	1.049	1.053	1.052 ‡	1.050	1.054	1.052 ‡	1.050	1.054
Sex (ref = Male)														
Female			1.079	1.023	1.138	1.064	1.007	1.124	1.083	1.025	1.144	1.084	1.026	1.146
Education (ref < secondary grad)														
Secondary Grad			1.196 *	1.095	1.306	1.165	1.065	1.275	1.149	1.050	1.258	1.116	1.020	1.222
Some post-secondary			1.305 *	1.165	1.462	1.279 *	1.141	1.433	1.275 *	1.138	1.429	1.206	1.076	1.351
Post-secondary grad			1.654 ‡	1.532	1.785	1.624 ‡	1.505	1.753	1.603 †	1.485	1.731	1.553 †	1.438	1.676
Household Income (ref < $20,000)														
$20 – 40,000			1.384 †	1.265	1.515	1.322 *	1.205	1.449	1.324 *	1.208	1.452	1.339 *	1.221	1.468
$40 – 60,000			1.837 ‡	1.672	2.018	1.706 †	1.550	1.878	1.716 †	1.559	1.889	1.742 †	1.582	1.918
$60 – 80,000			2.032 ‡	1.839	2.246	1.831 †	1.654	2.028	1.857 †	1.674	2.060	1.887 †	1.701	2.094
> $80,000			2.494 ‡	2.275	2.735	2.145 ‡	1.948	2.361	2.177 ‡	1.974	2.401	2.241 ‡	2.032	2.472
NDIS						0.861 †	0.836	0.886	0.855 †	0.830	0.880	0.832 †	0.803	0.862
Proportion Immigrant									1.016	0.998	1.034	1.013	0.991	1.035
Immigrant status (ref non-immigrant)														
Recent Immigrant									1.213	1.093	1.346	1.234 *	1.112	1.369
Long Term Immigrant									1.020	0.943	1.103	1.043	0.964	1.128
CMA (ref = Montreal)														
Toronto												0.882	0.806	0.966
Vancouver												1.365 *	1.257	1.482

Table 3.5 – Summary of variance components (standard errors), multilevel logistic
regression. DV = Quit Smoking

Random Effects	Null Model	'Model 2	Model 3	Model 4	Model 5
Level 2, Neighbourhood	0.166(0.02)	0.059(0.02)	0.048(0.019)	0.046(0.019)	0.021(0.018)
Level 1, Individual	1.00	1.00	1.00	1.00	1.00
Intra-class correlation coefficient (%)	4.80	1.76	1.44	1.38	0.63

CHAPTER FOUR: Conclusion

4.1 Introduction

This thesis presents the results of two studies exploring the smoking behaviours of immigrants in Canada based on data collected in the Canadian Community Health Survey (CCHS). The overall objective of this research has been to determine whether immigrants in Canada exhibit different patterns in smoking prevalence and cessation than non-immigrants and to what extent one's immigrant status affects the likelihood of both smoking and quitting smoking. This overall objective was met through pursuing the following secondary research objectives:

1. To determine if data on smoking prevalence and cessation disaggregated by country of birth reveals important heterogeneity unseen in aggregate data.

2. To examine whether immigrants from certain sending countries are more likely to be smokers than the Canadian-born population, and similarly, whether immigrants from certain sending countries are less likely to have quit smoking than the Canadian-born.

3. To understand to what extent length of time since immigration affects the smoking behaviours of immigrants from a given region or country.

4. To examine the relationship between neighbourhood and smoking cessation and to determine if neighbourhood disadvantage plays a role in an immigrant's likelihood of quitting smoking.

Descriptive and multivariate analyses, including both simple and multilevel logistic

regression techniques, were employed to address these research objectives based on secondary data sources (the CCHS and Canadian Census profile), the results of which have been discussed in chapters 2 and 3. This concluding chapter provides a summary of the major findings as well as limitations within the research. A discussion of overall contributions follows as well as suggestions for future research in immigrant smoking behaviour.

4.2 Summary of Major Findings

Smoking behaviour is comprised of two separate but related activities: uptake (often measured by prevalence in cross-sectional studies) and cessation. Using data collected by the CCHS, prevalence was defined by individuals who responded that they smoked cigarettes daily or occasionally at the time of the survey. Cessation was defined by individuals who identified themselves as former daily or occasional smokers who had smoked 100 cigarettes or more in their lifetime, but were non-smokers at the time of the survey.

Consistent with the existing literature on uptake amongst immigrants, (Millar 1992; Perez 2002) this research found that smoking prevalence was significantly lower among immigrants than among the native-born. While previous studies have aggregated immigrants into large groups such as ""foreign-born", "European", "Asian", etc, this study disaggregated immigrants by country of birth and found that significant variation between immigrant groups was revealed that had previously gone unseen. While Asian immigrants were found to be the least likely to smoke, they also exhibited the greatest

variation between country of birth, with Indian immigrants being the least likely to smoke and Vietnamese immigrants being one of the most likely. Stratification of the sample by gender revealed further heterogeneity with certain Asian women being extremely unlikely to smoke, while prevalence among many European women closely resembled that of the Canadian-born population, suggestive of cultural differences.

Similar heterogeneity was found upon disaggregation by country of birth when examining smoking cessation. While cessation among Asian immigrants in general, for example, resembled that of the native-born population, significant variation existed between the top five sending countries within Asia, with immigrants from China, India and Hong Kong significantly more likely to quit than non-immigrants. Concurrently, Vietnamese and Filipino immigrants were significantly less likely to quit.

Disaggregating smoking statistics by country of birth also allowed for particular at-risk groups to be highlighted. Vietnamese immigrants, for example, were revealed to be among the least likely immigrant groups to quit smoking, while Vietnamese men were more than one and a half times as likely to smoke as Canadian-born men, the highest prevalence observed in the study. This illustrates the need for further study on smoking within certain immigrant groups and can help inform targeted cessation initiatives.

While quitting smoking is mostly an individual decision impacted by individual level explanatory factors, recent research has suggested that neighbourhood level factors, particularly neighbourhood disadvantage, may be able to explain differences in smoking behaviour independent of individual level factors (Kleinschmidt, Hills et al. 1995; Reijneveld 1998; Duncan, Jones et al. 1999; Giskes, van Lenthe et al. 2006). This

research addresses the need to account for contextual effects by employing multilevel modeling techniques on smoking cessation amongst immigrants. While neighbourhood disadvantage was shown to have a statistically significant negative effect on quitting smoking, it was not shown to explain between neighbourhood variation any more than individual level socioeconomic effects. Despite this, the multilevel model did show that place is important in the study of smoking cessation and should be considered in both developing cessation interventions and in conducting further research.

4.3 Limitations

This research could have been strengthened by the use of longitudinal data. Longitudinal data sources such as the National Population Health Survey can provide insight into smoking behaviours unavailable in cross-sectional data sources, but may limit disaggregation by origin. For example, longitudinal data would allow a researcher to follow the quit attempts made by smokers from one cycle to the next and could provide additional insight into factors effecting cessation within a given population. For the purposes of this study, however, a cross-sectional data set was essential in allowing adequate sample sizes to disaggregate immigrants by country of birth while maintaining statistical significance.

Analyses employed for both prevalence and cessation in this research may have been strengthened by the addition of certain key variables. Measures of acculturation such as language spoken at home or ability to speak English or French have been shown to have an effect on smoking prevalence and cessation (Nevid 1996; Shelley, Fahs et al.

2004; Rahman, Luong et al. 2005) and may have been beneficial in multivariate analysis. Psychosocial factors measuring stress and anxiety have been identified as playing a role in one's decision to smoke or quit smoking (Shields 2004). Likewise, given the stresses involved in the immigration experience (Beiser 2005), it may be important to include such concepts in further research into immigrant smoking.

While not necessarily seen as a limitation, it is important to make note of this study's purposeful omission of ethnicity in the analyses. The purpose of this research was to examine the effects of immigrant status on smoking uptake and cessation. Ethnicity does not provide a clear distinction between foreign and native-born and the ability for respondents to associate themselves with multiple ethnicities in the CCHS seriously complicates analysis. Including both ethnicity and country of birth in analysis was not possible due to limitations in sample size.

4.4 Research Contributions

The primary goal of this research is to inform smoking cessation initiatives targeted at immigrants. By highlighting factors that explain smoking prevalence and cessation in immigrants, and by understanding particular immigrant groups' smoking behaviours (both their likelihood of smoking and their likelihood of quitting smoking), initiatives can be specifically targeted at and tailored to individuals and communities to increase quit attempts. Tailored interventions, which involve the provision of culturally sensitive information specifically designed for an individual or group of individuals and delivered through culturally relevant and appropriate media, have been shown in various

studies to be more effective than more general health information, even when general information is targeted at a specific group (de Nooijer, Lechner et al. 2002; Ahmad, Cameron et al. 2005).

This research contributes to the existing scholarly literature on smoking amongst immigrants. Following the lead of Baluja, Park et al. (2003) who disaggregated smoking statistics in California by country of birth and called for the inclusion of immigrant status in future studies of smoking prevalence, this is the first study in Canada (known to the investigator) to disaggregate smoking statistics by country of birth. It is also among the only Canadian studies to look at neighbourhood effects specifically related to immigrant smoking cessation.

4.5 Conclusions and Future Research

With roughly one fifth of Canada's population being foreign born, there is a great need for information on the health of immigrants in Canada. Despite their substantial numbers and the critical role they play on Canadian society, there is surprisingly little information on smoking within the immigrant population. Smoking is the number one preventable cause of death in Canada and, as such, is extensively researched by academics, health care professionals and policy makers alike. Yet immigrants remain conspicuously absent in this research. This study aims to contribute to the small amount of immigrant smoking research available to Canadians and leaves the door open for future researchers to continue to add to the pool.

While this study primarily employed quantitative methods on secondary data sources, it identified numerous areas for further qualitative research to take place. Most

notably, the issue of smoking among Vietnamese immigrants warrants further investigation into the high prevalence and low cessation rates amongst men that are not possible with the datasets used in this study. Structured interviews within the Vietnamese community could provide insight into their attitudes and beliefs on cigarette smoking. Such a study is critical if effective cessation initiatives are to be designed and implemented.

Further research is also important for fully understanding the neighbourhood effects of smoking prevalence and cessation within the immigrant population. Outside of including additional explanatory variables as discussed earlier, further expanding the sample to other CMAs outside of Montreal, Vancouver and Toronto is necessary to further explore the role played by neighbourhood disadvantage. With the inclusion of more CMAs, a third level of analysis could also be included where i individuals are nested within j neighbourhoods within k CMAs. Such an analysis may provide additional insight in understanding the effects of place on smoking.

Finally the methods used within this study, particularly those involving the disaggregation of immigrant status by country of birth, can be applied to future immigrant health studies outside of smoking. Examining the prevalence of diabetes or congenital heart disease, for example, by country of birth may reveal previously unseen variation within the population and help target at-risk communities, leading to healthier immigrants and, therefore, a healthier society.

4.6 References

Ahmad, F., J. I. Cameron, et al. (2005). "A tailored intervention to promote breast cancer screening among South Asian immigrant women." Soc Sci Med **60**(3): 575-86.

Baluja, K. F., J. Park, et al. (2003). "Inclusion of immigrant status in smoking prevalence statistics." Am J Public Health **93**(4): 642-6.

Beiser, M. (2005). "The health of immigrants and refugees in Canada." Canadian Journal Of Public Health-Revue Canadienne De Sante Publique **96**: S30-S44.

de Nooijer, J., L. Lechner, et al. (2002). "Tailored versus general information on early detection of cancer: a comparison of the reactions of Dutch adults and the impact on attitudes and behaviors." Health Educ Res **17**(2): 239-52.

Duncan, C., K. Jones, et al. (1999). "Smoking and deprivation: are there neighbourhood effects?" Soc Sci Med **48**(4): 497-505.

Giskes, K., F. J. van Lenthe, et al. (2006). "Smokers living in deprived areas are less likely to quit: a longitudinal follow-up." Tob Control **15**(6): 485-8.

Kleinschmidt, I., M. Hills, et al. (1995). "Smoking behaviour can be predicted by neighbourhood deprivation measures." Journal Of Epidemiology And Community Health **49**: S72-S77.

Millar, W. J. (1992). "Place of birth and ethnic status: factors associated with smoking prevalence among Canadians." Health Rep **4**(1): 7-24.

Nevid, J. S. (1996). "Smoking cessation with ethnic minorities: Themes and approaches." Journal Of Social Distress And The Homeless **5**(1): 39-54.

Perez, C. E. (2002). "Health status and health behaviour among immigrants." Health Reports **13**(Supplement): 89-100.

Rahman, M. M., N. T. Luong, et al. (2005). "Prevalence and predictors of smoking behavior among Vietnamese men living in California." Nicotine Tob Res **7**(1): 103-9.

Reijneveld, S. A. (1998). "The impact of individual and area characteristics on urban socioeconomic differences in health and smoking." Int J Epidemiol **27**(1): 33-40.

Shelley, D., M. Fahs, et al. (2004). "Acculturation and tobacco use among Chinese Americans." Am J Public Health **94**(2): 300-7.

Shields, M. (2004). "A step forward, a step back: Smoking Cessation and Relapse." Healthy Today, Healthy Tomorrow? Findings from the National Population Health Survey **Catalogue 82-618**.